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**SAMPLE REGISTRATION**

**KERALA—RURAL**

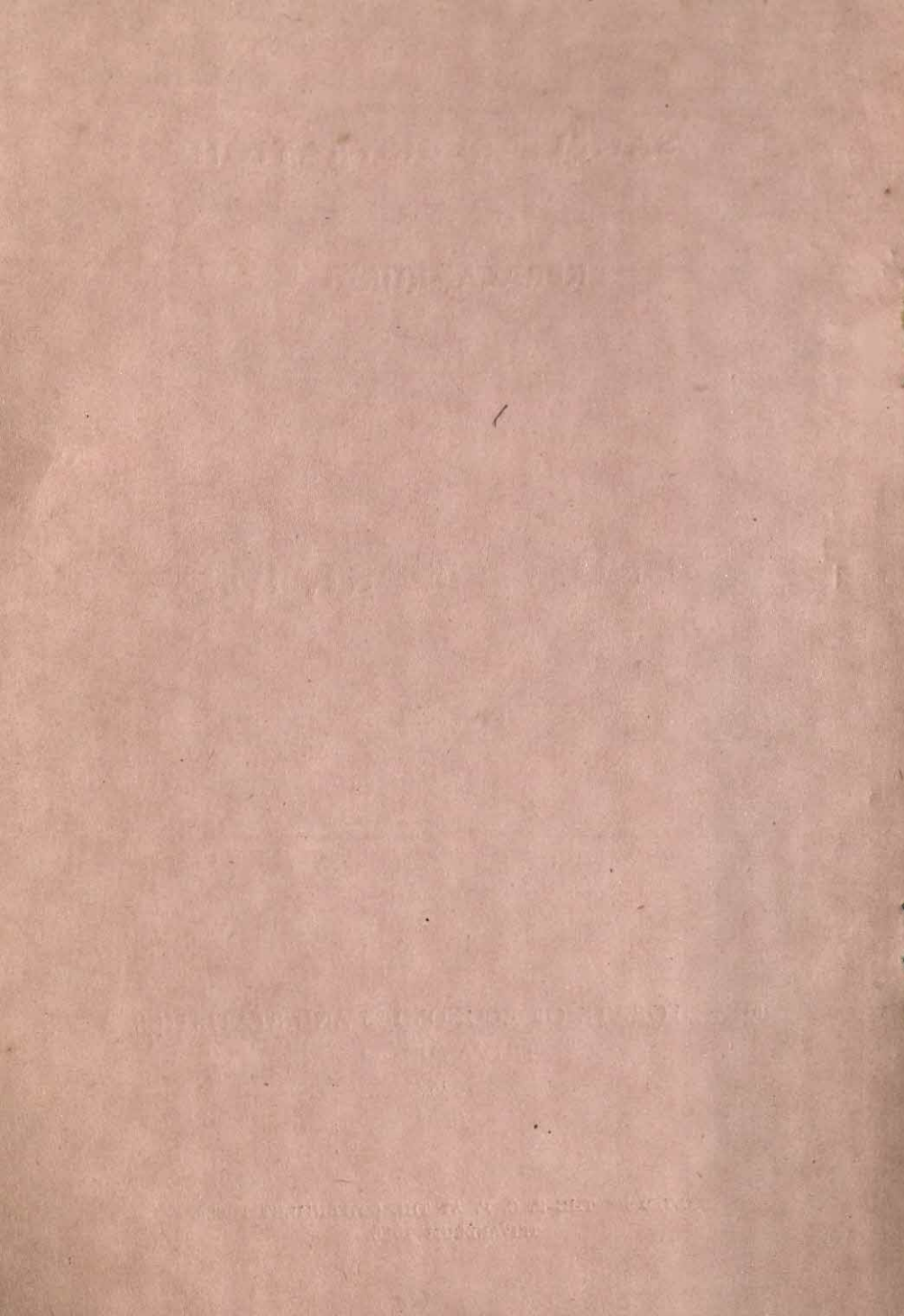
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**No. 20**

**DIRECTORATE OF ECONOMICS AND STATISTICS,  
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## PREFACE

The Sample Registration is conducted in all the states in India, under the direction of the Registrar General, Government of India, with the objective of getting reliable estimates of birth and death rates and growth rate of population, in the absence of other sources.

This report presents the results of the registration done during the year 1982. Besides the crude birth and death rates, a number of other results derived from Sample Registration data are included in this report. Special findings on vital rates for different religious groups, comparison of the rates in Malabar and Travancore-Cochin regions, in the neighbouring states and in the Rural and Urban sectors are some of the unique features presented.

This report was prepared by the Sample Registration Unit of the Directorate of Economics and Statistics. Sri M. K. Bhaskaran Pillai, Deputy Director (Population), Sri M. Mohammed Serverkhan, Regional Statistical Officer, and Shri N. Umamaheswaran Asari, Research Assistant were associated with the work.

Trivandrum,  
2-4-1985.

N. GEORGE JOHN,  
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Director of Economics and  
Statistics

Trivandrum  
2-4-1963



# SAMPLE REGISTRATION OF BIRTHS AND DEATHS IN RURAL AREAS—1982

## CHAPTER I

### INTRODUCTION

1.1 **Introduction.**—This report presents the results of the operation of Sample Registration Scheme in rural areas, relating to the year 1982. Owing to the deficiencies in the statutory registration system, the Sample Registration System has been recognised as a unique technique for obtaining reliable and accurate vital rates.

The Sample Registration System, basically, a sample survey, designed to obtain reliable data of vital events, was introduced in the State during 1964-65, in 20 rural and 5 urban samples. The fullfledged scheme began functioning on a regular basis, in 150 samples in the rural areas with effect from 1-7-1965. The directorate of Economics and Statistics, took up the work in rural areas. In the Urban areas, the work is undertaken by the Director of census operations, Kerala from 1970 onwards.

The sample design, adopted, was stratified uni-stage sampling. Initially samples were selected after stratifying the villages into four types according to population of below 500, 500-999, 1000-1999 and 2000 and over under the three natural regions of Lowland, Midland and Highland. The number of samples was allocated to different strata to the total population. But during the year under report, in 75 samples were replaced as per the instructions and directions of the Registrar Generals India. The new samples were selected according to the population figurer of 1981 census. Contrary to the previous distribution of samples under three natural regions new samples were allocated under two strata namelf Northern region and southern region. The northern region consists of all the district from Trichur and upwards, while the southern region consists of the remaining districts. Such a distribution of samples had made natural region wise estimation of vital events difficult, from 1982 onwards. Since there were two types of samples in the State during the year, the estimation had to be done by striking at the average of the estimates obtained for the state through the old and new samples.

