CENTRE FOR DEVELOPMENT STUDIES

Working Paper No.36

The Demographic Transition in Kerala-Facts and Factors

by

T N Krishnan

Centre for Development Studies
Ulloor Trivandrum 695011

July 1976

THE DEMOGRAPHIC TRANSITION IN KERALA-FACTS AND FACTORS

The birth, death and infant mortality rates are the key parameters which determine the demographic profile of a country. While the mortality rates have started to decline as a result of the extension of medical care and public health facilities in most of the developing countries, the absence of a similar decline in birth rates has aggrevated the population problem in these countries. The attempts made so far to strengthen and intensify the family planning programmes have not been very encouraging and some studies even question their contribution in bringing down the birth rates wherever they have occured.[1] Under these circumstances whatever little evidence that one may have on the decline in birth rate for any part of the developing world deserves careful scrutiny and analysis. Such an analysis might help to identify the factors that could have brought about the decline in birth rate in a particular case.

The emergence of a situation, where the birth rate is rapidly declining, has already been pointed out for Kerala in a recent study.[2] Since the main purpose of that study was to show, using the indirect evidence of primary school enrolment, that the decline in birth rate had started even before the intensification of the family planning campaign in the State, it did not contain either a detailed examination of the extent of the decline in the birth rate or a fuller analysis of the factors which could have brought this about. More information has become available on the pattern and magnitude of the decline in the birth rate in Kerala since then. This decline in birth rate it is now clear, has been preceded by equally important and dramatic declines in infant and general

mortality rates also. How these changes have been brought about in Kerala are of great significance not only to other States in India but also to developing countries in general since Kerala does not rank high among the Indian States in terms of either per capita State income or per capita daily calorie intake.

According to the latest available estimate, the birth rate in the rural sector of Kerala was only 26.9 per 1000 in 1974 compared to 35.9 for all-India.[3] While the decline in birth rate in Kerala from 37.4 in 1965-66 represents an impressive achievement, the full measure of the decline in the birth rate can be gauged only when the birth rates for the different districts in Kerala are examined. When this is undertaken, it is seen that in some districts the rural birth rate is as low a figure as 21 per 1000.[4] A decline of this order in a span of 8 years is not only of the greatest significance, but such a low level of birth rate is not probably recorded for any part of the present developing world with a similar level of income. Two countries in Asian region which have attracted considerable attention for ahieving low birth rates in recent times are Sri Lanka and Taiwan. But, in their cases, the birth rates were 29.5 in 1972 and 25.6 in 1971 respectively[5] and which are higher than the birth rate prevailing in a large part of Kerala.

The mortality rates also have shown similar impressive decline in Kerala. The crude death rate had fallen from 16.1 for the period 1951-61 to 10 by 1965-66 and to 7.9 by 1974, when the corresponding all-India rate declined from 22.8 to 14.4 in 1974. The difference between the all-India and Kerala infant mortality rates show a similar difference.

While the infant mortality rate was 56 for the rural sector of Kerala in 1970, the corresponding rate was 136 for all-India. Though infant mortality rates are still considerably lower for most of the developed countries, the Kerala rate falls almost within the range of the rates for industrially advanced countries.

The purpose of this paper is to examine the recent trends in the three demographic parameters mentioned above for Kerala and to analyse the role of factors like literacy, the age at marriage, the accessibility of medical care facilities etc. in this demographic transition. The study mentioned earlier had advanced the hypothesis that the decline in the birth rate in Kerala was closely related to the development of health services and education. In this paper, we shall examine the relevance and validity of this hypothesis in explaining the decline in birth rate in Kerala.

This study is mainly based on the data collected through the Sample Registration System (henceforth referred to as SRS) which was initiated on a pilot basis in 1963-64. SRS aims to provide reliable estimates of birth and death rates, separately for rural and urban areas, at State and National Levels. The sample for rural areas usually consists of 150 units in a State, the unit being either the whole village or a segment if the village had 1961 population of 2000 or more. In the case of urban areas, the sample varies from 60 to 100 blocks. A part-time enumerator, usually a teacher, or a full-time enumerator maintains a continuous record of births and deaths as they occur. Once in six months, the supervisory staff conducts a retrospective survey to arrive at an independent set of vital events in respect of the sample unit. The enumerator's record and the results of the six-monthly survey are matched on a unitary basis

and unmatched and partially-matched events are verified in the field. Thereafter, an unduplicated count of births and deaths is derived, from which the vital events are calculated. This system has been able to measure the birth rate at the National level with a coefficient of variation of less than 1 per cent".[6] The SRS was tried out in Kerala on a pilot basis during 1964-65 and the full scheme came into force from 1.7.1965; since then annual data on birth and death rates have been regularly published.

The rest of the paper is divided into three parts. In part I, we examine, the birth rate in Kerala in relation to those prevailing in other States in India, analyse the magnitude of its change in recent years, and isolate the factors that might have contributed to its decline. In Part II, the trends in mortality rates and the factors which might have contributed to their decline are analysed. Part III is the conclusion where we shall attempt to draw some policy lessons which may be of relevance for general population policy in developing countries.

Trends in Birth Rate in Kerala:

th rates for Kerala are available for the period prior 1966, but these are not based on the SRS. These estimates are based on the intercensal growth of population and have several limitations but, overlooking them for the present purpose, they indicate broadly that the birth rate did not decline very much during the period 1931-1966, but declined substantially between 1966 and 1974.[7] The figures given in Table 1 show that, between 1966 and 1974, the rural birth rate in the State declined by 30 per cent (from 37.4 to 26.9). While the difference in the birth

rates of Kerala and India was negligible in the period 1941-50, the gap has widened by 1974 due to the lower rate of decline for the all-India birth rate.

Table 1

Birth Rates in Kerala and India Compared

(per 1000 population)

Period/year	Kerala	India
1931-40	40.0	45.2
1941-50	39.8	39.9
1951-60	38.9	41.7
1966 Rural	37.4	N.A
1967 -do-	36.3	N.A.
1968 -do-	33.2	39.0
1969 -do-	31.3	38.8
1970 -do-	31.9	38.0
1971 -do-	31.3	38.9
1972 -do-	31.5	38.4
1973 -do-	29.9	...
1974 -do-	26.9	35.9

Decline in Birth Rates: An Inter-State Comparison

What makes a study of the demographic transformation of Kerala interesting is not the decline as such in mortality rates (which is taking place in most of the other States also) but the fact that the birth rate has shown such a sharp decline in recent years. In order to provide a proper perspective for this analysis of the extent of the decline of the birth rate in Kerala, we give in Table 2 the data on birth rates for the years 1970 and 1974 and their percentage decline during this

period for a number of States in India. Though SRS came into operation by 1965, only by 1970 did it cover most of the States. For purposes of comparison, we have also provided estimates of rural birth rates for 1958-59 based on the fertility survey data of the fourteenth round of the National Sample Survey.[8/]

