GOVERNMENT OF KERALA

STUDIES IN POPULATION AND FAMILY WELFARE PROGRAMME

Vol. III

Issued by:

DIRECTORATE OF ECONOMICS AND STATISTICS

KERALA

PRINTED BY THE S.G.P. AT THE GOVERNMENT PRESS,
ERNAKULAM—1983

STUDIES IN POPULATION
AND
FAMILY WELFARE PROGRAMME

Vol. III

Issued by:
DIRECTORATE OF ECONOMICS AND STATISTICS
KERALA

68/472—1

PREFACE

Population problems in Kerala attracted much international attention in recent years. This is because of its unique characteristics compared to the other Indian States like high density and a low Income level, still maintaining an appreciably high level of literacy. Hence it is considered beneficial to publish certain papers contributed by officers of this centre at different occasions as one volume. It is hoped that demographers and others interested in the subject will welcome this as a useful document.

DR. R. SIVASANKARA KURUP,
Director.

68/472—1a

CONTENTS

PAPER ONE

POPULATION OF KERALA

(Projected for 1976-2001)

By

MATHEW M. VARGHESE,

Research Officer,

Directorate of Economics and Statistics,

Trivandrum.

1. *Introduction.*—Since the days India became a Sovereign Democratic Republic it resorted to development planning "to initiate the process of development which will raise living standards and open out to people new opportunities for a richer and more varied life"(1). It goes without saying that every Social and Economic Planning is intended to ensure the well-being of the people. As such, the knowledge about the future population, its size, growth, composition and distribution etc., helps the planners to estimate the magnitude of requirements, such as, food, housing, education facilities, health and other amenities.

In Kerala, inspite of the high demand for population figures projected for future dates, attempt has not so far been made to systematically project the population based on the 1971 census figures. Demands were generally met by quick estimates. The main reason for this was the delay in obtaining the single year age data of 1971 census.

An attempt is made here to project the population, both for males and females, separately by quinquennial age groups for each five year period from 1976 to 2001 A.D.

2. *Methodology.*—There are different methods to estimate the population at a future date, for a specified area, by considering the growth rates, Arithmatic or Geometric and using Exponential or Logistic models. But, in all these cases, calculations are based on the growth rate of previous decade or decades. But in Kerala, where the demographic situation is in the transition stage, these methods cannot have validity in practical applications. In the recent decade, though fertility was moving down, the fast falling mortality pushed up the growth rate. But now, a stage has come when falling fertility rate with more or less stagnant mortality and receding growth rate can be visualised.

---

(1) Planning Commission First Five Year Plan, Delhi-1952.

In such a situation, the component method of projection is considered to be the most appropriate. This method consists of separate projections of each component of population growth, viz. birth, death and migration and determine the overall effect on both males and females of each age group.

Here, the population obtained in 1971 census, distributed according to age and sex has been taken as base. Assumptions are made on the future courses of fertility, mortality and migration, giving due consideration to the past performances and future expectations.

3. *Data.*—The single year age-sex distribution of population of 1971 census in respect of the State and data on migration were obtained from the census publications(1). Other data, mainly on fertility, mortality, sex-ratio, expectation of life at birth are taken from the publications of the Bureau of Economics and Statistics, Kerala(2).

3.1. *Evaluation of Age data.*—The projection of population requires a base population almost free from errors. An examination of the base population is therefore necessary. It is seen that as in the case of any population data of developing countries, though not to the extreme extent, the data on 1971 census count of the State population suffers from under enumeration in younger ages, particularly in ages 0-4 years, digit preference in ages 10 and above and over-reporting at older ages. These are noted in the percentage distribution of sex-age data of the population enumerated in 1971 given in Table 1 of the Appendix. Graphical and stable population methods and survival ratio method based on graduated population of 1961, also lead to the same conclusion. Comparison with the expected population of 0-4 ages based on the birth rate from sample registration* points towards the under-enumeration in that age group. Digit preference was found out by using Myer's Index method, shown in Table A below. The table depicts the high preference to digits 0, 5, 8 and 2 and low preference for 1, 9, 7, 3, 4 and 6 in the order. At the same time it is heartening to note in the percentage distribution of Myer's blended sum for each quinquennial age grouping (Table B) that 0-4 age grouping has the lowest index for both males and females. That is, the

---

(1) Census of India 1971, *General Population Tables, Kerala* etc.
(2) Bureau of Economics & Statistics, *Sample Registration Bulletins* 1976, 1977 etc.

* Birth rates taken from the "Fact Book on Population and Family Planning in Kerala" Population Research Centre, Trivandrum (publishing).

digit preference in age reporting is minimized by adopting the conventional age grouping (0-4, 5-9, 10-14 etc.). Sex-ratio score calculated according to U.N. Secretariat method comes to 55. This shows that the sex-distribution is only slightly disturbed. This has been further tested by the graphical method.

TABLE A

Myer's Index

(Population of Kerala: 1971 Census)

Terminal Digits	*Percentage distribution of Myer's blended sum*		*Terminal digit*	*Percentage distribution of Myer's blended sum*	
	Male	*Female*		*Male*	*Female*
0	17·50	19·07	5	16·75	17·53
1	5·98	5·26	6	8·50	8·28
2	11·06	10·48	7	6·76	6·88
3	7·83	7·19	8	11·79	11·99
4	8·01	7·60	9	5·82	5·72

TABLE B

Myer's Index for each quinquennial age group

(Population of Kerala: 1971 Census)

Age	*Percentage distribution of Myer's blended sum*		*Deviation from 50*	
	Male	*Female*	*Male*	*Female*
0–4	50·38	49·60	+0·38	—0·40
1–5	49·63	48·06	—0·37	—1·94
2–6	52·15	51·08	+2·15	—1·08
3–7	47·85	47·48	—2·15	—2·58
4–8	51·81	52·28	+1·81	+2·28

(i) Hence, to graduate the population figures. The enumerated single year age data has been grouped into 0-4 age grouping.

(ii) The grouped data were smoothed by the 3 point formula,

$$S = \frac{(Px-5)+(2\,Px)+(Px+5)}{4}$$ where

Sx = the smoothed population in age x to x+4
Px = the enumerated population in age x to x+4
Px — 5 } enumerated population in age groups proceeding
Px + 5 } and succeeding to age group x to x+4

(iii) Number of children below 5 years was calculated using estimated birth-rate for 1966-70.

(iv) Number of persons above 80 years of age was estimated using the stable population models (west model); sex-ratio of each age group was calculated using enumerated populations smoothed by graphical method.

(v) The smoothed population data obtained in the case of females were prorated to give the total female population enumerated. Male count in each group was adjusted using estimated female population numbers and smoothed sex-ratio and prorated to be equal to the enumerated male population.

The age-sex adjusted population in each conventional age group, percentage to sex-wise totals, and sex-ratio are given in Table 2.

4. *Inputs and assumption.*—As explained earlier, projection of population by the component method requires information on base-period levels and future course of fertility, mortality and migration. To estimate sex-wise distribution of new born children during the period of projection, sex-ratio at birth for the period, is aslo to be arrived at.

4.1. *Fertility.*—For the period upto 1961, estimates of birth-rate in Kerala are available as decadal averages estimated from decennial censuses. For the year 1961, an estimate of birth rates made by Namboodiri(1) is adopted. The sample Registration system provides estimates of birth and death rates in Kerala (Rural) from 1966 onwards and for both Rural and Urban areas from 1971 onwards. "The sample Registration data on vital events are regarded in India as more acceptable than those obtained through Civil Registration. Hence, these are used for the calculations (2)". The birth rates estimated as above are given below. These show that the fertility in Kerala started declining only after 1961.

---

(1) Namboodiri, N. Krishnan—*The changing population of Kerala*—Census of India 1961.

(2) Raghavachari S., Popluation projection 1976-2001 A.D. *Population in India's development 1947-2000*. Afhisk Box, P. B. Desai etc. P. P. 432.

Birth rates of Kerala 1931–1975

Period	*Birth rates*	
1931–40	40·0	Census estimates
1941–50	39·8	
1951–60	38·9	
1961	40·7	Estimated by Namboodiri
1966	37·4	S.R. estimates for Rural
1967	36·3	
1268	34·3	
1969	33·5	
1970	32·3	
1971	31·9	
1972	32·1	
1973	29·9	
1974	27·0	
1975	28·2	

4.10. *Factors affecting fertility.*—Hence, a study on the factors which affected the fertility change in Kerala during the 60's and the extent to which each of these may contnue its influence, will be helpful in our effort to arrive at the future course of fertility in the State.

According to Davis and Blake (3), the most important social factors affecting fertility are the duration of reproductive period spent on sexual union and the factors governing the exposure to intercourse within the unions, to conception and to foetal mortality, voluntary or involuntary.

4.1.1. *Mean age at marriage.*—First we may consider the duration of reproductive period spent in sexual union. Since the sexual union legally starts with male and female joining together in wedlock, the age at marriage is the most important factor determining this period, the other factor being the breaking up of marriage alliance.

A higher age at marriage not only reduces the span of sexual union, but also promotes favourable attitude towards a small family norm.

Following Hajnal's method of systematic cohort, it has been shown that the mean age at marriage of women in Kerala was 20.9 in 1961-70 period as against 17.1 for India as a whole. The

(3) Davis Kingiley and Judith Blake 'Social Structure & Fertility', An Analytical Frame work *Economic Development & Cultural Change* Vol. 4 No. 3 April 1956.

figures are given in the table below. It may be remembered further that Kerala has the highest per cent of never married females in the age group 15-44 among the States in India.