**1.2 Staff.**—150 enumerators were engaged in the regular field survey, and 13 computers in half yearly surveys. Additional District Officers conducted reverification work. At the State headquarters, the nucleus staff consisting of a Regional Statistical Officer, a research Assistant, a Computer and Compilers attended to the work relating to the preparation of this report.

**1.3 Field work.**—The enumerators collected the details of births and deaths on a regular basis through the informants and house visits. These were reported to both the districts and State headquarters every month. The computers conducted half yearly surveys independent of the enumerators, for updating the population and collecting details of birth and deaths. The data collected by both the enumerators and computer supervisors were matched at the district headquarters and reverification of unmatched and partially matched events were done by the Additional district officers.

**1.4 Overlapping survey.**—With every half yearly survey, the details of the preceding half year were also collected to bring out events missed by both the Enumerator and Computer. By this procedure 122 births and 21 deaths were detected during the year.

**1.5 Intensive enquiry.**—An intensive enquiry was conducted in 22 samples by senior officers of this department, by which 118 births and 26 deaths were detected.

## CHAPTER II

### POPULATION

**2.1 Population.**—The estimation of data, collected through Sample Registration Scheme, reveals that Hindus, who form 57.69% of total population in the rural areas of the State, are almost equally distributed both in Malabar and Travancore-Cochin areas, while 65.9% Muslims concentrates in Malabar and 78.7% Christians in Travancore-Cochin areas. Percentage of population of Hindus, Muslims and Christians in the state during the year 1982, is 57.69, 22.77 and 19.54 respectively.

**2.2 Percentage distribution of population by age and sex-ratio of each group.**—The percentage distribution of population by age and sex ratio for the years 1971, 1981 and 1982 are given in table 2.2 hereunder.



TABLE 2.2

**Percentage distribution of Population by Age and Sex ratio  
in Rural Kerala—1982**

Age group	1971	*Sex ratio	1981	Sex ratio	1982	Sex ratio
	Popula- tion %		Popula- tion %		Popula- tion%	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0-4	13.5	980	11.8	960	11.0	966
5-9	13.6	974	11.7	955	11.3	978
10-14	13.5	983	11.5	989	11.9	987
(0-14)	(40.6)	(976)	(35.0)	(968)	(34.2)	(977)
15-19	10.9	1078	11.6	1030	11.8	1036
20-24	9.2	1046	10.4	1149	10.6	1122
25-29	6.4	1103	8.3	1098	8.3	1096
30-34	5.6	1080	6.5	1071	6.5	1030
35-39	6.0	1080	5.2	1104	5.3	1103
40-44	4.6	1005	4.9	1116	4.6	1090
45-49	4.5	941	4.4	1155	4.5	1101
50-54	3.2	969	4.0	1047	3.8	1068
55-59	2.7	982	3.1	979	3.1	984
60-64	2.3	1044	2.5	1036	2.6	1054
65-69	1.6	1086	1.8	1027	2.0	1045
70+	2.4	1116	2.3	1118	2.6	1165
All ages	100.0	1020	100.0	1041	100.0	1041

\* Sex ratio—No. of females per 1000 males.

### CHAPTER 3

#### MEASURES OF FERTILITY

**3.1 Introduction:**—Crude birth rate, the most common measures of fertility, age specific fertility rate, general fertility rate, total fertility rate gross reproduction rate and net reproduction rate for the year 1982 have been estimated from the data collected, and presented in this chapter.

**3.2 Crude birth rate:**—Crude birth rate is defined as the number of live births per 1000 of mid year population.

The crude birth rate for Kerala rural for the year 1982 is estimated as 24.34 as against 24.72 in the previous year. Only the births to normal residents of the area and the normal resident population are considered here for estimation of fertility rate.

Births rates for rural Kerala and rural India for the years 1975-82 are given below in table 3.2.

TABLE 3.2.

**Crude birth rate for rural Kerala and all India rural (1975-82)**

Year	Rural Kerala			All India Rural
	North rn Region	Southern Region	Combined	
(1)	(2)	(3)	(4)	(5)
1975	31.57	25.23	28.2	36.7
1976	31.87	25.31	28.5	35.8
1977	28.92	23.64	26.2	34.2
1978	30.57	21.72	25.8	34.6
1979	31.80	22.18	26.8	34.3
1980	30.46	23.38	26.8	35.0
1981	28.01	21.50	24.7	35.5
1982	27.94	21.32	24.3	35.3

Based on the historical development and socio-economic conditions, the State is divided into two district regions namely Malabar and Travancore-Cochin regions; the former comprising of the northern districts and the later the remaining districts (Trivandrum to Trichur) out of 150 samples selected for the rural areas, 67 samples fall in Malabar region and 83 in Travancore-Cochin region, as per the distribution newly made by the Government of India.

From the above table it can be seen that the birth rate is always higher in Malabar region, than in Travancore-Cochin region. The lower age of woman at marriage, the reluctant attitude towards limiting the family size, low literacy etc. prevailing among the majority of the residents in Malabar region might be responsible for such a situation.

**3.3 Birth rates in the rural areas of neighbouring States:—** Compared to the rural area of neighbouring states, Andhra Pradesh keeps the highest birth rate, while Kerala, the lowest. The states in ascending order, will be Kerala, Karnataka, Tamilnadu and Andhra Pradesh.

**3.4 Birth rates in Rural and Urban areas:—**As a matter of fact, the birth rate in rural areas is always higher than that in urban area. The table given below, shows the difference between the birth rates in urban and rural areas in the neighbouring states.



TABLE 3.4

**Combined birth rate and difference between Rural and Urban birth rates—1982**

States	Combined birth rate (Rural and Urban)	Difference between rural and Urban birth rates	
		1981	1982
Andhra Pradesh	30.8	5.3	4.3
Karnataka	27.9	4.5	3.1
Tamil Nadu	27.5	5.9	4.9
Kerala	26.0	3.1	2.2
All India	33.6	8.6	7.7

Source: Registrar General, India.

In respect of urban and rural birth rates, Andhra Pradesh stands first and Karnataka comes second.

**3.5 Birth rates by religions.**—The birth rates in the major religious groups in the State during the year 1982 are given in table 3.5.

TABLE 3.5

**Birth rates among different religions**

Religion	Hindu	Muslim	Christian
1. Northern	25.84	34.04	18.00
2. Southern	20.59	27.64	19.43
State	22.98	31.86	19.13

The birth rate at the State level and in the two regions is the highest among Muslims and lowest among Christians.

The Muslims in Malabar area, who form 33% of the total population in the area (65.91% of total Muslim population in the State) attain the highest birth rate in the state during the year, i. e. 34.04 as against 34.9 in the previous year. The lowest birth rate in 1982 is recorded in the northern region itself, i. e. among Christians those who form 9.15% of the total population of the area, i. e. 18 as against 18.8 in the previous year.