Table 2

State-wise Birth-rate and its percentage Change between 1970 and 1974

State	Rural Sector				Urban Sector			Combined		
	1958-59	1970	1974	% change from 1970	1970	1974	% change from 1970	1970	1974	% change from 1970
Andhra Pradesh	32.6	35.8	34.6	- 3.4	33.8	32.2	- 4.7	35.4	34.2	- 3.4
Assam inclusive Meghalaya	37.5	39.5	33.6	-14.9	32.0	24.8	-26.6	38.8	32.8	-15.5
Bihar	32.5	32.4	-	-	28.2	-	-	32.0	-	-
Gujarat	39.5	43.2	40.0	- 7.4	34.9	34.0	- 2.6	41.0	38.4	- 6.3
Haryana	-	38.0	41.6	+ 9.5	27.9	29.0	+ 3.9	36.2	39.5	+ 9.1
Himachal Pradesh	-	33.3	35.7	+ 7.2	24.6	23.2	- 5.7	32.7	34.9	+ 6.7
Jammu & Kashmir	-	35.0	31.8	- 9.1	25.6	19.9	-22.3	33.0	29.2	-11.5
Karnataka	40.1	35.0	29.5	-15.7	27.8	24.3	-12.6	33.0	28.0	-15.1
Kerala	36.9	31.9	26.9	-15.7	30.1	26.4	-12.3	31.6	26.5	-16.1
Madhya Pradesh	40.0	40.7	37.5	- 7.8	32.2	31.5	- 2.2	39.3	36.6	- 6.9
Maharashtra	36.8	32.1	29.1	- 9.3	30.4	28.8	- 5.3	31.5	29.0	- 7.9
Orissa	35.5	38.5	-	-	34.2	-	-	38.1	-	-
Punjab	-	34.7	33.0	- 4.9	30.6	28.2	- 7.8	33.8	32.0	- 5.3
Rajasthan	43.7	39.7	37.8	- 4.8	33.3	29.8	-10.5	38.5	36.3	- 5.7
Tamil Nadu	35.0	32.6	31.3	- 4.0	23.8	24.3	+ 2.1	30.0	29.2	- 2.6
Uttar Pradesh	43.2	46.9	43.3	- 7.7	34.7	32.0	- 7.8	45.4	41.8	- 7.9
West Bengal	30.7	29.9	-	-	21.7	-	-	27.8	-	-
All-India	37.8	38.9	35.9	- 7.7	29.7	28.9	- 2.3	36.8	34.5	- 6.2

- = Not available

A comparison of the birth rates in 1970 among the States shows that they can be broadly classified into two groups, viz. those States whose birth rates had touched levels of 35 and below and others whose birth rates still exceeded 35. In 1970, West Bengal had the lowest rate followed by Tamil Nadu and Kerala, and Uttar Pradesh had the highest rate followed by Haryana and Gujarat. In the former group, the two States which showed the highest percentage declines in the birth rate between 1970 and 1974 were Kerala and Karnataka. In the latter group, Assam showed a rate of decline of the same order. Though the percentage decline were similar in Karnataka and Kerala, the lowest birth rate was recorded for Kerala in 1974. But it must be emphasized that Karnataka follows a close second. However, this analysis is confined only to Kerala but it will be interesting to examine the factors which were responsible for the decline of the birth rate in Karnataka in order to see whether those were the same or different from those which led to the decline in the birth rate in Kerala.

A comparison of the birth rates for the rural and urban sectors shows only minor variations in the above pattern during the period 1970 to 1974. The largest decline in the rural sector had occured in Karnataka and Kerala while the largest declines in the urban sector were recorded for Assam including Meghalaya and Jammu and Kashmir. At the same time, the birth rate was lowest in the rural sector of Kerala among all the States.

On the basis of the fertility rates obtained by the National Sample Survey, we have also estimated the birth rates in the rural sector for a number of States for the year 1958-59. These estimates indicate that in a large

number of States the rural birth rate remained the same or rose during the period 1958-59 and 1970. Since the National Sample Survey has been generally found to under-estimate the vital rates, it may be reasonable to assume that in those States where the birth rate had not shown any decline, it would have remained the same. At the same time, the reported declines in birth rate in some States would be genuine though the extent of the decline might have been under-stated. In any case, it appears that Karnataka, Kerala and Maharashtra had similar order of decline in their birth rate in the rural sector between 1958-59 and 1970.

A comparison of the birth rates for the rural and urban sectors at once indicates that the birth rates were consistently lower in the urban sector of every State. A variety of factors would explain the low birth rates in the urban sector. However, the urban birth rate does not constitute the crux of the population problem in India. Since the bulk of the population in India lives in the rural sector, a significant decline in over-all birth rate would be possible only if the birth rate in the rural sector declined. Since the rural birth rate in Kerala is almost similar to the birth rates obtaining in the urban sectors of many States and also close to its own figure for the urban sector, a detailed enquiry into the factors which brought this about in Kerala could throw some light on the mechanics of birth rate reduction and thus would be of help in formulating appropriate national population policies for reducing the birth rates in other States or in other developing countries. In view of this, the rest of the analysis of this paper is mainly confined to the rural sector of Kerala.

District-wise data on Rural Birth Rates:

The full extent of the decline in birth rate can be gauged only if the rural birth rates for the districts of Kerala are analysed. Table 3 gives the district-wise birth rates in the rural sector for the three-years 1972-1974 and the three-year averages. The birth rate was as low as 20 per 1000 population for Kottayam both in 1973 and in 1974; it was the highest for Palghat and Malappuram districts, close to 33 in 1974. The overall rural birth rate declined from 29.9 in 1973 to 26.9 in 1974.

The data in Table 3 indicate that the districts can be devided into two groups, those in which they are relatively high and those in which they are relatively low. Trivandrum, Quilon, Alleppey, Kottayam, Ernakulam and Trichur form one group and the remaining districts constitute the other groups. The estimated birth rate in 1974 for the first group is 23.12 and for the latter group is 29.93. The birth rate estimated for the former group has not been so far achieved anywhere in the developing world except Taiwan. But the effort and cost involved in the Taiwanese experiment is so well-known that efforts on that scale to bring down the birth rate might not be feasible in many developing countries.[9] It is interesting to observe that the birth rate of 23 was reached in Japan during 1950-55 and that the Japanese birth rate in 1974 was 18.6, only 2 points below that reported for Kottayam district.[10]

It is interesting to note also that the districts in the first group form a contiguous area belonging to the former Native States of Travancore and Cochin, and that the remaining districts (excluding Idukki) formed part of the Malabar districts of the Province of Madras under British administration. There is some evidence to believe that the birth rate was

much higher in Malabar compared to Travancore-Cochin at the time of the formation of the Kerala State. The Census Report of 1951 estimated the birth rate at 36.2 for Travancore-Cochin for the decade 1941-50.[11] It also mentions that the birth rate in Travancore was estimated at 34.9 in 1948 in a survey conducted by the Public Health Department.[12] The Kerala State was formed in 1956 by integrating Malabar District with the already merged territories of Travancore and Cochin. The birth rate for Kerala was estimated to be 38. for the decade 1951-60. On the assumption that the birth rate in Travancore-Cochin was 35 for that period, the over-all rate of 38.9 would imply a rate of 45.6 for Malabar.

Table 3

Birth Rates for the Districts of Kerala, 1972-74 (Rural)

District	1972	1973	1974	Average
Trivandrum	30.37	25.15	25.38	26.97
Quilon	26.04	24.14	22.96	24.38
Alleppey	29.28	27.42	24.10	26.93
Kottayam	25.15	20.06	20.79	22.00
Idukki	33.26	40.80	31.59	35.22
Ernakulam	24.76	23.26	21.28	23.10
Trichur	27.18	26.48	24.31	25.99
Palghat	34.82	34.24	32.61	33.89
Malappuram	39.56	36.33	32.90	36.26
Kozhikode	34.57	30.63	29.72	31.64
Cannanore	36.48	33.85	25.87	32.07
State	32.1	29.9	26.90	29.63

Source: 1972 and 1973. Bureau of Economics and Statistics, Kerala, Sample Registration Scheme, Annual Report, 1973.

