

## Chapter VIII

### POPULATION CENSUS

#### A. Introduction

Population projections are the numerical consequences of a selected set of assumptions regarding the future course of fertility, mortality and migration. They are conditional forecasts which indicate the effect on an existing population base of changes in the various components under carefully stated assumptions over the projection period. The accuracy of the projections, therefore, largely depends on the accuracy of the assumptions regarding the future course of the various components of population growth.

Despite the uncertainty about their accuracy, population projections serve a variety of purposes in relation to national planning. They provide an important part of the data needed for estimating future requirements of several categories of goods and services. Education, health, housing and other needs cannot be gauged rationally without regard to the expected size, composition and distribution of the population. Population projections also serve as a basis for measuring the increase in labour force and planning targets for employment and production.

Estimates of the size and composition of the population and the levels and trends in the components of population growth are usually derived from the data provided by the latest census, vital registration system and the sample surveys. In Nepal, as noted in earlier chapters, the first complete census of the country using internationally accepted concepts was conducted in 1952/54. The data from this census provided the basis for the initial series of population projections for Nepal. Since 1952/54, two more national censuses were carried out in 1961 and 1971 and the data collected through these

censuses was used for preparing a new set of projections. The demographic sample surveys and the Fertility Survey conducted in the Mid-1970s provided the basis for a further series of projections. The essential features of the various projections are summarized in table 51. For convenience of discussion these projections may be classified into three categories: (a) those based on the data of the 1952/54 census; (b) those based on the data of the 1961 census; (c) those based on the data of the 1971 census and the demographic sample surveys of the 1970s.

#### B. Projections Based on the 1952/54 Census

##### 1. *Government Projections*

The first of the series of projections made in respect of the population of Nepal was undertaken in 1958 by the Department of Statistics.<sup>2</sup>The Projections were limited to the five –year period 1955-1960. The 1952 age and sex data were projected to 1954 and appropriately adjusted for underenumeration. The sex ratio at birth was estimated at 107. The expectation of life at birth was estimated from the 1952/54 census age –sex data on the basis of comparison with the life table of central India. Three assumptions regarding Population growth were made: that the growth rate in 1954/55 estimated at 1.2 per cent pre annum would increase to (a) 1.6 per cent under the low assumption, (b) 1.9 per cent under the medium assumption and (c) 2.1 per cent under the high assumption in 1964/65. The crude birth rate was estimated at 40-50 per thousand of the population, and the crude death rate at around 30 per thousand. Fertility was assumed to remain constant and mortality to change in accordance with the growth rates specified. The resultant projections are summarized in table 52. It can be seen that all three variants were close to the 1961 census count of 9,412,996.

## 2. The United Nations Projections

In 1959, the United Nations secretariat prepared population projections for Nepal on the

Table 51. Important features of the various population projections

Year	Author	Period covered	Number of projections
1957	Government of Nepal	1955-1960	Three
1959	United Nations	1950-1980	one
1963	Thakur	1955-1975	Two
1968	Central bureau of statistics	1961-1981	one
1968	David	1970-1995	Eleven
1969	Ramachandran	1965-1985	Three
1973	United Nations	1970-2000	Three
1973	World Bank	1970-2000	Two
1974	Bureau of statistics	1976-1986	one
1976	Rajbansi and Gubaju	1971-2001	Three

Table 52. Projected population, 1955-1960 (in thousands)

Year	Variants		
	High	Medium	Low
1955	8563	8555	8546
1960	9243	9180	9107

basis of the age-sex data of the 1952/54 census.<sup>2</sup> A total population of 8,473,478 was enumerated at this census. In the absence of vital registration data, it was not possible to estimate reliable indicators of the levels of fertility and mortality. However, it was evident from the census data on age distribution that ages have been reported at this census with a fair degree of accuracy and these coincided very closely with the expected age structure in a population model having a birth rate structure in a population model having a birth rate of about 44 per thousand of the population, a death rate of about 33 per thousand of the population and a rate of natural increase of about 1.1 per cent. The model is that of a stable population in which expectation of life at birth is 30 years and the gross reproduction rate is 2.75.

On the basis of the limited information available regarding the levels and trends of the various components of population growth, the following simple assumption were made in regard to the future increase in population:

Period	Assumed percentage increase
1950-1955	5.00
1955-1960	6.25
1960-1965	7.50
1965-1970	8.75
1970-1975	10.00
1975-1980	11.25

The results of these projections are given in table 53. It may be noted that the enumerated population in the 1971 census was 11,555,983 which is close to the projected population of 11,750,000 in 1975. It may, therefore, be inferred that the pace of growth assumed by the United Nations is slower than what actually occurred. In fact, the assumptions concerning the periodic population changes were actually exceeded by the observed intercensal variation. For instance, it was assumed by the United Nations that population will increase by 7.5 per cent in the interval 1960-1965 and by 8.75 per cent in 1965-1970. The intercensal percentage change between 1961-1971 was 22.8 per cent.