**3.6 Distribution of sample villages by birth rate.**—The distribution of samples by birth rate is given in table 3.6.

It can be seen from the table 3.6 that 71.3% samples have birth rate below 28 (State rate of 24.3 falls in the group 24—27.9 in the table) during the year 1982, as against 70.7% in 1981. About 46.3% of the samples in Malabar area and 91.6% of those in Travancore-Cochin area, which form 20.7% and 50.7% of the total samples in the state were having birth rates below 28.

TABLE 3.6

## Distribution of Samples under different rates of birth—1982

		Birth Rates																		
		No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %							
Region	Le-shan 16	16—19.9	20—23.9	24—27.9	28—31.9	32—35.9	36—39.9	40—43.9	44 & above	All										
		No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %							
1982 Rural																				
Malabar	1	1.5	5	7.4	11	16.4	14	20.9	11	26.9	13	19.4	4	6.0	..	..	1	1.5	67	100.0
1982 Rural																				
Travncore-																				
Cochin	10	12.0	34	41.0	19	22.9	13	15.7	1	1.2	3	3.6	1	1.2	2	2.4	..	..	83	100.0
1982 Rural																				
Kerala	11	7.3	39	26.0	30	20.0	27	18.0	19	12.7	16	10.7	5	3.3	2	1.3	1	0.7	150	100.0
1981 Rural																				
Kerala	20	13.3	16	10.7	41	27.3	29	19.3	18	12.0	13	8.7	5	3.3	5	3.3	3	2.0	150	100.0
1980 Rural																				
Kerala	11	7.3	25	16.7	32	21.3	22	14.7	24	16.0	15	10.0	7	4.7	10	6.7	4	2.7	150	100.0
1979 Rural																				
Kerala	10	6.7	30	20.0	31	20.7	16	10.6	23	15.3	16	10.6	13	8.7	7	4.7	4	2.7	150	100.0



It is interesting to note that there was 29.3% of samples having birth rates below 20 in Travancore-Cochin area, while only 4% samples in Malabar area have such low birth rate. It is evident that the majority of residents in Malabar area is having no response to limiting their family size.

**3.7 Age specific fertility rate**—Age specific fertility rate is the number of live births in an year to 1000 women of specific age group. The age specific fertility rates in 1982 and the previous years are given in table 3.7.

TABLE 3.7

**Age specific fertility rate in Rural Kerala (1973-1982)**

Age Group	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
1	2	3	4	5	6	7	8	9	10	11
15-19	48.8	44.5	41.6	42.7	44.2	43.6	48.5	47.0	39.3	31.8
20-24	206.5	179.3	188.5	193.4	186.2	183.2	184.8	197.2	175.9	176.5
25-29	221.8	190.2	194.8	202.3	171.9	169.1	181.4	184.3	166.2	168.0
30-34	153.6	134.3	134.0	137.1	113.1	112.7	121.5	105.8	98.6	95.4
35-39	99.9	86.3	94.1	80.7	75.9	71.4	65.1	59.5	53.9	53.8
40-44	38.6	25.7	29.8	25.3	24.3	22.6	19.4	15.9	19.4	18.1
45-59	6.0	6.9	5.4	6.1	5.6	3.7	5.5	3.6	4.9	3.8

During to the decline in the number of births, the age specific fertility rates in all the age groups except 20--24 and 25--29 have shown considerable decrease.

**3.8. General Fertility Rate (GFR).**—General Fertility Rate (GFR) denotes the number of live births in an year to 1000 women in the reproductive age group 15—49. General Fertility Rates for the year 1975 to 1982 are given below.

Year	1975	1976	1977	1978	1979	1980	1981	1982
GFR	108.0	109.0	99.4	97.7	101.3	101.1	92.2	90.8

Generally a decreasing trend is seen in the case of general fertility rate in rural Kerala, since the inception of the scheme, though there was a slight increase during the year 1979. General fertility rate in Malabar area was 107.49 while it was 77.48 in Travancore-Cochin area during the year 1982.

**3.9. Total Fertility Rate (TFR).**—Total fertility rate is the average number of children that would be born to a woman during the life time if she was to pass through her child bearing years conforming to the age specific fertility rates of the year. Total fertility rates for rural Kerala during 1982 and previous years are given below.

Year	1975	1976	1977	1978	1979	1980	1981	1982
TFR	3.4	3.4	3.1	3.0	3.1	3.1	2.8	2.7

The total fertility rate for the year is estimated as 2.7 which is 1.4 less than that for the year 1971. In the Malabar and Travancore-Cochin areas, the total fertility rate were 3.3 and 2.3 respectively in 1982.

**3.10. Gross Reproduction Rate (GRR).**—Gross reproduction rate is defined as the average number of female children, that would be born to a woman during her life time if she was to pass through the child bearing years conforming to the age specific fertility rates of the year. The general fertility rates for rural Kerala for the year 1975 to 1982 are given below.

Year	1975	1976	1977	1978	1979	1980	1981	1982
GRR	1.7	1.7	1.5	1.5	1.5	1.5	1.3	1.3

**3.11. Net Reproduction Rate (NRR).**—Net reproduction rate shows the average number of female children that would be born to a woman during her life time conforming to the age specific fertility rate and mortality condition in the year. [It is obtained by multiplying the age specific female birth rates of the child bearing age groups by corresponding proportion of survivors as per life table for female ( $l_x/l_0$ ) and than repeating the process as in gross reproduction rate.] Net reproduction rate for the year 1982 is 1.22 as against 1.21 during the previous year. NRR for 1982 and previous years is given below.

Year	1978	1979	1980	1981	1982
NRR	1.33	1.37	1.34	1.21	1.22



**3.12. Order of birth.**—Table 3.12 shows the observed number of births by age of mother and order of birth of child for 1982.

TABLE 3.12

**Age of mother and order of birth of child 1982**

Age of Mother	Total No. of Birth	Order of birth									
		1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11	12
15-19	472	411	54	7	..	..	..	..	..	..	..
20-24	2464	1159	972	273	56	3	1	..	..	..	..
25-29	1818	341	557	546	253	91	25	5	..	..	..
30-34	774	64	127	181	161	106	76	44	11	4	..
35-39	368	11	19	40	53	57	85	51	24	18	10
40-44	106	2	4	4	6	11	17	23	19	7	13
45-49	21	..	..	1	2	1	4	6	2	2	3
Total	6023	1988	1733	1052	531	269	208	129	56	31	26

Out of 6023 live births, observed during the year 1982, 79.25% comes under, the first three orders of birth.