1974: Dr. K.S.Kurup, Demographic Research Centre, Bureau of Economics and Statistics, Kerala (SRS unpublished data)

Fertility Rates: An Inter-State Comparison:

Since a decline in the birth rate reflects the changes in the fertility pattern, it is necessary to examine the more sensitive measures of fertility to gain a clearer understanding of the process of the decline in birth rates. The most commonly used measures for such an analysis are the age-specific general and marital fertility rates. The general fertility rate measures the total number of children born alive for every 1000 women in a given age-group; the marital fertility rate expresses the number of children born for every 1000 married women within that age-group. In Tables 4 and 5, we provide the age-specific marital and general fertility rates for the rural sector for a number of States in India.

Table 4

Age Specific Marital Fertility Rates by States, Rural Sector, 1969

States	Age Groups (Years)						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Andhra Pradesh	173.33	251.11	254.29	196.83	149.97	75.44	30.04
Assam	270.76	393.18	336.08	270.68	146.54	66.29	15.83
Gujarat	114.72	327.81	320.98	271.95	173.79	81.25	22.63
Jammu & Kashmir	166.15	272.68	300.80	223.74	177.75	95.65	55.34
Karnataka	164.02	242.18	247.09	204.43	141.84	66.42	25.44
Kerala	185.52	300.47	256.77	202.34	165.82	62.85	12.34
Maharashtra	92.83	232.44	251.07	209.99	147.59	67.06	25.79
Punjab	42.91	257.02	311.19	268.63	195.20	113.17	30.28
Rajasthan	126.84	308.59	308.26	269.34	217.51	127.87	74.08
Tamil Nadu	183.88	270.45	262.96	193.23	122.14	44.18	15.47
Uttar Pradesh	131.99	304.39	302.87	301.50	236.19	147.44	95.54
All India	139.71	282.87	282.63	246.56	180.85	98.39	49.54

Source: SRS, Measures of Fertility and Mortality India.

Table 5

Age-Specific Fertility Rates, Rural Sector, 1969

State	Age-Group (Years) 15-19	20-24	25-29	30-34	35-39	40-44	45-49
Andhra Pradesh	140.21	236.73	237.13	173.49	125.12	54.40	19.20
Assam	146.23	313.05	302.54	251.28	132.90	56.77	12.34
Gujarat	70.38	312.00	309.24	256.02	157.41	66.99	17.35
Haryana	73.73	261.73	301.67	285.20	194.10	124.65	44.83
Jammu & Kashmir	123.75	258.17	290.04	210.43	160.88	78.23	40.07
Karnataka	117.31	225.64	231.10	181.47	117.22	46.81	15.55
Kerala	54.30	217.06	217.95	170.90	135.64	46.55	8.65
Maharashtra	75.24	220.82	237.49	190.82	126.31	50.73	16.93
Punjab	23.84	238.93	303.63	258.24	181.93	98.60	25.00
Rajasthan	109.21	300.44	299.57	252.91	196.28	102.60	53.34
Tamil Nadu	80.63	237.43	244.50	172.03	102.44	32.17	9.97
Uttar Pradesh	113.42	295.47	293.30	285.67	216.33	123.20	74.28
All-India	97.91	261.91	265.92	226.02	158.28	77.06	35.54

Source: SRS, Ibid.

An examination of the data in Tables 5 and 6 shows wide variations in the fertility rates. The marital fertility rates in the age group 15-19 is the lowest for Punjab followed by Maharashtra. The marital fertility rate for Kerala is one of the highest, its rate being exceeded only by that of Assam. The marital fertility rate of Kerala in other age-groups also does not appear to be lower than in many other States. However, an examination of the age-specific general fertility rates given in Table 6 tells a different story. While the general fertility is again lowest in Punjab in the age group 15-19, the next lowest rate is in Kerala. In the remaining age-groups, upto the 35-39 age-group, the fertility rate is lowest in Kerala (lower than even Punjab), while Assam, Gujarat, Rajasthan and Uttar Pradesh have reported generally the highest rates.

In fact, the widest divergence between the two sets of fertility rates is in the case of Kerala. Since the divergence between these two rates can be explained only in terms of difference in the marriage rate, it is necessary to examine the latter for the different States. These rates can be estimated for the year 1969 by dividing the age-specific general fertility rate by the corresponding marital fertility rate. The estimates so derived are presented in Table 6. It is clear from these figures why the general fertility rates are lower in Kerala in spite of comparatively high marital fertility rates. The number of females in the age-group 15 to 19 who were married in 1969 formed a mere 29 per cent in the case of Kerala while it was as high as 86 per cent for Rajasthan and Uttar Pradesh. The percentage of married females was only 72 for Kerala even in the age group 20-24 as against over 90 for most of the other States. This means that the average age at marriage has been significantly higher in Kerala.

Table 6

Age-Specific Nuptial Rates for States, Rural Sector, 1969

State	Age-group 15-19	20-24	25-29	30-34	35-39	40-44	45-49	% of "never married females" to total females in age-group 15-44.
Andhra Pradesh	0.8089	0.9427	0.9325	0.8814	0.8343	0.7211	0.6391	4.7
Assam	0.5400	0.7962	0.9002	0.9283	0.9069	0.8563	0.7795	15.7
Gujarat	0.6178	0.9520	0.9634	0.9414	0.9057	0.8245	0.7667	9.8
Jammu & Kashmir	0.7448	0.9468	0.9547	0.9405	0.9051	0.8179	0.7241	7.0
Karnataka	0.7153	0.9317	0.9352	0.8877	0.8264	0.7048	0.6112	8.2
Kerala	0.2927	0.7224	0.8488	0.8460	0.8180	0.7407	0.6833	22.0
Maharashtra	0.8105	0.9500	0.9459	0.9087	0.8558	0.7566	0.6565	6.7
Punjab	0.5556	0.9296	0.9757	0.9613	0.9320	0.8712	0.8256	12.5
Rajasthan	0.8610	0.9735	0.9718	0.9390	0.9024	0.8084	0.7470	3.4
Tamil Nadu	0.4385	0.8779	0.9298	0.8903	0.8387	0.7282	0.6445	13.2
Uttar Pradesh	0.8593	0.9706	0.9684	0.9475	0.9159	0.8356	0.7775	4.0
All-India	0.7008	0.9259	0.9444	0.9167	0.8752	0.7839	0.7117	7.4

Such difference in nuptiality patterns were conspicuous in Western Europe when the fertility rate declined in different countries in the region:

"The marriage pattern of most of Europe as it existed for at least two centuries upto 1940 was, so far as we can tell, unique or almost unique in the world. There is no known example of a population of a non-European civilisation which has had a similar pattern"

"The distinctive marks of the 'European pattern' are (i) a high age at marriage and (2) a high proportion of people who never marry at all. The 'European' pattern pervaded the whole of Europe except for the Eastern and South-eastern portion". 13/

While it is certainly true that the Kerala pattern does not completely fall into the 'European pattern', it has similarities and it is quite distinct from the 'all-India' pattern. In the 'Kerala pattern' the percentage of females who never marry is 22 and is highest among all the States in India. Similarly, the proportion of married females in the age groups 15 to 19 and 20-24 are also quite different. Therefore, if we are able to find the reasons why the nuptial rates differ in Kerala in these age-groups, then we would have gone a long way in explaining the lower fertility rates for Kerala.