C. Mean age at marriage of women in Kerala and India (1901–1970)

Decade	*Mean age at marriage*	
	Kerala	*India*
1901–10	17·1	13·2
1911–20	17·4	13·6
1921–30	17·8	12·6
1931–40	19·7	15·0
1941–50	19·4	15·4
1951–60	19·9	16·1
1961–70	20·9	17·2

Source: Goyal, R. P.—Shifts in age at marriage in India between 1961 and 1971, "Demography—India" Vol. 4 No. 2 December 1975.

The age of marriage in Kerala has an ascending tendency. Migration of young adults delays their marriages. The attitude of the youngesters to earn and become non-dependent before they enter into wedlock favourable sex-ratio towards women, improvement in female education, dowry system prevalent in certain major religious groups, breakdown of Marumakkathayam system of inheritance etc. point to an upward tendency to the age at marriage of the fair sex of the State, and for increased rate of postponement of marriages. The percentage of never married females in the reproductive age group 15-44 which was 22.0 in Kerala in 1961 against 7.5 in India moved up to reach *30.8* in 1971.

4.1.2. *Breaks in marriage alliance.*—Duration of sexual union is further affected by breaks in marriage alliance, either due to death of the spouce, divorce or separation. Since the death rate in Kerala is very low and remarriages are not restricted, extent of the decrease in the duration of married life is not much.

4.1.3. *Separation within marriage.*—The major factors affecting the exposure to intercourse within the unions are the separation of couples in their married life due to one of them undergoing education or participation in work away from home; also adherance to certain social customs and taboos which impose restrictions on cohabitation may reduce exposure to intercourse.

4.1.4. *Female literacy.*—Increase in general literacy level especially through spread of female education, helps to reduce fertility in more than one way. Engagement in educational pursuits delay marriage. Educated women easily grasp idea of the small family norm and birth control techniques. Increase in their social status make them engage more and more outside their home premises either for employment or social activities.

Literacy level in the State is the highest among the States in the country and ascending in good speed. (Table D). It can be predicted without any doubt, that facilities for free education up to matriculation, financial assistance to low income groups and programmes of adult education sponsored by the Government of India etc. will further boost the literacy level in the State to a considerable extent thus positively contributing to fertility decline.

TABLE D

Literacy rates in Kerala and India 1961–71

Sex	*Percentage literate*				
	Kerala			*India*	
	1961	*1971*	*1977*	*1961*	*1971*
Male	55·0	66·6	78·2	34·4	39·5
Female	38·9	54·3	68·0	12·9	18·7
Total	46·8	60·4	73·0	24·0	29·5

Sources: 1. Census of India 1961 and 1971.

2. 1977 figures are from the Director of Public Instructions, Kerala, Trivandrum.

4.1.5. *Labour participation of women.*—Participation of women in activities outside their home premises is considered conductive to pregnancy limitation. The employed women is compelled to limit the family size because of the difficulties in child bearing and child rearing. In Kerala female work participation rate is on the increase and is increasing faster than that of India. As seen from the under noted table, the female labour participation rate in Kerala which was far back of that in India during 1961, overtook Indian rate by 1971. So also, per cent women workers to total workers which was higher in India than in Kerala during 1961 has been reversed in 1971.

TABLE E

Female work participation rate 1961 and 1971 Kerala and India

Year	*Wamen gainfully employed*			
	as percentage to population		*as percentage to total workers*	
	Kerala	*India*	*Kerala*	*India*
1961	19·71	27·96	29·46	33·25
1971	13·49	13·18	23·06	20·05

Source: Census of India 1961 and 1971.

4.1.6. *Social taboos that affect sexual unions.*—One of the important factors that affects the exposure to intercourse within the marriage unions is the adherance to certain social customs and taboos. There are many such taboos in Kerala like, separation of bride and bridegrooms immediately after marriage till another function of sending the wife to husband's home is celebrated, practice of restricting chances to get privacy to young couples by their parents in a joint or extended family, young ladies given in marriage to old persons on economic, religious or prestige reasons, restrictions on intra-caste marriages as in the case of Namboodiris (only eldest sons among Namboodiris were allowed to marry from their own caste, resulted in many Namboodiri ladies deprived of any chance to get married) and also some deviant sexual practices prevalent in certain areas and among certain castes. But modernisation in customs and habits, disintegration of family ties etc. act against any such controls. However, the modernisation process has to make long strides to subdue the birth rate, though it helps to increase contraception.

4.1.7. *Family Welfare Programme.*—The third and the most important factor affecting fertility in the State, governing the exposure to conception at present and in the future is the practice of birth control. The progressive attitude of the people of Kerala towards the small family norm, created as a result of increase in educational status, increase in female employment rate, high expenditure of child bearing and rearing with little chance to accommodate the children in gainful activities, fall in mortality especially infant mortality, aspiration of individuals to increase their social status, change in family type and religious institutions

etc. make them appreciate and encourage the National Programme of pregnancy limitation without any compulsion. The following table depicts the bright picture of achievements made under the programme in the State.

TABLE F

Progress achieved under family welfare programme in Kerala (1966–78)

Year	*Methods adopted as equivalent to sterilisation*			
	Vasectomy	*Tubectomy*	*IUD and other methods*	*Total*
1966–67	33069	7205	14182	54456
1970–71	113747	27364	9842	150953
1975–76	94270	62352	10735	167361
1976–77	129829	84566	11950	226345
1977–78	15188	67225	3472	85885

Source: Fact Book on Population and Family Planning—Population Research Centre, Trivandrum 1979.

TABLE G

Births averted by various methods Kerala 1957–78

Financial Year	*No. of births averted through*			
	Sterilization	*IUD*	*CC*	*Total*
1957–58	13	..	..	13
1966–67	25721	5564	7	31292
1970–71	78001	22431	1916	102348
1975–76	149460	17335	3997	170792
1976–77	173191	17570	3779	194540
1977–78	212132	16539	4476	233147
Total (1957–58 to 1977–78)	1328935	209713	27237	1565885

Source: Fact Book—Ibid.

The tables show the progress in the practice of birth control methods upto 1970-71 taking momentum from that year to 1976-77. But the performance suffered a set back in 1977-78.

4.1.8. *Termination of Pregnancies.*—Yet another factor that causes reduction in birth is the possibility of foetal mortality, voluntary or induced. Chances of voluntary foetal loss in the State

is on the decrease. because of better medical services available. At the same time, since the people are more and more in favour of small families the couples feel it necessary to undo unwanted pregnancies. The progress shown under Medical Termination of Pregnancy Act (M.T.P. Act) gives an idea of the change in attitude of the people in favour of terminating unwanted pregnancies by medical means.

TABLE H

Abortions made under Medical Termination of Pregnancies Act, Kerala 1972–76

Year	*1972–73*	*1973–74*	*1974–75*	*1975–76*
Number of abortions	1084	4244	9564	19969

Source: Administration Report 1975-76, Department of Health Services, Trivandrum.

4.1.9. *Net effect.*—In short, practice of birth control methods under family welfare programme and termination of pregnancies are the two major factors affecting the birth rate in Kerala; these will continue to effect the birth rate in future.

The extent to which the increase in age at marriage helps to reduce the birth rate is still in doubt. According to a study by Basavarajappa and Belvalgidad(1) though a decline in birth rate is noticed at initial stage of the increase in age at marriage, because of the prevention of marriage for large numbers of females under the enhanced age, the rate will take momentum on subsequent increase in marriage rate at higher ages. And shorter the duration of marriage, higher the fertility rate during the period so that the total children born to a lady will almost be the same especially among contracepting society. They concluded that "little difference in birth rate can occur due to increase in age at marriage".

Their contention on enhanced marriage rates among higher age group is proved in the case of Kerala during 1961-71 period.

(1) Basavarajappa K. G. and M. I. Belvagidad—"Change in the Age at Marriage of Females and its Effect on Birth Rate,"—*Eugenic Quarterly Vol. 14. 1967.*

The increase in proportion married of females in the ages above 25 years, during the period, is shown in the following table:—

TABLE I

Proportion married in Kerala 1951 and 1971

Age	*Proportion married*	
	1961	*1971*
15–19	28	18
20–24	72	64
25–29	84	85
30–34	84	87
35–39	81	85
40–44	74	79
45–49	67	73
15–49	67	64
20–49	77·6	78·1
25–49	79·3	82·6

Source: Estimated from Census of India General Tables 1961 and 1971.

At the same time, the shift in marriage age caused a decline in the number of births during the period, as is noticed when the birth rates of 1971 is standardised with the population of 1961.

A Table showing the age specific fertility, marital fertility and general fertility rates of 1971 and the G.F.R. standardised with 1961 population is given below:—

TABLE J

Fertility Rates in Kerala 1961 and 1971 and standardised G.F.R. of 1971 with rates of 1951

Age	Females 1971	ASFR (2) 1971	ASMFR 1971	Females 1961	Proportion married 1961	ASFR (1) 1961
15–19	12088	37·76	208·12	8951	28	99·5
20–24	9863	211·6	329·78	7822	72	253·6
25–29	7678	255·6	299·24	6734	84	265·8
30–34	6550	198·9	288·96	5757	84	195·9
35–39	6080	125·20	147·10	4811	81	129·4
40–44	5351	58·20	74·33	4950	74	78·8
Total G.F.R.	47610	144·6	..	39025	..	174·4

Rates standardised with 1961 Population:—

GFR—147·4
GMFR—154·8

Source: Census of India 1961 and 1971 (General Population Tables).