**3.13. Medical attendance at birth.**—The percentage of births under different types of Medical attendance during the year 1976 to 1982 is given in table 3.13.

TABLE 3.13

**Medical attendance at birth (Percentage)**

Years	Institutional	Trained professional	Untrained professional	Non professional	Not stated
1976	32.1	19.8	32.6	14.8	0.7
1977	35.6	17.6	31.8	13.9	1.1
1978	40.8	16.4	40.6	2.2	..
1979	45.4	27.5	25.9	1.2	..
1980	46.6	24.4	28.2	0.7	0.1
1981	47.8	26.7	23.6	1.7	0.2
1982	59.1	21.8	18.2	0.9	..

More people are seen utilising the institutional facilities provided for maternal and child health, during the year, compared to previous years. But as far as Malabar and Travancore-Cochin regions are concerned, the institutional medical attention for the child birth in Malabar for the year 1982, was only 41% when it was 78.9% in Travancore Cochin area. Utilisation of the services of Trained Professionals and untrained professionals in Malabar area was 28.7% and 29.3% respectively, while it was 14.3% and 6.1% respectively in Travancore-Cochin area.

**3.14. Still Birth Rate (SBR).**—Still birth rate is the number of still births to 1000 births, (both the live and still births) in an year. The still birth rates during the year 1982 and previous years are given below.

Year	1976	1977	1978	1979	1980	1981	1982
SBR	20.18	19.30	23.68	20.50	18.35	20.76	12.6

During the year, the still birth rates was the lowest of all in previous years, since inception of the scheme. In regard to Malabar and Travancore-Cochin areas, the still birth rate in Travancore-Cochin area was 5.3 less than that in Malabar area. Still birth rates for Male and Female for the year 1982 are 13.4 and 11.7 respectively.

**3.15 Sex Ratio at Birth.**—Sex ratio at birth is the number of males per 100 females. Sex ratio at birth during the year 1982 and previous years is given below.

Year	1976	1977	1978	1979	1980	1981	1982
Sex ratio	100.3	103.6	104.9	104.4	107.4	108.8	107.2

Sex ratios at birth in Malabar and Travancore-Cochin areas during the year, are 105 and 107.2 respectively.

**3.16 Child-Women Ratio (CWR).**—Child-woman ratio is defined as the estimated number of children in the age group 0-4 years per 1000 women in the reproductive age group, 15-49.

The Child-Woman Ratios during the year 1982 and previous years are given below.

Year	1976	1977	1978	1979	1980	1981	1982
CWR	470	459	441	451	466	441	401

Though the Sex ratio at birth is higher in Travancore-Cochin area, than that in Malabar area, during the year under report, the child-woman ratio is seen higher in Malabar area. The Child-woman ratios in Malabar and Travancore-Cochin area are 483 and 350 respectively.

**3.17 Number of marriages and age at marriage.**—The rate of marriages and remarriages per 1000 population (for males and females separately) which took place during the year 1982 is presented in Table 3.17.



TABLE 3.17

## Rate of Marriage per 1000 Population for the year 1982

Age-Group	First Marriage		Remarriage		All Marriage	
	Male	Female	Male	Female	Male	Female
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15-19	1.11 (1.61)	35.85 (34.17)	0.07 (2.63)	0.47 (15.56)	1.18 (1.64)	36.32 (33.65)
20-24	24.06 (30.02)	54.90 (49.10)	0.16 (5.25)	0.79 (24.44)	24.22 (29.11)	55.69 (48.41)
25-29	47.80 (47.49)	20.67 (14.36)	0.91 (23.69)	1.11 (26.67)	48.71 (46.62)	21.78 (14.70)
30-34	23.06 (18.47)	3.42 (1.79)	1.25 (26.32)	1.46 (26.67)	24.31 (18.76)	4.88 (2.49)
35-39	3.35 (2.11)	1.01 (0.45)	1.11 (18.42)	0.29 (4.44)	4.46 (2.71)	1.30 (0.56)
40-44	0.55 (0.30)	0.34 (0.13)	0.37 (5.26)	0.17 (2.22)	0.92 (0.48)	0.51 (0.19)
45-49	—	—	1.33 (18.42)	—	1.33 (0.68)	—
All	16.15 (100.0)	23.45 (100.00)	0.62 (100.00)	0.68 (100.00)	16.77 (100.00)	24.13 (100.00)

(Figures given in brackets represent the percentage of marriage under each group)

The highest rate of first marriage per thousand female population during the year was 54.90 in the age group 20-24, as against 54.75 in the same age group during the previous year. Though there is a slight increase seen in this rate during the year, the decrease was a decrease of 8.89 during 1980. In the case of males, the highest rate of first marriage during the year was 47.80 in the age group 25-29 while it was 49.87 in the same age group during 1981.

The highest percentage of remarriage among males and female occurs in the age group 30-34 but it was in the age groups 20-24 and 25-29 respectively during 1981. Out of total marriages during the year, 3.15% marriages were remarriages for both the male and females.

The median age at first marriage for males and females was 27.1 and 21.5 respectively, as against 27.2 and 21.6 respectively during the previous year.

## CHAPTER 4

## MORTALITY MEASURES

**4.1. Crude Death Rate.**—The crude death rate for rural Kerala in 1982 is estimated as 5.93 as against 6.49 during the previous year. As in the case of births, deaths occurred to usual residents only are taken into consideration for calculating the death rate.

The crude death rates for Kerala Rural and All India Rural from 1974 onwards are given in table 4.1.

TABLE 4.1

**Crude Death Rates in Kerala Rural and All India Rural  
1974-1982**

Year	Kerala		Combined	All India Rural
	Northern region	Southern region		
1974	8.89	7.15	8.0	15.9
1975	9.18	7.93	8.5	17.3
1976	8.91	7.71	8.3	16.3
1977	8.39	6.64	7.3	16.0
1978	8.37	6.22	7.2	15.3
1979	8.63	5.84	7.2	13.9
1980	7.51	6.71	7.1	13.7
1981	6.91	6.07	6.5	13.6
1982	6.32	5.60	5.9	13.1

As in the previous year, Malabar area recorded the highest death rate during the year 1982.

**4.2. Death rates in rural areas of neighbouring states.**—In regard to the rural areas of neighbouring states, Tamil Nadu recorded the highest death rate, while Kerala the lowest.

**4.3. Death rates in rural and urban areas.**—Compared to the urban area of neighbouring states, Andhra Pradesh keeps the lowest death rate during the year 1982, while Tamil Nadu, the highest. As in the case of birth rates, the rural death rates are seen higher than urban ones. But during the year 1981, the urban death rate in Kerala was higher than the rural one. Both the Rural and urban death rates in the neighbouring states during 1982, were seen decreased from those in 1981, but the urban death rate in Karnataka seen increased by 0.1. Table 4.3 presents the combined death rates, increase of rural death rates from urban death rates in the neighbouring states for the year 1982.