In Table 7, we provide data on average age at effective marriage, the age at effective marriage by levels of education, and the female literacy rates for different States in India. The average age at effective marrige will differ from the average at marriage, since marriages still take place formally in many parts of India at an early age when they are not in fact consummated. The relevant concept of age at marriage for fertility measurement is that at which it becomes effective since it is beyond that point that

co-habitation begins. "In the case of child marriage, though the husband and wife may be living together just after the marriage, the effective marriage was reckoned to start after the attainment of puberty of wife". [14] The relevant information is however available only for 1961-62.

Table 73

Average age at Effective Marriage by Level of Education of Wife and Female Literacy Rates, Rural Sector, 1961-62. [15]

State	Average Age at Effective Marriage of Women					Female Literacy (1961) (excluding 0-5 ages)
	All	Illiterate	Below Primary school Education	Primary School Education	Middle School Education	
Andhra Pradesh	15.23	15.25	15.03	15.23	15.33	14.3
Assam	16.80	16.78	16.94	16.25	17.89	19.6
Bihar	15.87	15.85	16.62	16.03	15.60	8.2
Gujarat	16.90	16.89	17.04	16.92	16.71	22.0
Jammu & Kashmir	16.00	16.01	14.69	15.59	14.44	5.1
Karnataka	15.23	15.13	16.25	16.53	18.50	16.7
Kerala	18.17	17.68	18.68	18.16	18.28	45.6
Madhya Pradesh	15.79	15.81	15.64	16.50	17.82	8.1
Madras	17.01	16.90	17.81	16.90	17.94	21.1
Maharashtra	15.56	15.56	15.10	15.88	17.19	16.8
Orissa	16.29	16.32	16.17	15.80	14.00	10.1
Punjab	16.86	16.80	17.67	18.15	18.00	20.7
Rajasthan	15.72	15.65	14.96	17.71	-	7.6
Uttar Pradesh	16.24	16.22	17.73	15.20	16.65	8.3
West Bengal	14.72	14.66	15.18	15.12	17.46	20.3
All-India	16.02	15.94	16.35	16.75	17.35	1..1

Source: National Sample Survey Report.

It is seen from Table 8 that the average age at effective marriage of women is over 18 years in Kerala and that it is the highest among the States for which data are available. The age at marriage in India may be determined by numerous factors, partly based on custom and tradition and partly based on economic factors. It appears that one of the important factors that influences the age at effective marriage is the level of education. But, the relationship between the average age at effective marriage and the level of education depicts certain inter-State differences. In almost all the States however, the average age at marriage markedly increases with education upto the middle school level. In some cases, the curve relating age at effective marriage and levels of education is somewhat J-shaped, declining slightly with literacy or primary school education and then rising sharply with further education.

This J-shaped effect might be due to the level of income or occupation. A large proportion of the illiterates would comprise of agricultural labour and similar low-earning communities among whom early marriages are probably ruled out due to their economic position. In such communities the average age at effective marriage may be higher. On the other hand, the slightly better-off communities are the ones who initially take to female education and achieve minimum levels of literacy; at the same time, these communities are not so much better off as to take advantage of higher education. In such communities, there is probably less economic compulsion to postpone marriage as in the case of communities belonging to the illiterate group. These are, however only conjectures, and detailed enquiries in different parts of the country are needed to determine the factors affecting the age at marriage and its relation with the level of education.

Whatever may be the nature of the relationship between age at marriage and levels of education in different States in India, this relationship is very straight-forward and clear in the case of Kerala. The age at effective marriage rises from 17.68 for illiterates to 18.68 for literates (below primary) and stays more or less at that same level till it rises further with secondary education. At secondary level, it is 20.06.[16] If these relationships are valid, then one can explain the decline in birth rates in Kerala as largely due to the change in nuptial rates and the consequent rise in the age at effective marriage brought about by continuous and sharply higher rates of female literacy. Let us examine the available evidence which may help in clarifying further the relationships between levels of education and age at effective marriage in Kerala.

Changing Nuptial Patterns and Progress of Literacy in Kerala:

If education leads to an increase in the average age at effective marriage, then one should expect this to rise over time in Kerala, since the rate of literacy and levels of education have been steadily improving in Kerala. The female literacy rate, excluding the population belonging to the 0-4 age group, rose from 12 per cent in 1921 to 45 per cent in 1961. By 1971, the female literacy rate was over 52½ per cent in the rural sector. Available evidence indicates that there has also been a steady rise in the average age at effective marriage of women. The average age at effective marriage, which was a little below 15.9 for marriages prior to 1921, rose to 17.5 by 1951 and 18.6 by 1961.[17] We do not have data on average age at marriage for any year after 1961, since data relating to civil conditions from the 1971 Census have not yet become available. However, we have information on fertility rates for a few years covering the period 1941-71,

and from these it is possible to derive some conclusions regarding the nature of the changes in the average age at effective marriage.

As mentioned earlier, the rise in age at marriage in Kerala is reflected in the age-specific nuptial rates. We give in Table 8 the age-specific nuptial rates for a few selected years. The nuptial rates for Travancore for 1941 is also given for comparison. The percentage of married in the age-group 15-19 formed 40 per cent of the females in that age-group in 1941 in Travancore. This proportion had fallen to 29 per cent by 1961 and 16 per cent by 1971. The decline in the age-group 20 to 24 was from 76 per cent to 59 per cent.

Table 8

Age-Specific Nuptial Rates in Kerala, 1941-71

Year	Age-Group 15-19	20-24	25-29	30-34	35-39	40-44
1941 (Travancore only)	0.3632	0.7593	0.8832	0.8781	0.8335	0.7697
1961 (Kerala)	0.2927	0.7324	0.8487	0.8445	0.8180	0.7407
1969 (Rural Sector only)	0.2927	0.7224	0.8488	0.8460	0.8180	0.7407
1971 (Rural sector only)	0.1624	0.5924	0.8370	0.8697	0.8421	0.7973

Source: 1941 qne 1961: Census Reports for the respective years
1969 and 1971: SRS Bulletin.

The extent of the decline would have been probably greater if the nuptial rates were calculated for Kerala as a whole in 1941, since the average age at marriage appears to have been lower in Malabar.

These changes in the nuptial rates are naturally reflected in the fertility rates. In Table 9, we provide the data on age-specific fertility rates and the gross fertility rate for a few selected years.

Table 9

Age Specific Fertility Rates in Kerala (Rural Sector) for Selected Years

Year	Age group 15-19	20-24	25-29	30-34	35-39	40-44	45-49	Gross Fertility rate
1958-59	33.3	226.6	277.9	195.2	154.0	44.5	1.45	171.3
1969	54.3	217.1	218.0	170.9	135.7	46.6	8.7	128.3
1971-72 (Fertility survey)	36.4	215.1	259.9	200.3	132.3	59.2	11.9	133.3
1972 (SRS)	50.0	210.5	235.6	172.9	117.5	46.2	6.2	136.4
1973 (SRS)	48.3	204.2	218.7	152.0	98.8	38.2	6.0	117.1

Source: 1958-59: National Sample Survey Report
1969-1973: SRS Bulletins.