(1) ASFR 1961 from Namboodiri, N. Krishnan: "The Changing Population of Kerala".

(2) ASFR 1971 from Family Planning year Book 1975-76, Registrar General of India, Census of India 1961.

According to the table, the GFR 1971 is 144.6. But when it is standardised with the population 1961 the GFR increased to 147.4. This shows that a fall of 2.8 points in the GFR during 1961-71 period is due to change in age structure. Standardisation of the ASMFR of 1971 with married population 1961 brings out the GMFR of 1971 as 154.8. These shows that barring the decline in birth rate due to change in age structure, out of 27.0 point fall in the birth rates during the decade about 27 per cent was due to change in age at marriage and 73 per cent was owing to factors affecting pregnancy within the union, mainly, acceptance of birth control programmes and adoption of termination of pregnancies. According to Dr. R. S. Kurup and S. Cecil, the same trend continues even after 1971 (1) and the effect of factors other than Family Welfare Programme increased from 3.3 per cent in 1971-72 to 15.2(2) in 1973 and 30.8 in 1974. Divakaran Pillai has estimated that the effect of family Welfare Programme in reducing the birth rate during 1961 to 1971 as 66 per cent and that of increase in age at marriage 34 per cent. During 1971-77 period the effects were 85 per cent and 15 per cent respectively(3).

4.1.10. *Assumption on future course of fertility.*—Even with this background, it is difficult to predict the future course of fertility accurately, as the fertility of the State relies upon the voluntary limitation of family by its people. It is affected by the changes in behavious of the people, policy of the nation from time to time,

---

(1) Dr. Kurup R. S. & S. Cecil, Sample Registration Report Series No. 11 Bureau of Economics and Statistics, Trivandrum 1976.

(2) Divakaran Pillai K., Component of Fertility Change in Kerala during 1961-71, Population Research Centre, Trivandrum 1979.

(3) Divakaran Pillai K., Fertility Impact of Nuptiality change and Acceptance of Family Welfare Programe in Kerala,, Paper presented at the Conference on Population and Rural Development of the Indian Association for the Study of Population, Bombay 1979.

the enthusiasm and co-operation of the popular leaders and social workers in controlling the population growth etc. Hence, three courses of fertility are assumed here; denoted as high, medium and low.

In the high assumption the rate of decline in fertility during 1961 to 1971 decade is assumed to continue for the entire period upto the year 2001. The criterion is that during the 1961-71 period the family welfare programme has affected the birth rate only slightly and the public mobilisation in its favour was not appreciable. Hence this assumption is associated with low acceptance of the programme.

The total fertility rates for 1961 and 1971 were 5.22 and 4.49 respectively, showing an average decline of 1.4 per cent per annum. Thus, a 7 per cent decline within a period of 5 years is envisaged in this course, throughout.

The low projections are generally linked with the full achievement of programme targets. As far as Kerala is concerned there is no perspective targets of any period. Annual targets are being fixed and that also for Family Welfare Programmes only. Still during 1971-75 period, the achievement in the field of Family Welfare Programme was exemplary as shown in Table F & G para 4.1.7. and according to Sample Registration Reports, the fertility rate has declined, by 3 per cent per annum. This was during a period when co-ordinated effort of all agencies under the Government, social workers and voluntary bodies was directed for the success of the Programme on an emergency footing. Hence, this rate of decline is taken here as the maximum that can be achieved by the State under earnest leadership, political will and determination. Under this assumption, it is expected that the Fertility will decline by 15 per cent during all quinquennia upto 1991, 12.5 per cent by the next 5 years and continue without change for the subsequent period. The T.F.R. will be 2.05 by 1996, according to this course, and assuming the sex ratio at birth as 105, this course envisage a unit GFR (NFR still less) and a stationery population by the year 1996.

To assure a medium course of fertility to be used for all practical purposes, it is worth notice the medium course for all India taken by the Expert Committee set up by the Planning Commission(1). The Committee in its report of 1968 and in the revised

(1) Report on the Population Projections worked out under the guidance of the Expert Committee set up by the Planning Commission under the chairmanship of the Registrar General, India"—Office of the Registrar General of India, New Delhi.

series in the light of the 1971 census provisional totals, assumed the fertility decline by 10 per cent, 20 per cent and 25 per cent for the 5 year periods 1971-75, 1976-80 and 1981-86 respectively. The same course is taken by them for all the States also. In addition to the fact, that all India pattern of fertility levels does not fit to Kerala conditions, it can be stated that the assumed decline in this course seems to be on the high side. S. Raghavachari(2) took a modest course when he assumed two medium courses of 10 and 15 per cents of decilne in the fertility of the country as a whole during 1971-75 and 10 per cents for the next two quinqunnium and still less subsequently. For Kerala medium course of assumption is taken so that the population will reach a stationary stage by the year 2001 and is very close to that in Raghavachari's projection, mentioned above. The 15 per cent decline in fertility achieved during 1971-75 is taken as such and a slower rate of 12.5 per cent decline by 5 year time is assumed for 1976-85, considering the expected fall in achievements under the family welfare programme since 1977. From 1986 to 2001 the downward movement of the fertility at the rate of 11 per cent per quinquennium is envisaged. Total Fertility Rate, according to this course will reach 2.05 point by the year 2001.

The total Fertility Rates of the three courses assumed for the State are given in the table below:—

TABLE K

Assumed course of Total Fertility Rates in Kerala 1971–2001

Year level	1971	1976	1981	1986	1991	1996	2001	GRR in 2001
High	4·49	4·18	3·88	3·61	3·36	3·12	2·91	1·42
Medium	4·49	3·82	3·34	2·92	2·60	2·31	2·05	1·00
Low	4·49	3·82	3·24	2·75	2·34	2·05	2·05	1·00

4·2 *Mortality*.—In Kerala, mortality is at its lowest ebb as shown in the following Table. The death rate of 38·7 in 1911–20 decade fell down to 9·3 in 1971 and 8·1 in 1976.

(2) Raghavachari S.—Population Projections 1976-2001 in *Population in India's Development 1947-2000*—Ed. Ashish Bose etal for Indian Association for Study of Population, Vikas Publishing House, New Delhi.

TABLE L

Death rate in Kerala and India 1901–1976

Decade/year	*Death Rates*	
	Kerala	*India*
1901–10 ..	..	42·60
1911–20 ..	38·7	47·2
1921–30 ..	33·8	36·3
1931–40 ..	29·1	31·2
1941–50 ..	22·3	27·4
1951–60 ..	16·9	22·8
1961–70 ..	9·3	17·3
1971 ..	9·3	14·9
1972 ..	9·2	16·9
1973 ..	8·5	15·5
1974 ..	8·2	14·6
1975 ..	7·6	15·9
1976 ..	8·1	15·0

Source: 1. S. R. Annual Reports, Bureau of Economics & Statistics, Kerala.

2. S. R. Bulletins—Registrar General of India, New Delhi.

4.2.1. *Medical and Health Facilities.*—The main factor that contributed to the spectacular decline in death rate is the near universal availability of health and medical facilities. The number of medical institution has increased and number of beds per lakh of population in Allopathic Institution has gone up from 101 in 1966-67 and 102 in 1972-73, 108 in 1972-73 and 116 in 1977-78*. Bed-population ratio increased in Ayurvedic and Homoeopathic institutions also simultaneously. In addition, there are numerous hospitals, dispensaries and nursing homes owned .and managed by different trusts, missions and individuals, functioning in every nook and corner of the State. Some of them are famous for availability of up-to-date equipments, efficient treatment and nursing. Since, Government and all major religious groups are enthusiastically trying to improve their health services, further fall in age specific death rate is anticipated.

4.2.2. *Natural condition.*—The awareness of the people about health and hygienic way of life, natural facilities and equable climatic conditions available in the State contributed to the control of diseases especially epidemics.

* Economic Review 1978—State Planning Board, Government of Kerala, Trivandrum.

4.2.3. *Age Structure.*—Another important factor which determines the death rate of a country is its age structure. More people will die at infancy and at very old ages. The population of Kerala is still young. Hence any improvement in Infant Mortality Rate trends to bring down the death rate, considerably. Thus we can truly attribute the recent fall in Mortality rate of the State to the spectacular decrease in infant mortality. According to the Annual Report of the Registrar General of India 1978 the IMR in Kerala reached 53.3 while the corresponding rate in India as a whole was 127.5. The IMRs in Kerala for the last few years are given in the Table below.—

TABLE M

Infant Mortality Rates in Kerala 1966–76

Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I.M.R.	68·9	67·4	64·0	57·4	52·6	60·9	66·0	61·7	55·9	57·5	53·3

Source: 1. S.R. Annual Report 1975, Bureau of Economics and Statistics, Kerala.

2. (For 1976) S.R. Annual Report 1978, Registrar General of India, New Delhi.

4.2.4. *Other developmental activities.*—Improvements in pre and post-natal care to mothers, nutritional aid to infants, innoculation and vaccination against diphtheria, wooping cough, smallpox, etc., through developmental programmes of both State and National Governments for maternal and child care, predict further decline in infant death rate, to reach the lowest possible level. In certain Asian countries like Japan, Hongkong, Tailand and Israel the Infant Mortality Rates were only 11.3, 16.4, 21.8 and 22.8 respectively in 1973*. The fall in IMR would push up the expectation of life at birth.

But since the death rate in the State has already reached a low level of 7.5 in 1977 further decline is almost ruled out. But the expectation of life will move up further though at a slower pace.

---

* U.N. Demographic Year Book 1975.