Table 53. Projected population, 1950-1980 (in thousands)

Year	Projected population
1950	8170
1955	8600
1960	9140
1965	9820
1970	10680
1975	11750
1980	13070

Source: *The population of Asia and the Far East, 1950-1980*, report IV (United Nations publication, Sales No.: 59 XIII. 3).

### 3. *Thakur's Projections*

In 1963, Thakur prepared two population projections based on the 1952/54 census data.<sup>3</sup> The projections covered the twenty-year period 1955-1975. The population of the base year, 1955, was built up from the adjusted age sex data of the 1952/54 census. This was the first comprehensive set of population projections prepared for Nepal.

The formulation of assumptions in regard to the future course of fertility and mortality was rendered difficult by the absence of reliable data in regard to the levels and trends in these components. Nevertheless, the following specific assumption were made:

#### (a) *Mortality*

Two assumptions were made in regard to the future course of mortality based on the mortality experience of developing countries of the region. The first assumption, implying a faster improvement in mortality, was that the expectation of life at birth, estimated at 27.5 years for males and 25.0 years for females in 1955, would increase by one year per annum up to the projection period. Thus by 1975, the expectation of life at birth would have increased to 47.5 for males and 45.0 for females. The second assumption, implying a slower improvement in mortality, was that up to 1965 the estimated expectation of life at birth for the two sexes would increase by half a year per annum up to 1965 and that thereafter the increase would be at the rate of one year per annum. This assumption implies an expectation of life at birth of 42.5 for males and 40.0 for females by 1975.

In justification of these assumptions, Thakur noted:

"..... it can be expected that there will be a definite improvement in the health status of the people resulting in lowered death rates. It

has been observed of several countries in the world that when the expectation of life at birth is very low, a reduction in the death rate resulting in an improvement in the expectation of life by half a year per year is normal. It has also been observed for some countries where the expectation had not been too high that the improvement could be almost one year per year.<sup>4</sup>

#### (b) *Fertility*

It was assumed that fertility as measured by the sex adjusted birth rate will remain at a constant value of 50 throughout the projection period. In this connection the author observed:

"The deeply ingrained religious and cultural pattern of the people favouring a high fertility will take a long time to be changed. How far an improvement in literacy, the general raising of the level of living of the people resulting from the planned economic and social development, improved transportation and communication resulting in the free and frequent flow of ideas and ideals, the rapid pace of industrialization and the consequent urbanization of the people will put a check on the level of fertility existing in the country is very difficult to foresee. But experience from the neighbouring countries with similar situations has shown that the fertility component which needs the individual efforts of the people themselves does not show too much of a decrease. With this background and with the knowledge that the socio-economic climate in the country is favourable for the high fertility, we have assumed that fertility will remain at the same level as observed in the last census".<sup>5</sup>

#### (c) *Sex-ratio at Birth*

Sex-ratio at birth was assumed to be 105 males per 100 females. Thakur observed that:

"the sex-ratio at birth in Nepal is not obtainable from the usual sources, viz., registration and hospital data. The indirect source which is the census give an abnormal sex-ratio of less than 100 for the age group 0-4. Since the sex-ratio as observed for several countries of the world over a long period of time has shown an inherent tendency to be near about 104-106, we have assumed for the purpose of our projections, a sex ratio of 105. This ratio has been assumed to hold good up to the end of the period of projection which is 1975.<sup>6</sup>

#### (d) *Migration*

For purposes of the projections, it was assumed that there would be no international migratory changes in future and that even if migration occurred, its magnitude would not be so great as to bring about significant changes in population growth. In justification of this assumption, it was created:

"In the past, people from Nepal, especially young males, have gone out of the country to neighbouring countries like India, Malaya, Burma etc. This out-migration was at its peak during the days of the British regime in Asia. Gorkha soldiers were in great demand and Nepal supplied them. After the emergence of the independent countries in the region, including Nepal, the migration stream can be expected to dwindle down. No doubt there are treaty obligations between countries like India and Nepal whereby the supply of Gorkha soldiers to India is assured. It can be expected that in future the numbers out-migrating will attain so low levels as to be practically negligible. Some amount of return migration to Nepal of those who migrated to the neighbouring countries may be expected. But it is hoped that because of economic reasons this migration will be small. With this background, the assumption as to the future course of migration is made and this

assumption is that the migrant stream from and to the country will be so small as not to drastically affect its population size and structure in the future.<sup>7</sup>

The combination of two assumptions regarding the future course of mortality and one assumption each in respect of fertility and migration resulted in two different projections termed "high" and "low" projections. The "high" projections correspond to the assumption of faster improvement in mortality conditions and the "low" to that of a slow improvement in mortality. The results of these projections are summarized in table 54.