The gross fertility rate declined from about 172 in 1958-59 to 117 in 1973. A similar decline is noticeable in the age-specific fertility rates also. The age-specific nuptial rates indicate that they have virtually remained the same between 1961 and 1969. It is true that, while the 1961 rates are for the whole population of Kerala, the rates for 1969 refer to only the population in the rural sector. But this is likely to make much difference, since the rural-urban differences are relatively small in the case of Kerala. If this is correct, the decline in the gross fertility rate must have occurred as a result of change in the marital fertility rates.

It will be observed that the age-specific fertility rates for 1972 and 1973 seem consistent with the figures for 1969. However, the rates estimated from the data collected through the 1971-72 Fertility Survey appear somewhat out of line. The marital fertility rates appear to have risen in 1972-73 compared to 1969 reflected in a slight increase in the gross fertility rate. At the same time, the nuptial rates seem to have declined drastically in the age groups 15-19 and 20-24 in 1971-72 compared to 1969. They are not necessarily inconsistent, but these findings need careful examination. Possibly the 1971 Census data may provide another check on the marital rates prevailing in that year.

Leaving this problem aside, the age-specific fertility rates for 1973 appear to be consistent with what is happening in Kerala. Even if the percentage of married females in the age group 15-19 remain the same in 1973 as in 1961, it is possible for the fertility rate to decline because of a rise in the age at effective marriage. An increase in the average age at effective marriage will reduce the number of births taking place within that age-group, mainly for the reason that only a smaller proportion of the married couple will have the necessary minimum period that required for conception and delivery within/period. This factor alone may explain the decline in the fertility rate for the age group 15-19. It is interesting to note that the decline in the fertility rate is the lowest for the age-group 20-24. There are also marked reductions in the fertility rates for females above the age of 24. Since there are no changes in the marital rates, these reductions must be attributed to genuine reductions in fertility.

It will be interesting to find out how much of the reductions in fertility have been due to overt and specific family planning measures as such and how much due to the acceptance of a lower birth rate as part of a societal adjustment consequent on the higher standards of education and health. On the basis of calculations of births averted by various methods of family planning, the projected birth rate for Kerala was 30 for 1974,[18] whereas the estimated birth rate for the year by the SRS is 26.5. If this is any indication, then the number of persons practising 'non-programme' methods of family planning must be quite significant. The awareness of and the need for family planning among a much longer segment of the population than has been covered by the official programme cannot but be the effect of higher levels of literacy and education in Kerala.

Just as education appears to play an important role in reducing the fertility rates, lower mortality rates and longer life expectation could also be significant factors [reflecting the state of health] in reducing birth rates. Given the desired number of surviving children the higher the infant and child mortality rates the larger is likely to be the number of children born to a couple on the average. Therefore, with reduction in mortality rates, the birth rate may also decline. It is difficult to isolate the contribution of each of these different factors in reducing the birth rate in Kerala. But it is important to note that infant and child mortality rates are the lowest in Kerala among all the States in India.

Age at Marriage and Inter-district Variations in Birth Rates

The data given earlier show that the birth rate in the districts of Kerala varies from 21 for Kottayam and Ernakulam to 33 for Palghat and Malappuram. In the earlier analysis, we attributed the reduction in the

birth rate in Kerala to lower nuptial rates in the age group 15-24, an increase in the average age at effective marriage, and improvements in the levels of education and of health. If this hypothesis is correct, then the same factors should be able to explain the variations in the district-wise birth rates also.

Our analysis of the birth rates has shown that it is higher in the Northern districts compared to that for the Southern districts. It would have been interesting to compare the fertility patterns prevailing in the different districts of Kerala, but fertility rates at the district level have not been estimated.[19] However, from the Census of 1961, it is possible to derive the nuptial rates for different age-groups for the districts of Kerala. Since birth rates have declined significantly in the districts, it would have been useful to compare the nuptial rates for 1961 with those of 1971, but, again, the 1971 Census estimates are yet to be published. Though, data on the average age at effective marriage are not available, the difference from the average age at marriage may not be very significant in Kerala, since child marriages are rather uncommon in this State. The available data on the birth rate, the nuptial rate, and the average age at marriage, together with the female literacy rates in 1961 and 1971, are given in Table 10.

A comparison of the birth rates in 1974 with those prevailing in 1970-71 shows a remarkable degree of decline in birth rates in most of the districts. In 1970-71, the estimated average birth rate for the first seven districts (which formed part of Travancore-Cochin) was 26.9, while the average for the remaining districts worked out to 34.8. Though the birth rate for both groups has declined since then the gap between the two

Table 10

District-wise Birth rates, nuptial rates, average age at marriage, female literacy, and percentage of distribution of communities by religion

		Birth Rate		Nuptial Rate		Average age at marriage (females)	Female literacy per cent		Percentage of major religious communities in total population in 1971		
		1970-71	1974	15-19	20-24	1961	1961	1971	Hindus	Muslims	Christians
N	Trivandrum	25.20	25.30	0.2339	0.7391	20.59	43.9	54.21	71.71	12.01	17.26
	Quilon	27.41	23.96	0.2197	0.7326	20.13	51.0	56.47	63.65	12.83	23.51
	Alleppey	26.27	24.10	0.1538	0.6550	21.30	57.9	65.78	65.50	6.85	27.64
	Kottayam	29.38	20.29	0.1993	0.7432	20.64	59.6	62.71	43.63	4.43	46.93
	Idukki	-	31.59	-	-	-	-	-	-	-	-
	Ernakulam	26.30	21.28	0.1727	0.6825	21.18	50.9	58.47	46.01	12.33	41.54
	Trichur	33.01	24.31	0.1906	0.6560	21.49	48.4	56.06	61.11	13.69	25.15
S	Palghat	33.52	32.61	0.4268	0.7733	19.08	31.0	36.97	76.03	21.27	2.70
	Malappuram	40.48	32.90	-	-	-	-	40.18	34.08	63.93	1.99
	Kozhikode	34.38	29.72	0.4395	0.8175	18.28	35.5	46.29	62.14	30.62	7.15
	Cannanore	33.36	25.87	0.4588	0.7754	18.59	36.2	45.47	66.23	24.34	9.40

groups of districts persisted in 1974.

It is worth comparing the birth rates with the nuptial rates, the average age at marriage, and the female literacy rate. It will be seen that the nuptial rate is about 20 per cent for the age group 15-19 in the Southern districts whereas it is over 45 per cent for the Northern districts. This is naturally reflected in the average age at marriage. The average age at marriage is lower in the Northern districts where the female literacy rate is also lower. Since the proportion of Muslim population is larger in these districts, one may be tempted to attribute the higher birth rates to the fact that the age at effective marriage was lower for Muslims. However, the indications are that this is also due to the low educational levels of Muslims women residing in the northern parts of Kerala.

Estimates of community-wise birth rates show that it is highest for Muslims and is about the same for both Hindus and Christians.[20] But the birth rate in Malappuram district is much lower than the estimated birth rate for Muslims. On the other hand, the birth rate in Palghat considerably exceeds the estimated birth rate for Hindus who constitute the bulk of the population in that district. Kottayam and Ernakulam districts which have the highest proportion of Christians professing the catholic faith reported the lowest birth rates among all the districts in Kerala. While Palghat and Malappuram have similar low levels of female literacy, Kottayam and Ernakulam have similar high levels of female literacy. Thus, it appears that the religious factor in birth rate reduction is unlikely to be a major obstacle. The recent changes in birth rate in Jammu and Kashmir also point out in the same direction.

Thus, it appears that the same factors which explain the decline of the overall birth rate in Kerala can also explain the inter-district variations in birth rates. Since Kerala forms a more or less homogeneous socio-cultural region, we have attempted a multiple regression with a number of variables to explain the inter-district variations in birth rates.