4.2.5. *Course of assumption.*—For projecting the future course of mortality the possible course of expectation of life at birth is assumed here. The expectation of life at birth during the year 1971 to 1975 is given in Table below:—

TABLE 4·2·5.

Expectation of life at birth in Kerala 1971–75

Year	*Expectation of life at birth*		
	Male	*Female*	*Total*
1971	60·57	61·16	60·86
1972	59·05	61·49	60·18
1973	61·13	62·14	61·61
1973–75	60·90	63·26	63·18
Average of 1971–1972 and 1973–75	60·5	62·5	62·1

Source: S. R. Annual Reports—Bureau of Economics and Statistics Kerala, Trivandrum.

The average expectation of life at birth given as 62.5 years for females and 60.5 years for males are taken as that of the base period 1971 to 1975, for projection to future years. The rate of increase in the expectation of life during 1971 to 1973, the period only for which period single year age data are available is 0.5 for females and 0.3 for males. The same trend of improvement in the expectation of life is assumed for the near future, as it conforms the general trend expected when eo° reaches 60 years or above. The experience of certain developed countries when the female eo° was around 62.5 in the post-war period showed more or less the same trend as shown in the table below. Sri Lanka, which has almost the same socio-economic background as that of Kerala also showed a similar trend in 1964-71 period.

TABLE N

Trend in Expectation of life at birth in certain countries

Country	*Period*	*Expectation of life at birth*	
		Male	*Female*
Poland	1948	55·6	62·5
	1956	62·4	67·8
	1960–61	64·8	70·5
	1965–66	66·8	72·8
	1970–72	66·8	72·8
Portugal	1949–52	55·5	60·5
	1955–56	58·8	63·8
	1959–62	60·7	66·4
	1971	63·7	70·3
	1974	65·3	72·0
Yugoslavia	1952–54	56·9	59·3
	1970–72	65·4	70·2
Srilanka*	1964	63·0	63·6
	1965	63·7	65·0
	1966	63·6	65·0
	1967	64·8	66·9
	1971	64·2	66·7

Source : U.N. Demographic Year Books

* U.N.E.S.C.A.P. Population of Srilanka, Country Monograph Series No. 4 Bangkok 1976—P. 148.

Annual increase of 0.5 point in the expectation of life is assumed for female from 1971-75 upto 1981-85. Hence a declined rate of increase is expected as in the case of other countries, shown above. Hence, 0.4 points annual increase is assumed for the succeeding quinquennium and 0.3 points during each year in the next decade.

For males, an improvement in expectation of life at the rate of 0.3 years per annum is taken for first decade, which is 60 per cent of the increase assumed in the case of females. The same ratio between the expectation of life of females and males is taken to be continued the entire period till 2001 A.D.

The expected courses of expectation of life at birth in the case of both females and males are given in the table following:—

TABLE

Assumed courses of expectation of life at birth— Kerala 1971–2001

Periods sex	*1971–75*	*1976–80*	*1981–85*	*1986–90*	*1991–95*	*1996–2000*
Females	62·5	65·0	67·5	69·5	71·0	72·5
Males	60·5	62·5	63·5	64·7	65·6	66·5

4.3. *Sex ratio at birth.*—The sex ratio at birth is mainly a biological phenomenon and environmental factors affect very little. The ratio will always be highly favourable to males. Generally, there will be 105 males for every 100 female birth with small variation due to biological and socio-environments factors. Visaria in his studies estimate the average sex rates at birth in India as around 106(1). Analysing a large volume of data collected from hospitals, Ramachandran and Deshpande found the all India average to be 106(2). The expert Committee appointed by the Planning Commission assumed the sex ratio at birth in India as 105(3).

In Kerala, according to Sample Registration of the latest years, the sex ratios at birth are around 108, given a mean value of 106.75 for 1971-76 period. The year-wise data are given below:—

TABLE P

Sex ratio at birth in Kerala—1965–67 to 1976

Year	*Sex ratio at birth*
1965–67	105·0
1971	107·4
1972	105·7

* In this part sex ratio is taken as male births per 100 female births.

(1)Visaria P. M., "Sex ratio of Population of India"—Vol. I, Monograph No. 10, New Delhi, Registrar General's Office, 1971.

(1) Ramachandran K. V. and V .A. Deshpnde—"The Sex ratio at Birth in India, The Milbank Memorial Fund Quarterly, New york, Vol. I, 42, (Part I) April 1964 pp. 84-95.

(3) Report on the Population Projections worked out under the guidance of the expert committee set up by the Planning Commission under the Chairmanship of the Registrar General of India, Office of the Registrar General of India, New Delhi.

TABLE P—(*cont.*)

Year		*Sex ratio at birth*
1973	..	110·2
1974	..	108·2
1975	..	108·0
1976	..	101·0

Source: S.R. Annual Reports Kerala, Bureau of Economics and Statistics, Trivandrum.

But conditions in Kerala does not permit to assume a higher ratio than that of India as a whole. It is suggested that the sex ratio may change according to the age of the mother. Examining the data from 1947-52 Moore found that a definite drop in the sex ratio at birth with increasing age of mother (the sex ratio 108 for mothers aged 15-19 dropped to 106 for 20-24 and 105 for above 24 years)*. In Kerala, with higher age at marriage majority of births take place at age above 24 years.

Hence, the universal figure of 105 as average sex ratio at birth is assumed for Kerala also for the period of three decades from 1971.

5. *Projections and Results.*—The smoothed base figures of population as on 1st April 1971, distributed according to age and sex was projected to future quinquennial periods, using the Life table survivalship probabilities for each assumed expectation of life at Birth, estimated in coale and Demeny "West Model Life Tables".* The number of births obtained from Age specific Fertility Rates are given below for the 1971 period and projected to the future according to the assumed courses.

TABLE 5 Q

Age Specific Fertility Rates—Kerala 1971

Age		*Rates*
15–19	..	37·73
20–24	..	211·59
25–29	..	255·55
30–34	..	198·90
35–39	..	125·20
40–44	..	58·61
45–49	..	11·16
T.F.R.	..	44·49

Source: Calculated from F. W. Year Book, Registrar General of India, New Delhi—1975.

* U. N. Determinents and consequences of Population Trends 1973.

† Coale A. J. and P. Demeny, Regional Model Life Tables and Stable Population, Princeton University Press, 1966.

Sex ratio at birth is taken as 105 males per 100 females for the entire period under study.

Three projections are obtained for population based on the three courses assumed for fertility. The total population so obtained are given in table below:—

The age-sex distribution of all the sets are given in Tables 3 to 5 in the Appendix. The high and low projection broadly indicate the likely range of future population, to be utilised for specific purposes, whereas the medium set is considered as one represents the most plausible course of population growth, generally for all analytical and practical purposes.

TABLE 5·R

Projected Population (1971 to 2001) and sex ratio—Kerala

Year	*Nature of projection*	*Male*	*Female*	*Total*	*Sex-ratio*
(1)	(2)	(3)	(4)	(5)	(6)
1971		10587851	10759524	21347375	1016
1976	High	11961673	12070914	24032587	1009
	Medium	11845603	11959820	23805423	1010
	Low	11845604	11959820	23805424	1010
1981	High	13498317	13560046	27058363	1005
	Medium	13127443	13203962	26331405	1006
	Low	13102957	13180431	26283388	1006
1986	High	15113757	15148929	30262686	1002
	Medium	14405895	14466912	28872807	1004
	Low	14309095	14373550	28682645	1005
1991	High	16764860	16793545	33558405	1002
	Medium	15616941	15683846	31300787	1004
	Low	15391310	15465531	30856841	1005
1996	High	18409259	18448193	36857452	1002
	Medium	16721074	16811868	33532942	1005
	Low	16323626	16426455	32750081	1006
2001	High	20050587	20119614	40170201	1003
	Medium	17690337	17826045	35516382	1008
	Low	17197327	17346723	34544050	1009

6. *The results.*—The projected population figures given above provide that under high fertility assumption the population on 2001 AD will be double that of 1971. Total Fertility rate reaches 2.9 and General Reproduction rate 1.4 in place of 4.5 and 2.2 respectively in 1971. Under the medium and low fertility

assumptions the General Fertility rates are expected to reach unity by the year 2001 and 1996, respectively, and population increase by about two-thirds and three-fifths from that of the 1971 count.

Percentage of children aged below 15 years will decline from 40.29 in 1971 to 31.73, 26.64 and 25.11 in 2001 according to high, medium and low assumptions, respectively. The number of school-going children in the age group 5-14 will reach 84,64 and 58 lakhs in the respective three courses, which are 20.86, 18.13 and 16.92 per cents of the corresponding population. During the year 1971, the number of children in the school-going age group was 56 lakhs, 26.27 per cent of total population. Thus, the fact remains that though the per cent school going children dwindles, due to fall in birth rate, a fall in the total number of school going children cannot be expected in the near future in the State.

The proportions of working force increase from 53.62 per cent in 1971 to 60.66, 64.75 and 66.03 by the 3 subsequent decades as per the three courses expected.

Percentages of women in the reproductive age group of 15-49, according to the three assumptions, are on the increases, from the base level of 48.35 to 52.56, 55.54 and 56.54 by the coming century.

Thus, all the three assumptions depicts a picture of low proportion of children and increase in proportion of working force, females in the reproductive age-groups and old age persons, by the year 2001 A.D.

ACKNOWLEDGMENT

The author is indebted to Dr. R. S. Kurup, Additional Director, Bureau of Economics and Statistics, Trtvandrum. Under whose encouragement and guidance this paper has been prepared. Thanks are also due to Miss. T. Achamma, of the population Research Centre who rendered her assistance in calculations.