TABLE 4.3

**Combined death rate and increase of rural death rate from urban death rates—1982**

States	Combined death rate (rural and urban)	Increase in rural death rate from urban death rate	
	1982	1981	1982
Andhra	10.4	5.7	5.6
Karnataka	9.2	4.2	3.8
Kerala	6.6	1.2	0.4
Tamil Nadu	11.1	5.7	6.3
All India	11.8	5.8	5.8

Source : Registrar General, India.

**4.4. Death rates among religious groups.**—The death rates among the major religious groups in Kerala for 1982 are given in table 4.4.

TABLE 4.4

**Death rates among major religious groups**

Regions	Hindu	Muslims	Christians
I Northern	7.37	5.58	2.71
II Southern	5.67	4.62	6.07
State	6.45	5.25	5.36

As in the previous year, the highest and the lowest death rates are in Malabar area the highest is among Hindus and the lowest among Christians. The death rates in both the two regions, among Hindus and Muslims are seen considerably decreased during the year; but the death rate among Christians in Travancore-Cochin region is seen increased by 0.82 which caused an increase of 0.43 at state level.

In regard to the state, the highest death rate was among Hindus and the lowest was among the Christians, during the year 1981. Contrary to the conditions, during the previous year, the credit of having the lowest death rate, goes to the Muslims during the year 1982.

**4.5. Distributions of samples by death rate.**—The distributions of samples by death rates for 1982 is given in Table 4.5.

TABLE 4.5

## Distribution of samples under different rates of death—1982

Region	Death rates												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Samp'les	2	2-2.9	3-4.9	5-6.9	7-8.9	9-10.9	11-12.9	13-14.9	15-16.9	17& above	All	
Malabar area-1982	No.	2	2	20	14	17	7	3	..	..	2	..	67
	%	3.01	3.0	29.8	20.9	25.4	10.4	4.5	..	..	3.0	..	100.00
Travancore-Cochin area-1982	No.	5	6	20	29	14	8	1	..	..	..	..	83
	%	6.0	7.2	24.1	34.9	16.9	9.7	1.2	..	..	..	..	100.00
Kerala-1982	No.	7	8	40	43	31	15	4	..	..	2	..	150
	%	4.6	5.3	26.7	28.7	20.7	10.0	2.7	..	..	1.3	..	100.00
Kerala-1981	No.	4	14	20	50	37	17	6	1	1	1	..	150
	%	2.7	9.3	13.3	33.3	24.7	11.3	4.0	0.7	0.7	0.7	..	100.00
Kerala-1980	No.	3	3	32	50	28	22	6	4	4	1	1	150
	%	2.0	2.0	21.3	33.3	18.6	14.7	4.0	2.7	2.7	0.7	0.7	100.00
Kerala-1979	No.	2	7	31	44	30	17	11	2	2	4	2	150
	%	1.3	4.7	20.7	29.4	20.0	11.3	7.3	1.3	1.3	2.7	1.3	100.00



During the year 1982, 38 samples forming 56.7% in Malabar area and 72.3% in Travancore-Cochin area are having death rates less than 7. At the State level 65.3% samples in the state are having the above death rate.

**4.6 Age specific death rate.**—Age specific death rate can be defined as the number of deaths in a specific age group in one year among 1000 persons of that age group. The Annexure 7 appended, presents the age specific death rates of males and females and in the two regions of the state during the year 1982.

As in the previous year, the age specific death rate was highest in the age group 70 and above, and lowest in the age group 10-14 during the year 1982.

In regard to males and females, the age specific death rate of males in all the age groups except the age groups 15-19, 20-24 and 25-29 are highest.

As such the age specific death rates, during the year, in all the age groups except the age group 10-14, 25-29, 35-39, 50-54 and 60-64 were less than those in the previous year.

**4.7 Infant Mortality Rate.**—Infant Mortality Rate is the estimated number of deaths of infants below one year of age out of 1000 live births in a year. The infant Mortality rates for Kerala Rural for the years 1972 and 1976 to 1982 are furnished below.

Years	1972	1976	1977	1978	1979	1980	1981	1982
I.M.F.	66.0	56.5	50.7	44.8	48.6	42.5	40.4	30.3

As in the case of State, the Infant Mortality Rates in Malabar and Travancore-Cochin regions for 1982 were less than those in the previous year. Infant mortality rates in Malabar and Travancore-Cochin regions for the period were 35.57 and 22.38 respectively as against 42.7 and 39.2 respectively during the previous year.

**4.8 Neo-natal death rate.**—The neo-natal death rate is defined as the number of deaths to children of below 28 days of age per 1000 live births in a year. It is estimated as 20.3 during the year as against 28 in the previous year. The infant mortality has been distributed according to the period within which the infants died before completing one year of age, such as less than 7 days, 7-27 days and 28 days and above. The following table gives the rates in each period.



TABLE 4.8  
**Infant death rates distributed over different periods  
 within which the Infants died 1962**

Region	Less than 7 days	7-27 days	Less than 28 days	28 days and above	Total
Northern	21.0	3.2	24.2	14.3	38.5
Southern	12.2	3.8	16.0	7.3	23.3
State	16.8	3.5	20.3	10.9	30.3

The neo-natal death rate is seen decreased during the year, by 7.6 from that in the previous year.

**4.9 Medical attendance at death.**—The table below presents the percentage of deaths under different type of medical attention at the time of death for ten years (1973-1982).

TABLE 4.9  
**Medical Attendance at Death (Percentage)**

Year	Institutional	Recognised practitioner	Unrecognised practitioner	None
1973	17	33	22	28
1974	18	36	19	27
1975	20	36	16	28
1976	24	31	19	26
1977	22	33	19	26
1978	22	34	24	20
1979	30	34	11	25
1980	32	32	19	17
1981	41	31	12	16
1982	44	31	10	15

The increase in the percentage of deaths to persons who received institutional facilities is an evident that more and more people in the state are aware of medical facilities and their utilization.

In regard to Malabar and Travancore-Cochin areas, the percentage of deaths to persons who received institutional service in Travancore-Cochin was 6.8 more than that in Malabar area. As such, the percentage of deaths to persons who received recognised practitioners' service in Travancore-Cochin was also 2.6 more than that in Malabar area. But in the case of deaths to persons who received unrecognised practitioner's service, Malabar area attained again of 9.1% from the Travancore-Cochin area.