It will be noted that the population of 1970 according to the high projection approximates the 1971 census count of 11,555,983. The dependency burden as implied by these projections is shown in table 55. Under assumptions of faster improvement in mortality the dependency rates will increase, while these ratios will remain more or less constant under assumptions of slower improvement in mortality conditions.

### C. **Projections Base on the 1961 Census**

#### 1. *Bureau of Statistics Projections*

On the basis of the data obtained through the 1961 census, the Central Bureau of Statistics projected the population of Nepal up to 1981.<sup>8</sup> The following adjustments were however, made to the age-sex data of the 1961 census:

(a) The numbers in age not stated categories of each sex were distributed among all known age groups of the same sex by prorating each other by a ratio of the total for all ages (including age not stated) to the total for all ages excluding the age not stated category;

(b) For adjusting the 0-4 age group for possible underenumeration, sex-age-adjusted birth rate (SAABR) of the period 1951-1956 and 1956-

1961 was calculated by reverse surviving children enumerated at ages 5-9 and 0-4 years respectively in the census of 1961;

(c) The age groups from 5-69 were adjusted by a smoothing formula;

(d) The age group 70 and over was split into age groups 70-74, 75-79, 80-84, and 85+ on the basis

of observations derived from stationary population corresponding to the model life table used in the projections;

(e) Finally, for both males and females, each age group was prorated to yield the same total as revealed by the 1961 census.

The specific assumptions made in regard to

Table 54. Projected population, by sex, 1955-1975  
(thousands)

Year	High projection			Low projection		
	Males	Females	Total	Males	Females	Total
1955	4353	4431	8784	4353	4431	8784
1960	4705	4675	9380	4668	4634	9302
1965	5179	5064	10243	5042	4911	9953
1970	5787	5593	11380	5549	5313	10862
1975	6570	6305	12875	6155	5891	12046

Source: H.N. Thakur, *Population Projections for Nepal, 1955-1975* (Kathmandu, Central Bureau of Statistics, 1963), tables 6 and 7

Table 55. Proportionate distribution of population by broad age group, 1955-1980

Age group	1955	1960	1965	1970	1975
<i>High projection</i>					
0-14	41.65	42.29	42.86	42.20	42.65
15-59	53.66	53.22	52.74	53.04	52.58
60+	4.69	4.29	4.40	4.56	4.77
Total	100.00	100.00	100.00	100.00	100.00
<i>Low projection</i>					
0-14	41.65	42.35	42.39	41.75	41.77
15-59	53.66	53.38	53.31	53.86	53.67
60+	4.69	4.27	4.30	4.39	4.56
Total	100.00	100.00	100.00	100.00	100.00

the future course of the various components of population growth are as follows:

(a) *Fertility*

The fertility level as measured by the sex-age-adjusted birth rate of 40 per thousand of the population will remain constant throughout the projection period.

(b) *Mortality*

The level of mortality as measured by the expectation of life at birth ( $e^0$ ) which was

estimated at 37.5 years for the period 1956-1961 will increase by 0.5 years per year up to the projection period. This would mean that the  $e^0$  will be 40.0 for the period 1961-1966, 42.5 for the period 1966-1971, 45.0 for the period 1971-1976 and 47.5 for the period 1976-1981.

(c) *Migration*

As a component of population change,

Table 56. Population projections by sex, 1961-1981  
(thousands)

Year	projected population		
	Males	Females	Both sexes
1961	1636	5777	10413
1966	5077	5199	10276
1971	5571	5677	11248
1976	6152	6241	12393
1981	6850	6928	13778

Source: Central Bureau of Statistics, *Population Projections for Nepal, 1961-1981*, Kathmandu, 1968.

migration was not considered for purposes of these projections.

The results of the projections are summarized in table 56. It will be noted that the projected population for 1971 was very close to the census count of that year.