Let,

B_i^1 = Birth rates, average of 1972, 1973 and 1974.

B_i^2 = Birth rate, 1974.

P_i = Nuptial rate for the age group 15-19

M_i = Mortality rate, average of 1972, 1973 and 1974.

L_i = Female literacy rate, 1971.

Y_i = Per capita output (1969)

i = district.

The results are:

(1) $B_i^1 = 12.0212 + 17.7664\ P_i + 1.2214\ M_i$ $\quad \bar{R}^2 = 0.9413$
$\qquad\qquad\qquad\quad (3.2121) \quad (0.2879)$ $\quad F = 69.06$

(2) $B_i^1 = 9.4243 + 19.1095\ P_i + 1.7574\ M_i + 0.0506\ L_i - 0.0090 Y_i$
$\qquad\qquad\qquad\quad (4.0896) \quad (0.2520) \quad (0.0963) \quad (0.0033)$
$\bar{R}^2 = 0.9057$
$F = 48.17$

(3) $B_i^2 = 10.2254 + 17.0356\ P_i + 1.2412\ M_i$ $\quad \bar{R}^2 = 0.9715$
$\qquad\qquad\qquad\quad (3.1190) \quad (0.2067)$ $\quad F = 85.51$

(4) $B_i^2 = 14.5692 + 15.5790\ P_i + 1.4438\ M_i - 0.0371\ L_i - 0.0064\ Y_i$
$\qquad\qquad\qquad\quad (4.7359) \quad (0.2383) \quad (0.0909) \quad (0.0032)$
$\bar{R}^2 = 0.9385$
$F = 64.76$

The above results show that the most important factors which explain the inter-district variations in birth rate in Kerala are nuptiality and crude death rates. It is quite likely that infant mortality rate would have provided an equally good explanation instead of the death rate. But, the district-wise infant mortality rates were not available. It is seen that birth rate will be larger with higher rates of nuptiality as well as of deaths.

While birth rate is inversely related to per capita income, the importance of income appears to be marginal in explaining the district-wise birth rates. However, the lack of significance of the female literacy rate indicates that the relationship between birth rate and levels of education are probably more indirect than direct. This also seems to be the conclusion that emerges from the data in Table 11 where the age specific marital fertility rates by literacy is given.

Table 11

Age-specific Marital Fertility Rates by Literacy, 1971-72, Rural Sector

Literacy level	Age Group 15-19	20-24	25-29	30-34	35-39	40-44	45-49
Illiterate	207.0	390.5	317.7	245.1	176.4	81.4	19.4
Literate below matric	229.8	354.1	303.9	219.0	136.9	63.8	9.3
Matric and above	268.5	293.7	333.3	198.4	142.2	74.7	0.0

Source: Private communication from the Registrar-General's Office.

In the light of the above findings, one needs to exercise considerable caution in attributing the increase in the average age at effective marriage in Kerala solely to female education. The age at effective

marriage would have gone up as a result of the operation of a number of other factors also. We shall examine these factors in the concluding section when we attempt to draw the relevance of the Kerala experience for other regions or countries.

II

The demographic transition in a country involves not only reduction in birth rates but also significant lowering of the mortality rates. Reductions in mortality rates generally precede decline in birth rates, but one of the main unresolved questions in population dynamics is about the magnitude of the time-lag involved in this phenomenon. An examination of the data on crude death rates in Kerala indicates that it had begun to decline much earlier than the decline in birth rate. The crude death rate in Kerala declined from 16.9 during 1951-60 to 7.11 in 1966. The infant mortality rate in the rural sector was 66.0 in 1968 compared to 153 during 1941-50. In this section, we shall attempt an analysis of the factors which helped Kerala to reduce the mortality rates.

Inter-State differences in Mortality Rates

An examination of the crude death and infant mortality rates in the rural and urban sectors of different States in India, presented in Table 12, shows the comparative position of Kerala. It is 7.9 for the State as a whole, and 8.0 and 6.8 in the rural and urban sectors respectively, in 1973. It will also be noticed that the rural-urban differences in the death rate are smaller in Kerala than in all the States in India. Similarly, it is seen that the infant mortality is also the lowest in Kerala among the various States in India.

While the death rate in Kerala is similar to the rates prevailing in developed countries, it is necessary for a stricter comparison to standardise the death rate with reference to age-group.

Table 12

Death and Infant Mortality Rates by States

State	Crude Death Rate (1974)		Infant Mortality Rate (1970)	
	Rural	Urban	Rural	Urban
Andhra Pradesh	16.4	10.0	122.2	79.1
Assam (including Meghalaya)	17.5	9.5	138.4	78.0
Bihar	N.A.	N.A.	106.1	75.4
Gujarat	14.0	10.3	159.2	131.0
Haryana	13.4	8.4	82.1	61.4
Himachal Pradesh	12.6	7.2	151.3	75.5
Jammu & Kashmir	11.3	4.8	93.0	45.0
Karnataka	12.4	7.0	101.0	73.2
Kerala	8.0	6.8	55.9	39.7
Madhya Pradesh	16.9	9.4	151.7	113.2
Maharashtra	12.6	9.0	102.5	84.3
Orissa	N.A.	N.A.	139.8	103.3
Punjab	11.3	8.1	103.7	86.5
Rajasthan	15.8	7.7	148.5	104.5
Tamil Nadu	16.1	8.7	133.9	89.9
Uttar Pradesh	20.6	12.0	165.4	110.2
West Bengal	N.A.	N.A.	113.4	61.0
INDIA*	15.8	9.1	136.4	89.9

* Provisional

Source: Registrar-General, Sample Registration Bulletin, Vol.IX, No.4, October 1975.

The low levels of mortality rates in Kerala compared to other States in India cannot be explained either by the level of nutritional intake or by per capita state income. A State-wise comparison of the data on mortality rates with calorie intake or per capita state income does not support the hypothesis that it would be strongly correlated with either of them.[21]

The evidence we give below indicate that probably the major factor which brought about the decline in mortality rates in Kerala was the expansion and spread of health facilities.

Utilisation of Medical Care

The total number of persons treated in hospitals, primary health centres and dispensaries in Kerala was 21.6 million in 1970. The total population of the State in 1970 was about 21 million in that year, which implies that on the average the number of visits made to the institution listed above was approximately 1 per annum. In addition, 2.4 million persons were treated in Ayurvedic hospitals and dispensaries, and an unknown number in private clinics. The number of hospital beds per 100,000 population increased from 77 in 1960-61 to 105 in 1974-75.

Though, one could relate the decline in the death rate to the expansion in medical care facilities, it appears that the relationship need not be so simple and direct. Table 13 provides information on factors relating to the availability of medical care in a number of States : The These data bring out certain striking differences between Kerala and other States regarding the availability and utilisation of medical care facilities. This is brought out sharply by the differences in the pattern and development of medical facilities as represented by West Bengal and Kerala. The number of beds per 100,000 population, and the per capita expenditure on health, are almost identical in both cases. Moreover, a hospital/dispensary appears to cover on the average a smaller population in West Bengal than in Kerala. However, a comparison of the proportion of the population which annually received treatment in hospitals and dispensaries in the two States indicates that the utilisation ratio in Kerala (i.e. the number treated

in hospitals as a percentage of total population) was over four times that of West Bengal. It appears that Kerala has the highest utilisation ratio of all States in India.