**4.10 Expectation of life.**—Life tables have been constructed using the age specific death rates for 1980, 1981 and 1982 and are presented in Annexures 15, 16 & 17. The Expectation of life at birth during 1982 is 68.46 years against 66.75 years during the previous year. Females have higher expectation of life than males as in the previous year. The expectation of life of males and females during on 1982 are 66.35 years 70.71 years respectively as against 64.71 years and 69.01 years respectively in the previous year.

## 5. APPENDIX

- ANNEXURE 1 Live births observed in retained portion and estimated for stratum:
- „ 2 Age specific fertility rate, G.F.R., T.F.R. and G.R.R.
- „ 3 Live births observed in samples, classified by month of occurrence.
- „ 4 Live births by type of medical attendance at delivery
- „ 5 Deaths observed and estimated by sex.
- „ 6 Deaths classified by age and sex.
- „ 7 Age specific death rate.
- „ 8 Deaths observed, classified by month of occurrence.
- „ 9 Deaths classified by type of medical attendance
- „ 10 Infant deaths, observed and estimated and Infant death rate,
- „ 11 Still births, observed and estimated still birth rate.
- „ 12 Estimated births, death infant deaths and still births and vital rates.
- „ 13 Births and deaths recorded by Enumerators and supervisors and detected through overlapping survey.
- „ 14 Extra evens detected through overlapping and intensive survey.
- „ 15 Expectation of life (All)
- „ 16 „ (male)
- „ 17 „ (female)
- and Method of calculation of life table.



## ANNEXURE I

## Live Births Observed in Retained [Portions and Estimated for Stratum 1982

Stratum/Region/ State	Observed in retained portion			Estimated			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Male	Female	Total	Male	Female	Total
I							
A	9	9	17	18	175	176	351
B	20	17	109	37	1155	982	2137
C	115	109	1397	224	11028	10506	21534
D	1468	1532	1532	2865	122984	117231	240215
Northern Region	1612	1532	1532	3144	135342	128895	264237
II							
A	2	7	47	9	136	474	610
B	62	47	245	109	7821	5952	13773
C	319	245	1074	564	24088	18516	42604
D	1123	1074	1373	2197	93631	89732	183363
Southern Region	1506	1373	1373	2879	125676	114674	2+0350
State	3118	2905	2905	6023	261018	243569	504587



## Age Specific Fertility Rate, G.F.R., T.F.R., and G.R.R. for 1982

Region	No. of women estimated in the age group of						Total					
	15-19	20-24	25-29	30-34	35-39	40-44		45-49				
I Northern	546906	496839	398074	312385	266139	222116	215711	2458270				
II Southern	698548	670561	505808	371199	313259	272379	270254	3102008				
State	1245454	1167400	903882	683584	579398	494595	485965	5560278				
	No. of births estimated											
I Northern	28071	98431	70482	37680	21342	6690	1541	264237				
II Southern	11480	107651	81342	27526	339801	2282	288	240350				
State (All births)	39551	206082	151824	65206	31143	8952	1829	504587				
State (Female births)	19058	101764	71344	31189	15417	3795	1002	243569				
	Age Specific Fertility Rate											
	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
I Northern	51.33	198.11	177.06	120.62	80.19	30.11	7.14	107.49	3.32	G.F.R. T.F.R.		
II Southern	16.43	160.54	160.82	74.15	31.29	8.30	1.07	77.48	2.26			
State (All births)	31.76	176.53	167.97	95.39	53.75	18.10	3.76	90.75	2.74			
State (Female births)	15.30	87.17	78.93	45.63	26.61	7.67	2.06	G.R.R.	1.32			

T.F.R. Sum of age specific fertility rates x  $\frac{1000}{15}$ G.R.R. do. female children x  $\frac{1000}{5}$

## Live Births observed in samples, Classified by month of occurrence 1982

No. of live births reported from samples

Stratum/ Region/ State	January (3)	February (4)	March (5)	April (6)	May (7)	June (8)	July (9)	August (10)	September (11)	October (12)	November (13)	December (14)
I												
A	18	..	2	1	3	3	3	1	1	1	2	1
B	37	4	2	2	..	4	6	1	5	8	..	2
C	224	8	12	19	14	19	24	33	14	25	16	19
D	2865	248	223	263	274	291	227	238	214	247	190	230
Total	3144	260	237	287	291	313	255	274	234	281	208	252
II	9	1	1	1	..	..	..	..	2	1	1	2
A	109	6	2	8	12	8	11	7	10	13	15	9
B	564	55	31	41	48	45	50	46	38	65	49	48
C	2197	231	171	217	161	167	193	181	157	218	188	150
D	2879	293	205	266	222	220	251	240	207	297	253	209
Total	26023	553	442	553	513	533	506	493	441	578	461	461

## Live Births by Type of Medical Attention at Delivery—1982

Stratum	Type of Medical attention					
	Total	Institutional	Trained professionals	Untrained professionals	Non-professional	Not Stated
(1)	(2)	(3)	(4)	(5)	(6)	(7)
I						
A	18	14	2	1	1	..
B	37	3	31	3	..	..
C	224	101	55	68	..	..
D	2865	1171	816	848	30	..
Northern Region	3144	1289	904	920	31	..
II						
A	9	9	..	..	..	..
B	109	72	32	5	..	..
C	564	414	110	39	1	..
D	2197	1776	270	132	19	..
Southern Region	2879	2271	412	176	20	..
State	6023	3560	1316	1096	51	..



## ANNEXURE 5

## Deaths observed and Estimated by Sex—1982

Stratum	Deaths observed in samples			Deaths, estimated		
	Male (2)	Female (3)	Total (4)	Male (5)	Female (6)	Total (7)
(1)						
A	3	3	6	58	59	117
B	8	3	11	462	173	635
C	26	20	46	2442	2067	4509
D	369	286	655	30676	23887	54563
Northern Region	406	312	718	33636	26186	59824
II						
A	181	4	5	68	271	339
B	19	10	29	1978	1186	3164
C	86	74	160	6287	5885	12172
D	321	248	569	26772	20745	47517
Southern Region	427	336	763	35105	28087	63192
State	833	648	1481	68743	54273	123016



## Deaths observed in samples classified by month of occurrence—1982

Stratum	Total Deaths													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	January	February	March	April	May	June	July	August	September	October	November	December		
A	6	1	2	1	1	1	1	1	1	1	2	1		
B	11	1	2	1	2	4	4	2	2	1	1	1		
C	46	4	2	1	5	3	3	7	5	4	5	5		
D	655	47	39	45	46	35	76	81	60	66	54	62		
Northern Region	718	51	42	47	52	39	83	89	67	72	62	69		
Region														
A	5	1	2	2	2	3	3	1	2	1	1	2		
B	29	4	4	2	2	10	3	3	2	5	2	2		
C	160	9	7	16	8	14	16	19	16	14	13	14		
D	569	49	41	45	57	38	67	54	44	41	45	61		
Southern Region	763	62	49	67	73	55	83	77	62	61	60	77		
Region														
State	1481	113	91	114	118	89	94	166	129	133	122	146		