## 2. *David's Projections*

The most widely used set of projections covering a period of 25 years from 1970 to 1995 is that prepared by David.<sup>9</sup> The population of the base

year, 1970, was taken as 11.4 million and was based on a projection of the 1961 census figure of 9,829,000 as adjusted by Krotki and Thakur.<sup>10</sup> Other initial assumptions include a general fertility rate of 45, which corresponds to a sex-age-adjusted birth rate of about 50, and a life expectancy at birth of 37.5 in 1956-1961. The various assumptions made in regard to the future trends in fertility, mortality and migration are summarized in table 57.

Table 57. Assumptions concerning fertility, mortality and migration I A.S. David's population projections, 1970-1995

	Fertility	Mortality	Migration
Variant I (high)	No change in fertility level throughout the period of projection; initial level represented by CBR=44-58 per 1000 in 1970 corresponding the SAABR= 50per 1,000	Life expectancy in (1956-61) =37.5 years(estimated) mortality declines continuously so as to reduce the estimated CDR from 10.07 per 1000 in 1970 to 13.64 in1995.	nil
II	5 percent decline in fertility in the 25 years period	CDR declines from 20.06 in 1970 to 13.67 in 1995	nil
III	10 percent decline in fertility in the 25 years period	CDR declines from 20.05 in 1970 to 13.58 in 1995	nil
IV	15 percent decline in fertility in the 25 years period	CDR declines from 20.04 in 1970 to 13.48 in 1995	nil
V	20 percent decline in fertility in the 25 years period	CDR declines from 20.04 in 1970 to 13.39 in 1995	nil
VI	25 percent decline in fertility in the 25 years period	CDR declines from 20.03in 1970 to 13.30 in 1995	nil
VII	30 percent decline in fertility in the 25 years period	CDR declines from 20.02 in 1970 to 13.20 in 1995	nil
VIII	35 percent decline in fertility in the 25 years period	CDR declines from 20.01 in 1970 to 13.10 in 1995	Nil
IX	40 percent decline in fertility in the 25 years period	CDR declines from 20.00 in 1970 to 13.00 in 1995	Nil
X	45 percent decline in fertility in the 25 years period	CDR declines from 19.19 in 1970 to 12.89 in 1995	Nil
XI (low)	50percent decline in fertility in the 25 years period	CDR declines from 19.98 in 1970 to 12.79 in 1995	Nil

The results of the projections are shown in table 58. Population figures are given for the 20-year period in steps of five years and under different fertility assumptions ranging from on change in fertility to a 50 per cent reduction by

Table 58. Projections of total population, 1970-1995 (millions)

Fertility reduction (percent)	1970	1975	1980	1985	1990	1995
0	11.40	12.90	14.72	16.91	19.56	22.75
0	11.40	12.89	14.67	16.79	19.31	22.32
10	11.40	12.88	14.61	16.66	19.06	21.89
15	11.40	12.86	14.56	16.53	18.82	21.46
20	11.40	12.85	14.51	16.40	18.57	21.20
25	11.40	12.84	14.45	16.28	18.32	20.59
30	11.40	12.82	14.40	16.15	18.07	20.16
35	11.40	12.81	14.35	16.02	17.82	19.73
40	11.40	12.80	14.29	15.89	17.58	19.31
45	11.40	12.78	14.24	15.76	17.33	18.88
50	11.40	12.77	14.19	15.64	17.08	18.45

Source: A.S. David, "National development, population and family planning in Nepal", Nepal FP/MCH project, Kathmandu, 1968.

1995. The projections show that in the 25-year period 1970-1995, the population of Nepal would double from 11.4 to 22.7 million if there is no drop in fertility. With a 25 per cent drop, it would increase to 20.6 million and with a 50 per cent drop to 18.4 million

The annual growth rates implied in the various projections are shown in table 59. It will annual rate of population growth would increase from about 2.5 to 3.1 per cent if there was no fertility decline while it would remain almost static if there was a 25 per cent decline and it would decrease to 1.5 per cent if there was a 50 per cent

decline. The crude birth rate would remain virtually constant at its 1970 level of 45 if there was no fertility decline, but would decrease to 36 if fertility were to decline by 25 per cent or to 26 if there was a 50 per cent decline in fertility. Under all projections, the crude death rate is expected to decrease from about 20 in 1970 to about 13 in 1995. The proportion of children will increase from 42 to 45 per cent if fertility remains constant, but will decrease to 40 and 34 per cent if fertility declines by 25 and 50 percent respectively.