Table 13

Population per Hospital, Bed/population Ratio, per capita Expenditure on Health and Population treated in Hospital for States.

State	Population served by Hospitals (1965)	Population served by Dispensaries (1965)	No.of beds per 100,000 population (1968)	Per Capita Expenditure on health 1973/74 (rupees)	Population treated as percentage of total population 1968
Andhra Pradesh	106,541	51,443	65.61	7.30	N.A.
Assam	174,602	18,578	43.29	6.42	N.A.
Bihar	326,622	72,022	37.34	3.38	N.A.
Gujarat	196,596	17,145	54.28	9.27	34.10
Haryana	N.A.	N.A.	53.20	N.A	30.1[illegible]
Jammu & Kashmir	151,232	7,546	94.80	15.9[illegible]	N.A.
Karnataka	146,411	39,971	57.81	8.90	N.A.
Kerala	186,371	92,272	84.81	9.37	114.44
Madhya Pradesh	243,426	95,310	38.55	7.69	19.97
Maharashtra	113,854	44,531	80.65	11.83	N.A.
Orissa	105,473	63,913	46.45	6.37	51.96
Punjab	129,453	49,407	76.32	13.85	38.19
Rajasthan	58,961	75,207	66.25	9.67	53.32
Tamil Nadu	113,470	55,069	49.26	N.A.	N.A.
Uttar Pradesh	98,258	243,727	36.92	5.31	N.A.
West Bengal	148,065	75,895	88.79	8.97	26.53

Source: Government of India, Ministry of Health, Health Statistics in India, 1965, Central Statistical Organisation, Statistical Abstract of India, 1970, Kerala Government, Economic Review - 1975.

The factors responsible for such differences in the utilisation ratio of medical facilities have not been studied, but apparently an important reason appears to be the spatial allocation of such facilities. The lower utilisation ratio in most of the States is probably accounted by the fact that medical care facilities are largely located in urban areas while this is not so in Kerala. This is borne out by the data given in Table 14. The percentage of total number of birth and deaths taking place in a medical institution is certainly higher for the urban sector of all States, but, even within this sector, these vary considerably. In the urban sector, Kerala reports the highest proportion of deaths taking place in a medical institution. Similarly, the data for the rural sector unmistakeably show that the percentage of births as well as deaths taking place in medical institutions is highest for Kerala among the various States in India. An important factor affecting infant mortality and maternal death are deliveries unattended by trained personnel and the non-availability of medical help in complicated cases. Deaths arising from such situations can be considerably reduced if births take place in medical institutions. Similarly, the large proportion of deaths occuring in medical institutions indicates that more persons are being treated in hospitals for various illnesses. The fact that a higher proportion of persons get treated in the hospitals should itself have a beneficial effect on the over-all death rate.

The above findings seem to indicate that accessibility is an important factor in determining the degree of utilisation of medical care.[12] The utilisation has been much higher in the urban sector of all States, which appears to be closely related to the spatial allocation of such facilities.

Table 14

Percentage of Total Births and Deaths taking place in Hospital, Maternity houses and other Medical Institutions, 1964-65

State	Urban Sector		Rural Sector	
	Births	Deaths	Births	Deaths
Andhra Pradesh	27.60	13.62	4.03	4.88
Assam	24.55	10.10	1.90	N.A
Bihar	11.85	7.78	1.46	0.32
Gujarat	29.48	8.64	2.12	1.09
Haryana	5.00	N.A.	1.41	-
Jammu & Kashmir	4.16	2.86	0.62	1.55
Kerala	31.95	25.80	12.91	7.69
Madhya Pradesh	22.88	13.47	0.68	1.72
Madras	47.22	14.94	9.00	5.89
Maharashtra	46.94	17.11	5.09	2.26
Mysore	32.75	14.87	5.06	3.64
Orissa	15.94	5.59	1.82	1.82
Punjab	3.64	3.31	1.04	1.73
Rajasthan	15.17	7.60	0.54	2.17
Uttar Pradesh	13.12	15.41	0.48	1.24
West Bengal	49.03	13.42	5.83	3.32
All India	29.96	11.76	2.96	2.27

Source: NSS Report No.177, Nineteenth Round, 1964-65, pp.83-88.

It appears that the higher utilisation ratio in Kerala is largely due to the geographical spread of medical facilities in Kerala.[23/]

That accessibility is an important factor is also brought out clearly by data on the distribution of hospitals and the percentage availing medical facilities before death and for child-birth. Kerala is often divided into three natural regions, viz., the coastal low-land, the mid-land with slightly higher elevation, and the hilly (even mountainous) highland. From Table 15 it will be seen that the low-land region which has also the highest population density, is characterised by the highest number of beds per 100,000 of the population and the smallest average area to be covered by a hospital (or dispensary). On the other hand, in the highland region, which has the lowest population edhsity among the three natural regions, the number of beds per 100,000 population is the lowest and the area covered is largest. The mid-land region falls in between in all these respects. An examination of the crude death and infant mortality rates show that they are highly correlated to these variables.

Table 15

Accessibility and utilisation of medical care and mortality rates in the natural regions of Kerala

	Low land	Mid Land	High Land
Number of beds per 100,000 population (1970-71)	142.0	87.0	46.0
Average area covered by medical Centres (square kilometres)	29.4	65.4	101.9
Percentage of case availing medical facilities before death (rural sector 1973)	80.0	72.0	53.0
Percentage of deliveries availing of medical assistance (Rural sector, 1973)	59.0	44.0	36.0
Death rate per 1000 population (Rural, 1973)	8.8	8.5	9.3
Infant deaths per 1,000 live births (Rural, 1973)	46.6	46.9	78.0

The number of deaths per 1000 population, as well as of infant deaths per 1000 live births, appear to be smaller in the low-land and very much more in the high-land. The rates of mid-land lie in between.

While accessibility to medical care does not appear to affect significantly the percentage of total deaths availing medical facilities before death, it does seem to be an important factor in the case of child-birth. The percentage of child-birth with medical assitance was 60 per cent in the low-land region but it declined to 37 per cent for the high-land region. Even in the mid-land region only 41 per cent of the deliveries took place with medical assistance. It appears from the data given in the table that there is a sharp decline in the number of child-births under medical supervision with increase in the average distance of the medical centre from the home. It is also seen that the infant death rates are closely related to the percentage of deliveries taking place under medical supervision. These facts clearly demonstrate that accessibility to the medical care system is one of the important variables determing the level of mortality rates in a region or a State.

III

The population of Kerala increased at an annual average rate of 2.6 per cent during the decade 1961-70. In 196 , when the SRS first came into operation in Kerala, the estimated natural growth rate in the rural sector was 2.7 per cent per annum. There was a steady decline in the estimated natural growth rate in the rural sector since then and it was only 1.9 per cent in 197 . The estimated natural growth rate for Pattanam district, which reported the lowest birth rate in the rural sector amongst

the districts of Kerala in 1974 was only 1.38 per cent. The natural growth rate for the Southern districts, which accounts for 63 per cent of the total rural population of Kerala was only 1.6 per cent in 1974. Therefore, a one per cent rate of natural growth of population in Kerala appears to be achievable within the next quiquennium.