## Deaths classified by Type of medical attention—1982

Stratum	Type of medical attention					
	Total deaths	Institutional	Recognised practitioner	Unrecognised practitioner	None	
(1)	(2)	(3)	(4)	(5)	(6)	
I						
A	6	4	..	1	1	
B	11	10	..	..	1	
C	2046	2020	1212	26	6	
D	655	260	202	97	96	
Northern Region	718	294	214	104	106	
II						
A	55	2	..	2	1	
B	29	18	7	..	1	
C	160	73	58	12	17	
D	569	271	181	27	90	
Southern Region	763	364	246	41	112	
Total	1481	658	460	145	218	



## Still Births—Observed and Estimated and Still Birth Rate for Stratum—1982

Stratum	Still births—Observed			Still births estimated		Live births and still births estimated	Still birth rate
	Male	Female	Total	Male	Female		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)
<b>I</b>							
A	..	..	..	..	..	..	..
B	..	1	1	..	58	58	26.4
C	2	4	6	207	462	669	26.4
D	30	19	49	2480	1502	4082	30.1
Northern Region	32	24	56	2687	2122	4809	16.7
<b>II</b>							
A	..	..	..	..	..	..	..
B	1	..	1	132	..	132	9.5
C	3	5	8	220	384	604	14.0
D	11	8	19	517	371	888	4.8
Southern Region	15	13	28	869	755	1624	6.7
State	47	37	84	3556	2877	6433	12.6



## Estimated Births, Deaths, Infant Deaths and Still Births, and Vital Rates for Stratum—1982

Stratum	Estimated					Vital rates			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Live births	Deaths	Infant deaths	Still births	Birth rate	Death rate	Infant death rate	Still birth rate	
I									
A	351	117	58	—	26.35	8.78	165.24	—	
B	2137	635	58	58	25.84	7.68	27.14	26.4	
C	21334	4509	650	669	27.20	5.70	30.18	30.1	
D	240215	54563	9161	4082	28.03	6.37	38.14	16.7	
Northern Region	264237	59824	9927	4809	27.94	6.32	35.57	17.9	
II									
A	610	339	—	—	12.92	7.18	—	—	
B	13773	3164	264	132	23.17	5.32	19.17	9.5	
C	42604	12172	1072	604	22.33	6.38	25.16	14.0	
D	183363	47517	4044	888	21.02	5.45	22.05	4.8	
Southern Region	240350	63192	5380	1624	21.32	5.60	22.38	6.7	
State	504587	123016	15307	6433	24.34	5.93	30.34	12.6	

**Births and Deaths recorded by Enumerators and Supervisors and detected through overlapping survey—1982**

**Births—1982**

Region	Total netted by Enumerators & Supervisors		Common to Enumerators & Supervisors		Enumerators		Supervisors		Overlapping survey	Intensive survey	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)			
I Northern	3010	2361	2532	80.5	2839	90.3	9	102	23	3144	
II Southern	2754	2098	2323	80.7	2529	87.8	10	20	95	2879	
<b>STATE</b>	<b>5764</b>	<b>4459</b>	<b>4855</b>	<b>80.6</b>	<b>5368</b>	<b>89.1</b>	<b>19</b>	<b>122</b>	<b>118</b>	<b>6023</b>	

## ANNEXURE 13—(Contd.)

## Deaths—1982

Region	Total netted by Enumerators and Supervisors		Common to Enumerator and Supervisors		Enumerators Supervisors				Others	Overlapping survey	Intensive survey	Total
	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)				
I Northern	690	538	596	83.0	632	88.0	8	16	4	718		
II Southern	731	594	648	84.9	677	88.7	5	5	22	763		
STATE	1421	1132	1244	84.0	1309	88.4	13	21	26	1481		



Extra Events Detected Through Overlapping and Intensive Survey Classified according to place and kind—1982

Stratum	Place		Kind		Total	Place		Kind		Deaths
	In	Out	LB	SB		In	Out	Infant death	Other deaths	
(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)	(11)	(12)
A	1	1	1	1	4	—	—	—	—	—
B	2	2	2	2	8	—	—	—	—	—
C	2	2	2	2	8	—	—	—	—	—
D	62	58	117	3	20	14	6	6	14	(13)
Northern Region	63	62	122	3	20	14	6	6	14	—
A	—	—	—	—	—	—	—	—	—	—
B	—	—	—	—	—	—	—	—	—	—
C	2	34	36	—	9	7	2	1	8	—
D	11	68	78	1	18	11	7	6	12	—
Southern Region	13	102	114	1	27	18	9	7	20	—
STATE :	240	176	164	4	47	32	15	13	34	—

**Abridged Life Table Based on Mean Age Specific Death rate for 1980, 1981 & 1982**  
(All—Males and Females)

Age x to x+n	Age specific death rate		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	1980	1981									
1	42.44	38.40	35.81	0.03888	0.03111	3111	100000	97121	6846550	68.46	0
1-4	4.66	5.14	3.40	0.00440	0.01745	1691	96889	384174	6749429	69.66	1
5-9	1.52	1.15	1.27	0.00131	0.00653	622	95198	474435	6365255	66.86	5
10-14	0.78	0.53	0.60	0.00064	0.00319	302	94576	472125	5890820	62.29	10
15-19	1.00	1.43	0.96	0.00113	0.00563	531	94274	470042	5418695	57.48	15
20-24	1.39	1.55	0.91	0.00128	0.00638	598	93743	467220	4948653	52.79	20
25-29	1.54	1.71	1.83	0.00169	0.00841	783	93145	463767	4481433	48.11	25
30-34	2.85	1.89	1.56	0.00210	0.01045	965	92362	459397	4017666	43.50	30
35-39	3.16	2.01	2.61	0.00259	0.01287	1176	91397	454045	3558269	38.93	35
40-44	4.02	3.70	3.14	0.00362	0.01794	1619	90221	447052	3104224	34.41	40
45-49	5.09	4.76	4.70	0.00485	0.02396	2123	88602	437702	2657167	29.99	45
50-54	8.66	8.29	9.17	0.00871	0.04262	3686	86479	423180	2219465	25.66	50
55-59	12.62	12.70	11.75	0.01236	0.05995	4963	82793	401557	1796285	21.70	55
60-64	20.86	18.81	19.16	0.01961	0.09347	7275	77830	370962	1394728	17.92	60
65-69	43.84	29.41	27.81	0.03369	0.15536	10961	70555	325372	1023766	14.51	65
70+	93.13	87.24	75.61	0.08533	1.00000	59594	59594	698394	698394	11.72	70