Table 59. Projections of average annual growth males rate the population under different assumption fo fertility reduction, 1970-1975 1990-1955

Fertility reduction (percent)	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995
0	24.65	26.33	27.75	29.00	30.20
5	25.45	25.81	26.96	27.97	28.81
10	24.24	29.29	26.16	26.92	27.48
15	24.04	24.77	25.36	25.85	26.12
20	23.83	24.25	24.54	24.75	24.71
25	23.63	23.72	23.71	23.63	23.26
30	23.42	23.19	22.87	22.49	21.77
35	23.22	22.65	22.03	21.32	20.23
40	23.01	22.12	21.17	20.13	18.64
45	22.08	21.58	20.31	18.91	16.99
50	22.60	21.04	19.43	17.66	15.29

Source: A.S. David, "National development, population and family planning in Nepal", Nepal FP/MCH Project, Kathmandu, 1968, p. 9.

### 3. Ramachandran's Projections

Ramachandran prepared a population projections for Nepal covering the 20-year period 1965-1985.<sup>11</sup> The population of the base year 1965 was built up from age-sex data of the 1961 census after adjustment for distortions in age reporting. The assumptions made un regard to future levels and trends of fertility, mortality and migration were as follows:

#### (a) Fertility

Fertility was assumed to decline as per the following three assumptions:

	1965-1970	1970-1975	1975-1980	1980-1985
High	-	2.5	2.5	5.0
Medium	2.5	5.0	5.0	5.0
Low	2.5	5.0	10.0	10.0

In the absence of vital statistics, the Coale and Demeny fertility schedule was used to gauge age-specific fertility rates on the assumption that the crude birth rate as estimated on the basis of

available demographic data was 49 per thousand of the population. The mean age of the fertility schedule (m) was estimated at 27 and the gross reproduction rate (GRR) at 3.08. The age-specific fertility rates (ASFR) corresponding to m = 27 and GRR= 3.08 are as follows.

Age Group	ASFR
15-19	.8930
20-24	.1694
25-29	.1663
30-34	.1140
35-39	.0616
40-44	.0123
45-49	.0031

(b) *Mortality*

The  $e^o$  of 38.5 years in 1965 was assumed to increase at first slowly but thereafter at an accelerated rate until it reached 55 years. The actual levels of  $e^o$  (assumed are: 1965-1970 = 40.5; 1970-1975 = 45.0; 1975-1980 = 50.0; and 1980-1985 = 55. The sex breakdown of mortality has been obtained by taking the same levels for the two sexes from the Coale-Demeny Model West Table corresponding to the average values given above.

(c) *Migration*

It was assumed that owing to the policies adopted by the Government of India and Nepal, the flow of migrants towards India would slacken by 1970, after which the quantity of migrants would be negligible. Between 1965 and 1970, it was estimated that a net 100,000 would out-migrate, 70 per cent of whom would be males and most migrants would be aged 15-34 years. The age distribution of migrants was assumed to be in the ratio of 1:2:2:1 for both sexes.

(d) *Sex ratio at Birth*

The sex ratio at birth was assumed to be 105 males per 100 females throughout the projection period.

The assumptions made in regard to future trends in fertility, mortality and migration were used to

project the estimated population of 1965 to the next twenty years by the component method. The results are summarized in table 60. It will be noted that the total population of Nepal estimated at 10,387,000 in 1965 would increase to 17,660,000 in 1985 according to the high projections and to 16,869 according to the low projections.

**D. Projection Based on the 1971 Census**

1. *United Nations Projections*

The method adopted by the United Nations in preparing a set of population projections in 1973<sup>12</sup> was the same as that used in previous projections, i.e., the cohort component method. The projections covered a 30-year period 1970-2000.

Since at the time of preparation of the projections, the sex-age distribution of the 1971 census was not available, the estimated mid-1976 population total derived from the census was prorated according to the age-sex distribution estimated for 1970 in the United Nations projections as assessed in 1968.<sup>13</sup>

Table 60. Projected population, 1965-1985 (thousands)

Period and variant		Males	Females	Both sexes
1965	High	5167	5220	10387
	Medium	5167	5220	10387
	Low	5167	5220	10387
1970	High	5728	5822	11550
	Medium	5715	5810	11525
	Low	5715	5810	11525
1975	High	5527	6608	13135
	Medium	6473	6553	13026
	Low	6473	6553	13026
1980	High	7554	7611	15165
	Medium	7424	7476	14890
	Low	7380	7442	14822
1985	High	8820	8840	17660
	Medium	8367	8594	16961
	Low	8419	8450	16869

Source: K.V. Ramachandran, *Population Projections for Ceylon, Burma, India and Nepal, 1965-1985*, Demographic Training and Research Centre, Bombay, 1969.