BIBLIOGRAPHY

1. Barelay, George, W. Techniques of population Analysis. Basavarajappa, K. G. and M.I. Belvalgidad, "Change in the Age at Marriage of Females and its effect on Birth Rate", Eugenic Quarterly. Vol. 14, 1967.
2. Bureau of Economics and Statistics, Sample Registration, Annual Report for the years 1971, 1972, 1973, 1974 and 1975 DRC, Trivandrum.

3 Bureau of Economics and Statistics—Fact Book of Population and Family Planning D.R.C. Trivandrum.

4. Census of India, General Population Tables 1961 and 1971.

5. ESCAP—Guideline for preparing subnational population projection, Asian Population Studies series No. 32, ESCAP, Bangkok, Thailand 1975.

6. Kurup, R. S. and Cecil, Sample Registration Report Series No. 11, Bureau of Economics and Statistics, Trivandrum, 1976.

7. Kurup, R. S. The Effect of the Family Planning on the Birth Rates in Kerala, Demographic Research Centre, Trivandrum 1973.

8. Kurup, R. S.—Note the calculation of Births averted due to the Family Planning in Kerala, D. R. C. Kerala 1973.

9. Kurup, R. S.—A note on the trends in life Expectancy in Kerala over the years D. R. C., Kerala 1973.

10. Nair, Surendranathan, G.—Social and Cultural Aspects of Fertility of women in Kerala, Demographic Research Centre, Trivandrum— 1973.

11. Namboodiri, N. Krishnan—The Changing Population of Kerala, Census of India—1961.

12. Raghavachari, S.,—Population Projections 1976-2001 population in India's Development 1947-2000 Ed. Ashish Bose ctal, Vikas Publishing House, New Delhi.

13. Ramachandran, K. V. Techniques of population Projection, D. T. and R. C. Bombay 1968 (Mimeographed).

14. Ramachandran, K. V. and V. A. Deshpande—"The Sex Ratio at Birth in India"—The Milbank Memorial Fund Quarterly, New York Vol. I 42, No. 2 (Part-I) April 1964.

15. Registrar General of India, Family Planning Year Book 1976.

16. Registrar General of India—Report on the Population Projections worked out under the guidance of the Expert Committee Set up by the Planning Commission, New Delhi.

17. Ronaled Presets, Demographic Analysis, Aldine—Athatain, Chicago 1972.

18. Shyrock, Henry S ctal—The methods and materials of Demography Vol. 2, U. S. Bureau of Census 1971.

19. U. N. Determmants and consequences of Population Trends, 1973.

20. U. N. Demographic Year Book 1974, 1975, etc.

21. U. N. Manual I—Methods of Estimating Total population for Current dates 1955.

22. U. N. Manual II—Methods of Appraisal of Quality of Basic for population Estimates—1955.

23. U. N. Manual III—Methods of population Projection by Sex and Age 1956.

24. U. N. Methods of Estimating Total population for Current Dates—Population Studies No. 10—1953.

25. U. N. Accuracy Tests for Census Age Distribution Tabulated in Five Year and Ten Year Groups—Population Bulletin No. 2—1952.

26. U. N. Population of Sri Lanka, ESCAP countries Monograph Series No. 4, ESCAP, Bangkok, Thailand, 1976.

27. Visaria P. M.—Sex Ratio of Population of India Vol-I Monograph No. 10, Registrar General's Office, New Delhi-1971.

LIST OF TABLES

TABLE 1

Unadjusted percentage distribution of population (by age/sex) and sex ratio (females/males) of the population of Kerala for 1971 Census

Age group	Unadjusted population			Percentage of distribution			Sex ratio
	Male	Female	Total	Male	Female	Total	
0— 4	1441758	1413646	2855404	13·62	13·14	13·38	981
5— 9	1457604	1418369	2875973	13·77	13·18	13·47	973
10—14	1446053	1417832	2863885	13·66	13·18	13·42	980
15—19	1127098	1210207	2337305	10·65	11·25	10·95	1073
20—24	977869	1012032	1989901	9·24	9·41	9·32	1035
25—29	664365	723141	1387506	6·27	6·72	6·50	1089
30—34	587456	622125	1209581	5·55	5·78	5·67	1059
35—39	617632	660645	1278277	5·83	6·14	5·99	1070
40—44	497158	495924	993082	4·70	4·61	4·65	998
45—49	498587	464704	963291	4·71	4·32	4·51	932
50—54	351904	340445	692349	3·32	3·16	3·24	967
55—59	288041	284182	572223	2·72	2.64	2·68	987
60—64	234469	247426	481895	2·21	2·30	2·24	1055
65—69	165662	183850	349512	1·56	1·71	1·64	1109
70—74	108254	120822	229076	1·02	1·12	1·07	1116
75—79	66107	75882	141989	0·62	0·71	0·67	1148
80+	57834	68297	126131	0·55	0·63	0·59	1181
Total	10587851	10759524	21347375	100·00	100·00	100·00	1016

TABLE 2

Adjusted percentage distribution of population (by age and sex) and sex ratio (female/male) of the population of Kerala for 1971 Census

Age group	Adjusted population			Percentage distribution			Sex ratio
	Male	Female	Total	Male	Female	Total	
0— 4	1533489	1459910	2993399	14·48	13·57	14·02	952
5— 9	1455939	1411626	2867565	13·75	13·12	13·43	970
10—14	1386194	1355827	2742021	13·09	12·60	12·84	978
15—19	1188908	1208775	2397683	11·23	11·24	11·23	1017
20—24	958565	986313	1944878	9·05	9·17	9·11	1029
25—29	737837	767760	1505597	6·97	7·14	7·05	1041
30—34	623052	654992	1278044	5·88	6·09	5·99	1051
35—39	572545	608019	1180564	5·41	5·65	5·53	1062
40—44	502808	535143	1037951	4·75	4·97	4·86	1064
45—49	412812	440053	852865	3·91	4·09	4·00	1066
50—54	333476	356375	689851	3·15	3·31	3·24	1069
55—59	268457	288191	556648	2·53	2·68	2·61	1074
60—64	221218	239979	461197	2·09	2·23	2·16	1085
65—69	167283	183432	350715	1·58	1·70	1·64	1097
70—74	104534	120979	225513	0·99	1·12	1·06	1157
75—79	65168	75497	140665	0·62	0·70	0·66	1158
80+	55566	66653	122219	0·52	0·62	0·57	1200
Total	10587851	10759524	21347375	100·00	100·00	100·00	1016

TABLE 3

Projected population Kerala 1976–2001 (High assumption)

Age group	1971	1976			1981			1986		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	2	3	4	5	6	7	8	9	10	11
0— 4	2993399	1766640	1690912	3457552	1949820	1873844	3823664	2055232	1982948	4038180
5— 9	2867565	1504230	1430756	2934986	1738674	1665785	3404459	1924823	1854750	3779573
10—14	2742021	1445718	1400517	2846235	1494272	1422014	2916286	1728781	1658356	3387137
15—19	2397683	1374203	1344208	2718411	1434629	1391035	2825664	1484185	1414776	2898961
20—24	1944878	1173547	1194306	2367853	1358317	1331250	2689567	1419881	1380658	2800539
25—29	1505547	943659	971696	1915355	1157305	1179903	2337208	1341696	1318643	2660339
30—34	1278044	725279	754562	1479841	929429	957995	1887424	1141971	1166688	2308659
35—39	1180564	610473	641827	1252300	712267	741946	1454213	914725	945052	1859777
40—44	1037951	557659	593378	1151037	596212	628676	1224888	697395	729288	1426683
45—49	852865	484878	518987	1003865	539451	577665	1117116	578439	614279	1192718
50—54	689851	391783	422134	813917	461846	500028	961874	515596	558920	1074516
55—59	556648	308739	336022	644761	364252	400166	764418	431161	476497	907658
60—64	461197	239222	264052	503274	276513	310068	586581	327812	371830	699642
65—69	350715	185982	209593	395575	202391	232767	435158	235354	275833	511187
70—74	225513	128534	147899	276433	144013	170994	315007	157883	192119	350002
75+	262884	121127	150065	271192	138926	175910	314836	158823	208292	367115
Total	21347375	11961673	12070914	24032587	13498317	13560046	27058363	15113757	15148929	30262686
Sex ratio	1016	..	..	1009	..	..	1005	..	..	1002

TABLE 3—(*cont.*)

Population of Kerala 1976–2001 (High)

Age group	Population 1991			Population 1996			Population 2001		
	Male	Female	Total	Male	Female	Totai	Male	Female	Total
	12	13	14	15	16	17	18	19	20
1— 4	2126789	2057835	4184624	2166380	2098351	4264731	2216920	2149982	4366902
5— 9	2032974	1968730	4001704	2107052	2046661	4153713	2149005	2090063	4239068
10—14	1915103	1848574	3763677	2023785	1963552	3987337	2098497	2042568	4141065
15—19	1718270	1651988	3370258	1904455	1842899	3747354	2013524	1958918	3972442
20—24	1470382	1406669	2877051	1703630	1644405	3348035	1889600	1836412	3726012
25—29	1404220	1370413	2774633	1455561	1398243	2853804	1687957	1636824	3324781
30—34	1325685	1306907	2632592	1388942	1360423	2749365	1441151	1390203	2831354
35—39	1125652	1153901	2279553	1308332	1294910	2603242	1372344	1350261	2722605
40—44	897263	931491	1828754	1105750	1139639	2245389	1286993	1281443	2568436
45—49	678042	714666	1392708	873826	914901	1788727	1078714	1121963	2200677
50—54	554249	596354	1150603	650975	695756	1346731	840725	893300	1734025
55—59	482742	534870	1017612	520179	572763	1092942	612567	670792	1283359
60—64	389821	445253	835074	437403	502269	939672	472905	540699	1013604
65—69	280358	333241	613599	334661	401734	736395	377138	456488	833626
70—74	184699	229868	414567	221065	280229	501294	265339	341177	606516
75+	178611	242785	421396	207263	291458	498721	247208	358521	605729
Total	16764860	16793545	33558405	18409259	18448193	36857452	20050587	20119614	40170201
Sex ratio	..	..	1002	..	..	1002	..	..	1003