Abridged Life Table based on Mean Age Specific Death Rate for 1980, 1981 and 1982  
(Males)

Age x to x+n	Age specific death rate			(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	1980	1981	1982								
1	48.01	44.92	37.14	0.04336	0.3224	3224	100000	97063	6635269	66.35	0
1-4	4.18	4.76	4.00	0.00431	0.01709	1654	96776	383796	6538296	67.56	1
5-9	1.44	1.66	1.47	0.00152	0.00757	720	95122	473810	6154410	64.70	5
10-14	0.64	0.40	0.69	0.00058	0.00290	274	94402	471325	5680600	60.17	10
15-19	1.14	1.40	0.86	0.0013	0.00363	530	94128	469315	5209275	55.34	15
20-24	1.32	1.68	0.75	0.00125	0.00623	583	93598	466532	4739960	50.64	20
25-29	1.90	1.90	1.70	0.00183	0.00911	847	93015	462957	4273423	45.94	25
30-34	3.63	2.44	2.15	0.00274	0.01361	1254	92168	457705	3810471	41.34	30
35-39	4.62	1.59	2.95	0.00305	0.01513	1376	90914	451130	3352766	36.88	35
40-44	4.91	5.52	4.64	0.00302	0.02479	2220	89538	442140	2901636	32.41	40
45-49	7.51	7.57	6.65	0.00724	0.03556	3105	83318	428827	2459496	28.17	45
50-54	10.87	10.04	12.90	0.01127	0.05481	4616	84213	409525	2030669	24.11	50
55-59	14.87	18.48	15.58	0.01624	0.07803	6211	79597	382457	1621144	20.37	55
60-64	24.73	24.49	24.26	0.02449	0.11529	8468	73386	345760	1233687	16.88	60
65-69	49.79	36.29	32.97	0.03968	0.18049	11717	64918	295297	892927	13.75	65
70+	96.44	89.68	80.94	0.08902	1.00000	53201	53201	597630	597630	11.23	70



**Abridged Life Table based on Mean Age Specific Death Rate for 1980, 1981 and 1982**  
(Females)

Age x to x+n	Age specific death rate			(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	1980	1981	1982								
1	38.01	31.51	34.43	0.03465	0.02988	2988	100000	97183	7070836	70.71	0
1-4	5.31	5.53	2.78	0.00454	0.01800	1746	97012	384556	6973653	71.88	1
5-9	1.67	0.62	1.07	0.00112	0.00558	532	95266	465000	6589097	69.16	5
10-14	0.92	0.66	0.52	0.00070	0.00349	331	94734	472842	6114097	64.54	10
15-19	0.87	1.46	1.06	0.00113	0.00563	531	94405	470687	5641255	59.76	15
20-24	1.52	1.43	1.05	0.00133	0.00663	622	93872	467805	5170568	55.08	20
25-29	1.21	1.54	1.95	0.00157	0.00782	729	93250	464427	4702763	50.43	25
30-34	2.25	1.39	0.99	0.00154	0.00767	710	92521	460830	4238336	45.81	30
35-39	1.88	2.38	2.31	0.00219	0.01089	1000	91811	456535	3777506	41.14	35
40-44	3.23	2.07	1.76	0.0.235	0.01168	1061	90811	451402	3320951	36.57	40
45-49	2.97	2.34	2.94	0.00275	0.01366	1226	87730	445685	2869549	31.97	45
50-54	6.45	6.62	5.68	0.00625	0.03077	2724	88524	433810	2423864	27.38	50
55-59	10.51	6.81	7.86	0.00839	0.04109	3526	85800	420185	1988054	23.17	55
60-64	17.70	13.32	14.32	0.01511	0.07280	5990	82274	396375	1567869	19.06	60
65-69	39.45	22.72	22.87	0.02835	0.13237	10098	76284	356175	1171474	15.36	65
70+	87.45	85.04	71.04	0.08118	1.00000	66186	66186	815299	815299	12.32	70

## Method of Calculation of life table

$$(1) \quad m_x = \frac{\text{Total of A. S. D. R.}}{n \times 1000}$$

$$(2) \quad q_0 = \frac{D_1}{B_1} + \frac{D_2}{B_2}$$

Where  $D_1$  is the number of deaths of Children, born during the previous year and died during the current year, and  $D_2$  is that of the children born and died during the current year.

$B_1$  and  $B_2$  denote the number of births occurred during the previous year and current year respectively.

$$(3) \quad q_x = \frac{2x_n (m_x)}{2+n (m_x)}$$

$$(4) \quad \text{Let } o/o \text{ be } 100,000$$

$$(5) \quad l_x = l_0 - d_0$$

$$(6) \quad dx = q_x \times l_x$$

$$(7) \quad d_{70} = 170$$

$$(8) \quad L_0 = f l_0 + (1-f) l_1$$

$$\text{Where } f = \frac{D_1}{D_1 + D_2}$$

$$(9) \quad L_x = \frac{(l_x + l_{x+1}) C}{2}$$

where  $C$  is class interval

$$(10) \quad L_{70} = \frac{d_{70}}{m_{70}}$$

$$(11) \quad \text{Let } L_{70} \text{ be } T_{70}$$

$$(12) \quad T_{70}-1 = T_{70} + L_{70} - 1$$

$$(13) \quad \text{Expectation of life } (E_x) = \frac{T_x}{l_x}$$

## Method of Calculation of Life Table

Total of A, B, D, R.

$$n \times 1000$$

$$D_1 - D_2$$

$$\frac{D_1 + D_2}{2}$$

Where  $D_1$  is the number of deaths of children born during the previous year and died during the current year, and  $D_2$  is that of the children born and died during the current year.

$H_1$  and  $H_2$  denote the number of infants occurred during the previous year and current year respectively.

$$\frac{D_1}{H_1}$$

$$\frac{D_2}{H_2}$$

$$1 - \frac{D_1}{H_1}$$

$$1 - \frac{D_2}{H_2}$$

$$D_1 - D_2$$

$$D_1 + D_2$$

$$D_1 - D_2$$

Where  $l =$ 

$$\frac{D_1 + D_2}{2}$$

$$(k + \frac{1}{2})G$$

$$\frac{D_1}{H_1}$$

where  $G$  is class interval

$$470$$

$$170$$

$$170 + 170$$

$$170 - 170$$

$$170 + 170$$

$$170$$

$$170$$

$$170$$

$$170$$

$$170$$

$$170$$



209