	Low	52.2	55.2	53.7
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The initial fertility assumption was a gross reproduction rate of 3.0. Three assumptions were made in regard to the future course of fertility. In the low variant, a decline in fertility was assumed to begin only after 1980 and, by the end of the century, the fertility level would be reduced by about 30 per cent. In the high variant, the decline would begin after 1985 and reach a level of about 20 per cent lower than that in 1985. For the medium variant, a median of the levels of the high and low variants assumed for each quinquennium was adopted.

The mortality assumption was derived from the general models of mortality. For 1970-1975, life expectancies at birth were assumed to be 42.2 for males, 45.0 for females and 43.6 for both sexes. For the rest of the quinquennia covered by the projection, the mortality pattern would conform the values of expectation of life at birth given in table 61.

The results of the projections are shown in table 62. It will be noted that, according to all three variants, the population of Nepal estimated at 11.2 million will almost double or more than Table 61. Assumed life expectancies at birth by sex, 1970-1975 to 1995-2000

Period and variant		Males	Females	Both sexes
1970-1975	High	42.2	45.0	43.6
	Medium	42.2	45.0	43.6
	Low	42.2	45.0	43.6
1975-1980	High	44.7	47.5	46.1
	Medium	44.7	47.5	46.1
	Low	46.2	47.2	45.7
1980-1985	High	47.2	50.0	48.6
	Medium	47.2	50.0	48.6
	Low	46.2	49.2	47.7
1985-1990	High	49.7	52.5	51.1
	Medium	49.7	52.5	51.1
	Low	48.2	51.2	49.7
1990-1995	High	52.2	55.0	53.6
	Medium	52.2	55.0	53.6
	Low	50.2	53.2	51.7
1995-2000	High	57.7	57.5	56.1
	Medium	57.7	57.5	56.1

Source: *World Population Prospect as Assessed in 1973*, Population Studies No. 60 (United Nations publication, Sales No.E.76. XIII.4), tables, 42 and 43.

Table 62. Projected population, 1970-2000 (1)  
(thousands)

Year	High	Medium	Low
1970	11232	11232	11232
1975	12572	12572	12572
1980	14231	14231	14211
1985	16269	16186	16040
1990	18708	18348	18001
1995	21465	20771	20032
2000	24457	23196	22051

Source: *World Population Prospect as Assessed in 1973*, Population Studies No. 60 (United Nations publication, Sales No.E.76. XIII.4), tables, 30, 31 and 32.

## 2. World Bank Projections

Another set of long-range projections is that prepared in 1973 by the World Bank Mission covering the 3-year period 1970-2000.<sup>14</sup> The population of the base year, 1970, was assumed to be 11.2 million, the figure used in the United Nations projections discussed in the previous section.

The age-specific fertility rates for the base year were estimated from regional model life tables showing a gross reproduction rate of 2.95. Two assumptions were made in regard to the future course of fertility. The high variant assumed that fertility would remain constant at the base year level throughout the projection period. The assumption for the low variant was that fertility would drop to a total of 50 per cent reduction in the gross reproduction rate by the year 2000.

The assumption in regard to the initial level of mortality was a life expectancy at birth of 41.7 years. It was further assumed that life expectancy

would increase to 56.9 years by 2000. net migration was assumed to be nil.

The results of the projections are summarized in table 63. it will be noted that the projections prepared by the World Bank and those of David support each other since, on the whole, assumptions are similar. The only major difference between the two sets of projections is in their assumptions relating to the population of the base year: the World Bank mission assumed 11.2 million while David assumed 11.4 million. The results of the 1971 census suggest that the United nations estimate which was used by the Bank is too low and the figure used by David is closer to the actual. If the base population in the mission 's projections is increased from 11.2 million to 11.4 million, then the Mission's adjusted total population in 1995 of 22.3 million according to the high variant and 18.5 million according to the low variant is equal to the corresponding totals of 22.7 million and 18.9 million derived from David's projections.

### 3. Bureau of Statistics Projections

In 1974, the Central Bureau of Statistics prepared projections of the population of Nepal

Table 63. Population projections, 1970-2000 (2)  
(thousands)

Year	High	Low
1970	11240	11240
1975	12574	12466
1980	14230	13755
1985	10267	15095
1990	18747	16440
1995	21746	17850
2000	25408	19293

Source: IBRD, *Economic Situation and Prospects of Nepal*, report No. 125a-NEP., August 1973, annex 2, tables 8 and 9.

and its regions covering the 15-year period 1971-1986 using the component method of projection.<sup>15</sup> The population of the base year was derived from the age-sex data of the 1971 census after effecting the following adjustments:

(a) The enumerated population in the age group 0-4 years was replaced by an independent estimate based on the estimated number of births occurring during 1966-1971 and the estimated level of expectation of life at birth during this five-year period;

(b) The quinquennial age groups from 5 to 64 were smoothed by a three point moving formula;

(c) The reported age group 65+ in the census of 1971 was split into five age groups, 65-69, 70-74, 75-79, 80-84 and 85+ on the basis of observations derived from stationary populations corresponding to the model life tables used in the projections;

(d) Finally, each age group for each sex was prorated to yield the same total as given by the 1971 census enumeration.