TABLE 4

Projected Population 1976–2001 (Medium Assumption)

Age group	1971	1976			1981			1986		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	2	3	4	5	6	7	8	9	10	11
1— 4	2993399	1650571	1579818	3230389	1693178	1627203	3320381	1714309	1654015	3368324
5— 9	2867565	1504230	1430756	2934986	1624442	1556342	3180784	1671471	1610621	3282092
10—14	2742021	1445718	1400517	2846235	1494272	1422014	2916286	1615199	1549401	3164600
15—19	2397683	1374203	1344208	2718411	1434629	1391035	2825664	1484185	1414776	2898961
20—24	1944878	1173547	1194306	2367853	1358317	1331250	2689567	1419881	1380658	2800539
25—29	1505547	943659	971696	1915355	1157305	1179903	2337208	1341691	1318643	2660334
30—34	1278044	725279	754562	1479841	929429	957995	1887424	1141971	1166688	2308659
35—39	1180564	610473	641827	1252300	712267	741946	1454213	914725	945052	1859777
40—44	1037951	557659	593378	1151037	596212	628676	1224888	697395	729288	1426683
45—49	852865	484878	518987	1003865	539451	577665	1117116	578439	614279	1192718
50—54	689851	391783	422134	813917	461846	500028	961874	515596	558920	1074516
55—59	556648	308739	336022	644761	364252	400166	764418	431161	476497	907658
60—64	461197	239222	264052	503274	276513	310068	586581	327812	371830	699642
65—69	350715	185982	209593	395575	202391	232767	435158	235354	275833	511187
70—74	225513	128533	147899	276432	144013	170994	315007	157883	192119	350002
75+	262884	121127	150065	271192	138926	175910	314836	158823	208292	367115
Total	21347375	11845603	11959820	23805423	13127443	13203962	26331405	14405895	14466912	28872807
Sex ratio	1016	..	..	1010	..	..	1006	..	..	1004

TABLE 4--(*cont.*)

Age group	Population 1991			Population 1996			Population 2001		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
	12	13	14	15	16	17	18	19	20
0— 4	1681065	1626562	3307627	1618089	1567278	3185367	1533978	1487662	3021640
5— 9	1695743	1642156	3337899	1665465	1617730	3283195	1605112	1561087	3166199
10—14	1663030	1605259	3268289	1655078	1637837	3325915	1658703	1614495	3273198
15—19	1605379	1543451	3148830	1653784	1600331	3254115	1679519	1633972	3313491
20—24	1470382	1406669	2877051	1591701	1536367	3128068	1640884	1594698	3235582
25—29	1404220	1370413	2774633	1455561	1398243	2853804	1577057	1529284	3106341
30—34	1325685	1306907	2632592	1388942	1360423	2749365	1441151	1390203	2831354
35—39	1125652	1153901	2279553	1308332	1294910	2603242	1372344	1350261	2722605
40—44	897263	931491	1828754	1105750	1139639	2245389	1286993	1281443	2568436
45—49	678042	714666	1392708	873826	914901	1788727	1078714	1121963	2200677
50—54	554249	596354	1150603	650975	695756	1346731	840725	893300	1734025
55—59	482742	534870	1017612	520179	572763	1092942	612567	670792	1283359
60—64	389821	445253	835074	437403	502269	939672	472905	540699	1013604
65—69	280358	333241	613599	334661	401734	736395	377138	456488	833626
70—74	184699	229868	414567	221065	280229	501294	265339	341177	606516
75+	178611	242785	421396	207263	291458	498721	247208	358521	605729
Total	15616941	15683846	31300787	16721074	16811868	33532942	17690337	17826045	35516382

TABLE 5

Projected Population 1976-2001—Kerala (Low Assumption)

Age group	Population 1971 Total	Population 1976			Population 1981			Population 1986		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1	2	3	4	5	6	7	8	9	10	11
0— 4	2993399	1650572	1579818	3230390	16686692	1603672	3272364	1641681	1583943	3225624
5— 9	2867565	1504230	1430756	2934986	1624442	1556342	3180784	1647299	1587331	3234630
10—14	2742021	1445718	1400517	2846235	1494272	1422014	2916286	1615199	1549401	3164600
15—19	2397683	1374203	1344208	2718411	1434629	1391035	2825664	1484185	1414776	2898961
20—24	1944878	1173547	1194306	2367853	1358317	1331250	2689567	1419881	1380658	2800539
25—29	1505547	943659	971696	1915355	1157305	1179903	2337208	1341691	1318643	2660334
30—34	1278044	725279	754562	1479841	929429	957995	1887424	1141971	1166688	2308659
35—39	1180564	610473	641827	1252300	712267	741946	1454213	914725	945052	1859777
40—44	1037951	557659	593378	1151037	596212	628676	1224888	697395	729288	1426683
45—49	852865	484878	518987	1003865	539451	577665	1117116	578439	614279	1192718
50—54	689851	391783	422134	813917	461846	500028	961874	515596	558920	1074516
55—59	556648	308739	336022	644761	364252	400166	764418	431161	476497	907658
60—64	461197	239222	264052	503274	276513	310068	586581	327812	371830	699642
65—69	350715	185982	209593	395575	202391	232767	435158	235354	275833	511187
70—74	225513	128533	147899	276432	144013	170994	315007	157883	192119	350002
75+	262884	121127	150065	271192	138926	175910	314836	158823	208292	367115
Total	21347375	11845604	11959820	23805424	13102957	13180431	26283388	14309095	14373550	28682645
Sex ratio	1016			1010			1006			1005

TABLE 5—(*cont.*)

Age group	Population 1991			Population 1996			Population 2001		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
	12	13	14	15	16	17	18	19	20
0— 4	1551325	1501031	3052356	1444609	1399245	2843854	1435953	1392596	2828549
5— 9	1623902	1572586	3196488	1536930	1492880	3029810	1433023	1393718	2826741
10—14	1638980	1582045	3221025	1616562	1568450	3185012	1530690	1489894	3020584
15—19	1605379	1543451	3148830	1629867	1577188	3207055	1608366	1564748	3173114
20—24	1470382	1406669	2877051	1591701	1536367	3128068	1617154	1571636	3188790
25—29	1404220	1370413	2774633	1455561	1398243	2853807	1577057	1529284	3106341
30—34	1325685	1306907	2632592	1388912	1360423	2749365	1441151	1390203	2831354
35—39	1125652	1153901	2279553	1308332	1294910	2603242	1372344	1350261	2722605
40—44	897263	931491	1828754	1105750	1139639	2245389	1286993	1281443	2568436
45—49	678042	714666	1392708	873826	914901	1788727	1078714	1121963	2200677
50—54	554249	596354	1150603	650975	695756	1346731	840725	893300	1734025
55—59	482742	534870	1017612	520179	572763	1092942	612567	670792	1283359
60—64	389821	445253	835074	437403	502269	939672	472905	540699	1013604
65—69	280358	333241	613599	334661	401734	736395	377138	456488	833626
70—74	184699	229868	414567	221065	280229	501294	265339	341177	606516
75+	178611	242785	421396	207263	291458	498721	247208	358521	605729
Total	15391310	15465531	30856841	16323626	16426455	32750081	17197327	17346723	34544050
Sex ratio			1005			1006			1009

PAPER TWO

TREND AND SEASONAL FLUCTUATIONS IN THE OCCURRENCE OF VITAL EVENTS IN KERALA

A. SYAMALA DEVI,
Research Officer, Directorate of Economics and Statistics, Trivandrum.

Introduction.—The birth and death rates in the State of Kerala have been declining since 1930. The birth rate which was estimated as nearly 40 between 1931 and 1940 has come down to 25 per 1000 by 1978. The death rate also declined from 25 to 7 during the same period. As the result of these declines the growth rate of population was raised, but possibly during 1971-80 the growth rate might decline. Here other factors like out-migration and emigration will have some contributions. In this context, it would be interesting to look at the trend in the occurrence of births and deaths in the State. It is also worth-while studying the seasonal fluctuations in the occurrence of these events as far as data permit; considering the monthly occurrence as a time series, this can be attempted. As there are two sources of data relating to vital events, it would be desirable to compare these and establish the rate of under-registration or under-reporting. For this type of examination, one has to label one of the sources as reliable and base the judgment as compared to that source. This paper intends to pursue these points with the available data.

2. *Previous studies.*—This topic was discussed earlier by the Demographic Research Centre, Trivandrum in 1959 in a paper published in 1963(1). The number of births and deaths available from the civil registration system for 7 years from the year 1951 was examined and it was found that the births had the maximum seasonal index of 109.38 during the month of June and the deaths had high seasonal indices in the months of July and August (129 and 116 respectively). Fitting a straight line for the date, it was found that the intercept is 22.293 and gradient—.193 for births and 6.689 intercept and—.276 gradient for deaths.