What lessons does the Kerala experience offer to other States in regard to population control? The above analysis has identified four elements which could have contributed to the decline of the birth rate in Kerala. These are the nuptial rates, the mortality rates, per capita income and voluntary limitations of the family size by practising 'programme' and 'non-programme' methods of family planning. While it has not been possible to estimate the precise contribution of each factor to the reduction in birth rates in Kerala, the analysis of the inter-district data has unequivocally demonstrated the role of nuptiality and mortality rates in reducing the birth rates. While we found the contribution of per capita income to the reduction in birth rate to be marginal, we have not analysed the contribution of family planning in reducing the fertility rates at all.

Since the major causes of reduction in birth rate in Kerala are a rise in the average age at effective marriage (brought about by changes in nuptiality rates) and the decline in the mortality rates, it is important to identify correctly how these changes took place. We attributed the rise in average age at effective marriage to improvements in the female levels of education in Kerala. It is necessary to undertake field investigations to prove that it is so. It may also be possible that the rise in the female age at marriage is consequent upon a rise in the average age

at marriage of males.[24] The average age at effective marriage of males has also been rising partly as a result of improvements in their levels of education. At the same time, improvements in the education of males has increased the number of job-seekers outside of the traditional occupations and the system of self-employment. There are some indications that the waiting period for employment has been lengthening through time.[25]

In the last three or four decades, Kerala, brought about a number social and economic reforms which altered the traditional relations in family and in land ownership. These changes have given rise to the emergence of unitary families in Kerala in place of the traditional joint families. A lengthening of the waiting period combined with these changes might have contributed to the increase in the average age at marriage of males. This, in turn, might also result in a rise in the average at marriage of females. These relationships need further investigation and until it is undertaken, the relationship between age at marriage and education needs to be interpreted cautiously especially in the case of Kerala.

The second important factor affecting birth rate was mortality rate. We had earlier hypothesized that given the desired number of <u>surviving</u> children, the higher the infant and child mortality rates the larger was likely to be the number of children born to a couple on the average. This hypothesis may need modification when applied to most parts of the rest of India. The Hindu religion attaches considerable importance to the survival of a male child. Therefore, for any given desired number of <u>surviving male</u> children, with the same infant and child mortality,

the larger would have to be the number of children born to a couple on average. Due to the prevalence of the matriarchal system, a large segment of the Kerala population were indifferent between the sexes of the children born and even in other communities, the preference for male children has probably declined due to female education and the possibility of securing jobs for females in Kerala. But, this may not apply to the rest of India. Therefore, limiting the number of children a couple may have, ignoring these factors can only lead to confusion and hardship.

When discussing the relevance of Kerala experience for other States in India, it is also important to examine the case of Karnataka. We mentioned earlier that the decline in the rural birth rate of Karnataka between 1970 and 1974 was of the same order as in Kerala. An examination of the marital rates, marital fertility rates and general fertility rates for the year 1969 do not indicate that these are quite different from the all-India pattern. The mortality rates also appear to be higher for Karnataka than of Kerala. There is no indication that the rural birth rate could fall so drastically between 1970 and 1974. These make it all the more important that a study is undertaken to find out how the decline took place in Karnataka. The same applies to Jammu and Kashmir. The rural birth rate in Jammu and Kashmir suddenly declined from 39.5 in 1969 to 35.0 in 1970 and it has declined further by 1974. These declines in birth rate indicate that there are numerous factors which can bring about a reduction in birth rate and we are yet to unravel them.

I am extremely grateful to K.N.Raj who suggested a number of improvements to the draft of this paper. I am also thankful to N. Krishnaji for his suggestions, to P.R. Gopinathan Nair with whom I discussed a number of questions and to R.S.Murup of the Demographic Research Centre, Bureau of Economics and Statistics, Kerala for providing me the corrected estimates for 1974. I am also indebted to Mr. M. Purushothaman Nair who helped me in the computations and I thank him for the same.

Footnotes

1. See, Mahmood Mandani, The Myth of Population Control, Monthly Review Press, New York, 1972.

2. P.R.Gopinathan Nair, 'Decline in Birth Rate in Kerala', Economic and Political Weekly, Annual Number, February 1974.

3. Registrar-General, Ministry of Home Affairs, Government of India, Sample Registration Bulletin, Vol.IX No.4, October 1975. For Kerala, the Demographic Research Centre, Bureau of Economics and Statistics, Kerala.

4. It is necessary to point out that the district estimates are based on small sample sizes and therefore, are likely to contain larger sampling errors.

5. Japan: United Nations, Population and Vital Statistics Report Series A Vol.XXVIII, No.1.

   Taiwan: Europa Publications: The Far East and Australia Yearbook 1973. p.933.

6. SRS Bulletin, 'About SRS'. Vol.VII, No.1, Jan.-March 1973.

7. This is contrary to the finding put forward in the paper by P.R. Gopinathan Nair, Op.cit. We have not gone into this question in this paper. We are planning a historical study of the growth of population in Kerala covering a much larger period.

8. The National Sample Survey, Fertility and Mortality Rates in India, Number 76, 1963.
   The general fertility rate is estimated in this report for the age-group 15-44. We estimated the birth rate by first dividing the general fertility rate by the proportion of females in the age-group 15-44 in total female population and then multiplying this figure by the population of total females in total population.

9. See the articles on Taiwanese family planning which have appeared in Population Studies, A Journal of Demography, London.

10. United Nations, Op.cit.

11. Census of India, Travancore-Cochin, Vol.XIII, Part II, Report p.21.

12. Ibid

13. J. Hajnal, 'European Marriage Patterns in Perspective' in Population in History, Edited by D.V. Glass and D.E.C. Eversley, Edward Arnold, 1965, p.101.

14. National Sample Survey, Tables with Notes on Couple Fertility, Number 154. Seventeenth Round, 1961-62.

15. National Sample Survey, Ibid.

16. National Sample Survey, Ibid.

17. National Sample Survey, Ibid.

18. R.S. Kurup, P.S. Gopinathan Nair and K. Divakaran Pillai, Fact Book on Population and Family Planning, Demographic Research Centre, Bureau of Economics and Statistics, Kerala, 1974 Table 12.2 p.79.

19. The Centre for Development Studies, has just received the primary data on Kerala of the 1971-72 Fertility Survey undertaken by the Vital Statistics Division of the Office of the Registrar-General, Government of India. It is hoped that the analysis of this data will enable the estimates of fertility rates for the districts and also the relationships between fertility and a number of other variables.

20. The community-wise birth rates in the rural sector in 1974 are as follows: Muslims - 38.41
Hindus - 26.97
Christians - 26.53
Source: S.R. Report No.10, Bureau of Economics and Statistics, Kerala.

21. See, Centre for Development Studies, Poverty, Unemployment and Development Policy, A Case Study of Selected Issues with reference to Kerala, United Nations, New York, 1975. Especially Chapter X 'Health Indicators and Demographic Trends'.

22. It is necessary to point out that this view is disputed. See, P.G.K. Panikar, 'Fall in Mortality Rates in Kerala', Economic and Political Weekly, Vol.X, No.47, November 22, 1975.

23. See, Centre for Development Studies, Op.cit. The following Table is reproduced from this study.

Average Catchment area (square Kilometric per medical centre within a taluk)	No. of taluks	Percentage of total population
Less than 50	28	51.97
50 - 100	13	24.81
More than 100	15	23.22

24. R.S. Kurup, et.al, Op.cit, Table 5.5 p.30. The average age at marriage of males rose from 23.31 years in the decade 1921-30 to 26.33 years for the decade 1951-60.

25. Centre for Development Studies, Op.cit See Chapter IX Structure of Education and the Market for the Educated.

oc0oo