The specific assumption made in regard to sex ratio at birth and the future trends of the various components of population growth are as follows:

#### (a) Sex ratio at birth

In the absence of vital statistics, it was assumed that the sex ratio at birth was 105 male births to every 100 female births and that this ratio would remain constant throughout the projection period.

#### (b) Fertility

Fertility as measured by the sex-age adjusted birth rate of 41.86 per thousand (corresponding to a crude birth rate of 42.87 per thousand as estimated by the Coale and Demeny method) was assumed to remain constant throughout the projection period.

#### (c) Mortality

The level of mortality as measured by the expectation of life at birth estimated by the application of the Coale and Demeny method to the 1971 census female age distribution is 45.0

years for 1971-1976. It was assumed that the 1971-1976 level of life expectancy at birth would increase to 47.5 years between 1976 and 1981 and to 50.0 years between 1981 and 1986.

(d) *Migration*

For Purposes of the national projections, it was assumed that international migration would not make any significant contribution to the growth of population in the future.

The results of these projections are summarized below:

Projection Year	Projected Population (in thousands)		
	Males	Females	Both Sexes
1971	5817	5739	11556
1976	6471	6386	12857
1981	7203	7112	14315
1986	8075	7976	16051

According to the projection, the population of Nepal, which was 11.5 million in 1971, would increase to 16.0 million by 1986 or by about 39 per cent in fifteen years. The average annual rate of growth implied by this projection is 2.16 per cent for the period 1971-1976; 2.17 per cent for the period 1976-1981; and 2.31 per cent for the period 1981-1986. The density of the population, i.e., the number of persons per square kilometer, will increase from 82.6 in 1971 to 91.9 in 1976, to 102.3 in 1981 and to 114.8 in 1986. As will be observed from table 64, there will not be any significant change in the age structure of the population which will continue to be weighted in favour of children and youth.

Table 64. Percentage distribution of the total population by broad age group, 1971-1986

Age group	1971	1976	1981	1986
0-14	40.9	40.8	39.7	39.9
15-19	53.7	53.7	54.7	54.4
60 +	5.4	5.5	5.6	5.7
All ages	100	100	100	100

Source: Central Bureau of Statistics, *Population Projections for Nepal, 1971-1986*, Kathmandu, 1974.

4. *Projections of Rajbanshi and Gubhaju*

Rajbanshi and Gubhaju prepared a set of three projections based on the adjusted data of the 1971 census and the results of two demographic surveys, viz., the demographic sample survey of 1974-1975 and the Nepal Fertility Survey of 1976.<sup>16</sup> The projections which constitute the latest in the series cover a 30-year period from 1971 to 2001.

The age-sex distribution of the population obtained at the 1971 census and subsequently corrected by the Central Bureau of Statistics constituted the population of the base year of the projection. The five-year age groups of the base population were survived to every five-year period by use of survival ratios obtained from the West Model Life Table of Coale and Demeny corresponding to the various assumed levels of mortality. The number of live births in every five-year period was computed under varying assumptions of fertility levels. The number of children born in a five-year period were made to survive to the 0-4 age group by the application of the appropriate survival ratios.

The age-specific marital fertility rates available from the Nepal Fertility Survey of 1976 constituted the initial fertility schedule. The age structure of ever-married women in the 1971 census was assumed to remain constant throughout the projection period. The following three assumptions were made in regard to the future course of fertility: (a) that the age-specific marital fertility rates of 1976 would remain constant through the projection period (high variant); (b) that the 1976 age-specific marital fertility rates would decline linearly by 10 per cent up to 1996 (medium I); and (c) that the 1976 age-specific marital fertility rates would decline linearly by 20 per cent up to 1996.

According to the demographic sample survey conducted in 1974-1975, the expectation of life at birth ( $e^{\circ}_0$ ) for males was 46.0 years and for females 42.5 years. These values were assumed to indicate the mortality levels for the period 1971-1976. It was further assumed that, after 1976, male life expectancy would increase by 0.5 year every year until the end of the projection period and that the female life expectancy would increase by 0.5 year per year until 1981 and thereafter at the rate of 0.75 year per year until the end of the projection period. Thus in terms of the above assumptions, the expectation of life at birth in 1996-2001 for males would be 58.5 and for females 60.0 years.