3. *Data and methods.*—In the present paper time series extends to a larger number of years. Also there are two sources; (1) the civil registration system and (2) the sample registration system. It

(1) The Demographic Research Centre, Department of Statistics, Trivandrum Trend in Registered Birth and Deaths. Paper No. 2 of Studies in Demography.

may be remarked here that though the civil registration system suffers from under-registration, the incidence of under-registration was high in the sixties and was declining in the seventies. Of course, there had been a change in the registration personnel. In the sixties, the village officers of Malabar and the Health Assistants of Travancore Cochin were the agencies responsible for registration in the rural areas and the Municipal/Corporation Commissioners in the urban areas. With the implementation of Births and Deaths Act of 1969, in 1970 in the State the responsibility for registration was vested with the Executive officers of the Panchayats in the rural areas. With this arrangement there have been some improvement in the registration of events, but even then the registration is far from complete. However, monthly data(2) for 14 years from 1962 have been utilised here.

The second source of information is the sample registration scheme introduced in the rural areas from 1965 onwards and in the urban areas from 1970 onwards. The rural scheme is with the Bureau of Economics and Statistics; in the reports issued during the seventies monthly data are published. There are 150 samples selected under this scheme. The month-wise events for 8 years from the year 1971 onwards have been utilised, for the study(3). It may be noted here that with each sample a probability is attached and hence to add up the events in all the samples in a month is not scientifically correct without giving proper weight to the events in each sample. Though this is a serious limitation, month-wise figures as published are employed here without any adjustment or evaluation. The extent of difference occurring will be the subject of another study which will be taken up later. Also the events in urban areas of Kerala could not be obtained as the monthly series are not published. However, it is hoped that the patterns will be similar and the rates in the rural and urban areas do not show much variation as the rural-urban differentials in the State are not significant.

Regarding the methods adopted, the time-honoured method of curve-fitting for establishing the straight line trend and the method of analysis of time series is adopted for the calculation of seasonal indices, with the moving average method having been employed to average out, in general, the trend and cycle.

---

(2) The Population Division, Bureau of Economics and Statistics, Vital Statistics Bulletins Nos. 26 to 39, Trivandrum.

(3) Bureau of Economics and Statistics, Annual report of Sample Registration Nos. 9, 10, 12, 13, 14 and 16, Trivandrum-19.

If Y, is the time series moving with respect to time 'T' the trend y=a+bt is fitted by estimating 'a' and 'b' by the least squares method. Y can also be considered as equal to TSCI where T refers to trend, S the seasonal variation, C the cyclical variation and I the residual irregular fluctuations. By dividing Y by the moving averages and adjusting the month-wise averages to get 1200 for an year the seasonal indices are obtained. For this 12 monthly moving averages are worked out and entered at the 7th month 8th month, etc. consecutively.

The efficiency of registration by the Panchayat Staff has also been worked out by applying the average under-registration observed in the former system.

4. *Trend in birth and death rates.*—Though it is obvious that the birth rate and death rate are declining it would be interesting to measure the variation statistically. To find out the trend the birth and death rates available from both the sources of Civil Registration and Sample Registration have been made use of. In the Civil Registration Scheme, birth and death rates were available for 14 years, while under the Sample Registration Scheme, figures available only for 8 years.

The following table presents the birth and death rates obtained from both the Schemes:—

TABLE 1

Birth and death rates from Civil Registration and Sample Registration (Rural Schemes)

Civil registration			*Sample registration*		
Year	*Birth*	*Death*	*Year*	*Birth*	*Death*
1962	22·73	6·35	1971	31·88	9·23
1963	22·38	5·99	1972	32·09	9·39
1964	23·32	5·85	1973	29·91	8·67
1965	22·32	5·25	1974	26·96	8·00
1966	22·52	5·38	1975	28·17	8·48
1967	20·69	4·86	1976	28·5	8·3
1968	20·89	4·66	1977	26·2	7·3
1969	18·64	4·29	1978	25·8	7·2
1970	14·70	3·36			
1971	18·56	4·26			
1972	21·41	4·69			
1973	20·94	4·75			
1974	20·79	5·00			
1975	22·98	5·70			

By fitting straight lines using least squares method it is found that the trend in births follows the straight line Y=21.10—·1803t in Civil Registration and Y=32.7082—·8932t in Sample Registration Scheme.

The best fitting lines for the trend in death rates are Y=5.75—.0959t under Civil Registration Scheme and Y=9.6762—.3011t under Sample Registration Scheme. The closeness of these lines has been tested with x^2 which is not significant at 5 per cent and 1 per cent levels.

X^2 Values

	Birth	*Death*	
Civil registration	4·1918	1·2762	(with 13 degree of freedom)
Sample registration	·2604	·0860	(with 7 degrees of freedom)

The trend found out from the rates under both the schemes reveals that the birth and death rates are declining over the years. The only difference is that the declination is steeper in sample registration data than that in civil registration data.

Seasonal indices.—The data available through Civil Registration Scheme for 14 years from the year 1962 were divided into 2 sets of 7 years each and processed separately using the moving average method for analysis of time series. The seasonal indices for birth and death obtained from these two sets of figures are given in the following tables, separately:—

TABLE II

Seasonal Indices of births and deaths as calculated from Civil Registration Data

Month/year	*1962 to 1968*		*1969 to 1975*	
	Birth	*Death*	*Birth*	*Death*
January	89	85	101	97
February	88	85	90	83
March	99	86	105	93
April	95	84	94	82
May	107	99	105	93
June	111	105	102	101
July	114	130	113	130
August	104	124	97	115
September	95	111	89	106
October	99	102	102	105
November	98	96	101	98
December	101	93	101	97

The table shows that the seasonal indices of birth are maximum during the months of May to July in both sets. Regarding deaths, the peak period for the occurrence of the event is July to September.

TABLE III

Seasonal indices of births and deaths as calculated from Sample Registration Data

Month/year	*1971–1978*	
	Birth	*Death*
January	103	107
February	99	89
March	106	88
April	104	90
May	106	93
June	99	105
July	102	121
August	98	119
September	93	106
October	98	94
November	93	89
December	99	99

The Sample Registration data show a slight variation. Regarding birth the seasonal indices are high during the months of March, April and May and for death the indices are high during the months of July and August.

6. *Under-registration.*—The birth and death rates under civil registration are much lower than those under sample registration and hence they suffer from under-registration. The Sample registration operates as a dual record system with the Enumerator first finding out the events and the Supervisor getting the events independently through half-yearly surveys. The details of events netted by the Enumerators and Supervisors are matched, unmatched events are verified in the field by a superior officer and intensive surveys are conducted to ensure that no events are missed. It can therefore be assumed that these rates are reliable. The figures show the under-registration in the Civil Registration Scheme, as compared to the Sample Registration Scheme.

TABLE IV

Under Registration

Year	Civil Registration		Sample Registration(4)		Under registration in Civil registration	
	Birth rate	Death rate	Birth rate (combined)	Death rate (combined)	Birth percentage	Death percentage
1	2	3	4	5	6	7
1971	18·56	4·26	31·1	8·9	40·32	52·13
1972	21·41	4·69	31·2	9·2	31·38	49·02
1973	20·94	4·75	29·2	8·5	28·29	44·12
1974	20·79	5·00	26·0	7·6	20·04	34·21
1975	22·98	5·70	28·0	8·4	17·93	32·14

The percentage of under-registration comes down as years pass on. The under-registration in births which was 40 per cent during 1971 has been reduced to 18 per cent during 1975. Extrapolating the linear trend during 1971-75 fitted by the method of least squares ($Y=18.470+.822t$ for births and $Y=3.923+.319t$ for deaths) show that towards 1978, the birth rate will be 25.046 where as that according to sample registration scheme is 25.2. By that time the death rate in Civil Registration Scheme will be 6.475 while that under Sample Registration Scheme is 7. According to these calculations the under-registration might have vanished by 1978. The Civil Registration rates for 1978 are yet to be made available. It is however presumed that there will still be some under-registration during 1978, 1979, etc.

7. *Discussion and Implication.*—It is obvious from the values of the seasonal indices that the seasons have some influence over the occurrence of births. Providing some margin for the period of reporting of the event under civil registration scheme it will be more accurate to consider the period of occurrence earlier by one month. As such, both schemes indicate the same period as the peak period of occurrence of births i.e. April to June. Taking 9

(4)Family Welfare Programme in India: Year Books 1975–76 and 1977–78

to 10 months for a pregnancy to terminate in birth, it can be seen that if pregnancies occur in August—September the delivery may take place in April—June.

The harvest season for paddy will be over by August—September: this is the period of prosperity and rejoicing for Keralities. The Onam festival is celebrated during this time in the State. People who are away from their families return to their beloved ones for the Onam festival as far as possible. The month of Chingom, the first month of the Malayalam era is considered to be one of the auspicious months for conducting marriages by the Hindus. A good number of couples enter into the wedded life duriny this month. This month is the equivalent of August-September. The high level of birth rate during the months of April to May may be the consequences of these happy occasions.

In respect of deaths, the indices reveal some seasonal effect. More people fade out of their lives during July-August. It may be due to the fact that comparatively worse climatic conditions exist in July and early August which causes illness to the people and deprives them of their lives. July is also extremely cold and rainy and people will not find any employment during this period. July-August corresponds to the last month of the Malayalam era, namely Karkatakom.

It may be noted that the conclusion made earlier are confirmed by this study. This means that interesting by the attitude and customs of the people of Kerala remains unaltered even after the lapse of nearly two decades.