As in most of the projections prepared for Nepal, net migration was assumed to be nil throughout the projection period, and the sex ratio at birth was assumed to be 105 males births per 100 female births.

The results of the three projections are summarized in table 63. It will be noted that, according to all three variants, the population of Nepal, estimated at 11.5 million in 1971, will more than double by the beginning of the next century. If the 1976 fertility schedule were to remain unchanged, then the population would increase to 26.1 million by the year 2001. Assuming a 10 per cent decline in fertility over the next two decades, the projected population will be 25.0 million. If, however, fertility were to drop by 20 per cent over the same period, the total population by 2001 would be 23.8 million. The average annual growth rates implied in these projections are as follows:

	1971-1976	1976-1981	1981-1986	1986-1991	1991-1996	1996-2001
High	2.33	2.32	2.41	2.58	2.73	2.87
Medium I	2.33	2.26	2.30	2.42	2.50	2.52
Medium II	2.33	2.20	2.19	2.25	2.32	2.34

It will be noted from table 66 that the age structure of the population does not change significantly in a quarter of a century if there are

no changes in the fertility pattern or if there is only a decline of 10 or 20 per cent in fertility over this period. The proportion of the population in the younger age groups, 0-14 years, increases from 40.9 in 1971 to 44.0 in the year 2001 if fertility remains constant, and to 42.0 per cent if there is a 10 per cent decline in fertility, but decreases to 39.8 if fertility declines by 20 per cent. Correspondingly, the proportion of the population in the working ages, 15-59 years, decreases from 53.7 to 50.5 per cent if fertility remains constant, and to 52.2 if fertility declines by 10 per cent, but increase to 54.1 if fertility declined by 20 per cent.

Table 65. Alternative population projections, 1971-2001  
(thousands)

Projection year	Projection variation	Population projection		
		Males	Females	Both sexes
1971	High	5817	5739	11556
	Medium I	5817	5739	11556
	Medium II	5817	5739	11556
1976	High	6643	6437	13080
	Medium I	6643	6437	13080
	Medium II	6643	6437	13080
1981	High	7571	7226	14797
	Medium I	7545	7201	14796
	Medium II	7519	7177	14696
1986	High	8648	8181	16829
	Medium I	8564	8102	16666
	Medium II	8479	8024	16503
1991	High	9953	9365	19318
	Medium I	9767	9192	18959
	Medium II	9581	9018	18599
1996	High	11537	10842	22379
	Medium I	11109	10517	21035
	Medium II	10843	10192	26131
2001	High	13454	12677	24972
	Medium I	12858	12114	23818
	Medium II	12264	11554	23818

Source: Bhabani S. Rajbanshi and Bhakta B. Gubhaju, "Population projections for Nepal, 1971-2001", Tribhuvan University, Kathmandu, 1976 (mimeo).

Table 66. Percentage distribution of the projected total population by broad age group, 1971-2001

Projection year	Projection variation	Proportion of total population in various age groups				
		0-4	5-14	15-59	60+	All ages
1971	High	15.4	25.5	53.7	5.4	100.0
	Medium I	15.4	25.5	53.7	5.4	100.0
	Medium II	15.4	25.5	53.7	5.4	100.0
1976	High	17.3	24.8	52.6	5.3	100.0
	Medium I	17.3	24.8	52.6	5.3	100.0
	Medium II	17.3	24.8	52.6	5.3	100.0
1981	High	16.8	25.3	52.7	5.2	100.0
	Medium I	16.6	25.4	52.8	5.2	100.0
	Medium II	16.3	25.5	53.0	5.2	100.0
1986	High	16.8	26.4	51.6	5.2	100.0
	Medium I	16.2	26.4	52.1	5.3	100.0
	Medium II	15.7	26.4	52.6	5.3	100.0
1991	High	16.9	26.1	51.7	5.3	100.0
	Medium I	16.2	25.7	52.7	5.4	100.0
	Medium II	15.4	25.4	53.7	5.5	100.0
1996	High	17.2	26.1	51.2	5.5	100.0
	Medium I	16.3	25.5	52.6	5.6	100.0
	Medium II	15.3	24.9	54.0	5.8	100.0
2001	High	17.6	26.4	50.5	5.5	100.0
	Medium I	16.4	25.6	52.2	5.8	100.0
	Medium II	15.1	24.7	54.1	6.1	100.0

Source: Bhabani S. Rajbanshi and Bhakta B. Gubhaju, "Population projections for Nepal, 1971-2001", Tribhuvan University, Kathmandu, 1976 (mimeo)