This sutdy has implications on the health and family planning programmes. The knowledge about the peak period of conceiving by women, helps the health personnel to plan the family welfare programme in such a way, as to yield better results. Since Chingom, seems to be the peak period for conceiving, the family planning work during 'Karkatakom' should be more effective. So also, the frequency of death is more during Karkatakom. The health measures adopted during this month may afford timely protection from illness and reduce the number of deaths.

8. *Limitations.*—In this paper, the registration data have been used. It is well known that they suffer from under-registration of different magnitudes over the years. In spite of this, the results are consistent with those obtained from Sample Registration data. The latter might also suffer from under-reporting to a very small

extent. The sample registration data may suffer from two handicaps: one is that the events at the end of a month may be sometimes noted against the succeeding month, also the birth and deaths detected during half-yearly Survey and intensive surveys might not strictly be shown against the months of occurrence, the births and deaths that occur outside the sample may also not be brought to the correct month of occurrence. These happen, because in practice the half year is considered as the unit of time for the scheme, the second handicap arise because rural data are used which may not strictly be representative of the State, though rural-urban differential is negligible.

9. *Summary.*—The month-wise figures on births and deaths collected from Civil Registration Scheme for 14 years from 1962 and the sample registration scheme for 8 years from 1971 were analysed using the techniques of time series analysis. The seasonal indices obtained by this analysis show that the number of births is high during April to June and number of deaths is high during July-August. The former has been found to be the result of the rejoicing during August-September while the latter can be attributed to the cold and rainy months in the State. These correspond to the first and last months of the Malayalam era respectively. The results obtained in a study published in 1963 have been confirmed here.

The linear trends in the birth and a death rates, under both the schemes show declination. The curve fitted with the sample registration data is steeper than the other one. The rates show that there is under-registration in Civil Registration compared to sample registration scheme. There is improvement in Civil registration system as time passes; the under-registration in births is reduced from 40 per cent to 18 per cent during 1971-75. Government have made the Civil Registration System compulsory and insisted upon the birth and death certificates for many official purposes. People are becoming more and more aware of this system. It is hoped that in another 5 years the under-registration will become negligible.

In order to effectively reduce birth rate efforts should be made in the month of July-August to motivate people to accept family planning. Similarly more attention to health measures may have to be paid in the month of July-August to reduce death-rate.

PAPER THREE

TOWARDS POPULATION STABILISATION IN INDIA NEEDED STRATEGIES

MATHEW M. VARGHESE,

Research Officer, Directorate of Economics and Statistics, Trivandrum

Introduction.—Population is a problem in every country-either under population or over population. But, for the last three decades, under population became a rare phenomenon and population explosion took the stage.

As in most of the developing countries, the population problem in India is mainly its quantity, leave aside the quality aspect. It became a dynamic problem because of its ever increasing growth rate. The population of undivided India which was only about 130 millions in 1600 A.D., according to certain estimation, took more than two centuries to double. The slow growth rate of population during that period, as we all know, was due to the nearness of the death rate to the birth rate, consequent to internal struggles, external attacks, famine, epidemics, etc. The next doubling took only half the time. The growth rate took momentum since the second decade of the present century and assumed large population in the latter half. The population is estimated to be 648 millions as on the first March 1979 more than two and a half times the number in 1921. If the present tempo continues without hinderance, we can visualise another, doubling of the population a decade or so after the very beginning of the coming century.

The consequences of this population explosion are too well-known to enumerate here. Over populated countries of the world face major problems of prevailing poverty, ill health, illiteracy and lack of energy and skill of the people to work. Scarcity of capital is chronic as majority of the people are living close to subsistence level. Social overhead expenditures eat up the public income. Rapid industrialization is handicapped by both scarcity of capital and technical know-how.

In India 43.33 per cent of the population were living below the poverty line during the previous year. Population pressure makes it difficult for the Government of India even to provide basic amenities like health, housing, education and the like.

Hence, it became imperative that the nation must commit itself to stabilise the population within the shortest possible period. India is pursuing a policy of controlling the birth rate in the country. The "Family Planning Programme" was initiated as of the National policy to "stabilise the population", immediately after the country became independent.

An attempt is made in this paper to discuss the disperities between the expected goal of "population stabilisation programme" of the country and actual achievements, and suggest strategies for a renewed and vigorous effort for immediate accomplishment of the target.

Firstly, the disparities between the target laid down under the Family Planning Programme by the Government of India from time to time in each Five Year Plan and achievements made, are presented. Effort is made to provide the socio-economic and demographic situations of Kerala and the States' performance towards the population programmes. Accomplishments of certain third world countries towards reduction in birth rate of their population, in unfavourable conditions are also given as a prelude to the understanding of the future strategies to be adopted in India.

Socio-Economic and Demographic situation in India.—India is still among the countries with low level of socio-economic development, having only 29.5 per cent literates in 1971. Literacy among females was only 18.7 per cent. Only 19.9 per cent population was living in urban areas; labour participation rate was 32.9. Mean ages at marriage were 22.4 years and 17.2 years for males and females respectively in 1976 and per capita income Rs. 1049 at current prices.

Birth rates, death rates and natural growth rates from 1911-21 decade to 1978 exhibited in the table below reveals that it is not the increase in the birth rate but the fall in the death rate that causes the accelerated increase in population, and shows the speed at which growth rate is moving up.

Birth, Death and natural Growth rates–India 1911–78

Year	*Birth rate*	*Death rate*	*Natural growth rates*
1911–20	48·1	47·2	0·9
1921–30	46·4	36·3	10·1
1931–40	45·2	31·2	14·0

Year	*Birth rate*	*Death rate*	*Natural growth rates*
1941–50	39·9	27·4	12·5
1951–60	40·9	22·0	18·9
1961–70	41·2	19·0	22·2
1971	36·9	14·9	22·0
1972	36·6	16·9	19·7
1973	34·6	15·5	19·1
1974	34·5	14·6	19·9
1975	35·2	15·9	19·3
1976	34·4	15·0	19·4
1977	32·9	14·7	18·2

Source:—Family Welfare Programme in India Year Book 1978. Government of India, Department of Family Welfare, New Delhi.

But no one is in favour of increasing or even stabilising the death rate to diminish population increase. On the contrary every effort is being bestowed to increase the health of the people and provide a longer life.

Population control programme in India.—The only alternative India is pursuing is the reduction in birth rate. That is the Family Planning Programme of India, initiated in 1952, immediately after the country became a 'Demographic Republic'. And we are proud of India being the first country to take up birth control programme as a national policy. In its early period, clinical method was followed under the population programme "to achieve a reduction in birth rate to the extent necessary to stabilise the population at a level consistent with requirements of National population policy"* in the first Five Year Plan period itself.

It was also expected to study the suitability of different Family Planning methods and the effect of socio-economic variables on fertility behaviour. But, so far we are nowhere near the goal in the first plan viz. population stabilisation.

During the second plan period, the same programme continued with small changes. In the Third Plan a definite goal was fixed for the first time, to reduce the birth rate in the country to 25 per 1000 population by 1973. To reach this goal extension method was introduced. I.U.D. programme was initiated with great momentum during this period. Still the achievement was far short of the target, so the goal was revised in the 4th Plan to

* Government of India, Planning Commission "Review of 1st Five Year Plan 1970 p. 280.

achieve a crude birth rate of 32 by the end of that Plan in 1974, and a birth rate of 25 by early 80s only. Sterilisation methods gained importance during the period and surgical facilities were provided in all 7000 and odd Family Planning Welfare Centres. In the 5th Plan the goal was once again revised backward to reach a birth rate of 30 by, 1981 and 25 by 1986. In order to achieve this goal in the 5th Plan certain State Governments had even adopted strong arm measures, the abuse of which ultimately put even the programme enter into doldrums.

At present, the all India target is once again revised. The aim, at present, is to reduce the crude birth rate from an estimated 35 in 1978 to 30 in 1983. But there are still doubts about the possibility of achieving even this modest goal. To reach this goal, according to Dorothy, Nortmen, "in India, where wives in couples participating contraception, are five or six years older than the average married women, a crude birth rate of 30 requires that about 37 per cent of the couples be protected from pregnancy"* This assumes that during 1983, the population of India will b/ "middle heavy" and potential for motherhood remains the same over years. Further, consequent to the expected decline in death rates, especially of infant mortality, the growth rate will continue its ascending pace.

Though it is sometimes worthwhile to put ambitious target and bestow all efforts to achieve it, the failure the programme has attracted world-wide attention.

Generally, explanation given for the poor performance, is the lack of socio-economic development of the country. Advice based on this philosophy pushed the Government to experiment with strong arm methods.

But, the question that remains is how much of socio-economic development will be helpful in the reduction of fertility. It is stated that people when they become socially advanced and when their standard of living moved up, their aspirations change to climb up the social status and create an attitude favourable towards small family norm which in turn causes decline in birth rate and growth of population. The transition theory of population rests on the same idea. This has happened in developed countries of the Western world. But, it does not prove that socio-economic development is an essential necessity for decline in birth rate.

---

* Nortonan, Derothy, L. "India's New Birth Rate targets and Analysis", Population and Development Review Vol. 4-2, 1978 p. 282.

There are, however some parts of India which witnessed declines in birth rate in the current era. The example of the State of Kerala is often cited in this context. Let us examine the characteristics of the population of Kerala and how far Kerala State could reduce its birth rate and death rate as compared to India as a whole.

Achievements in several other developing Asian countries towards a considerable decline in birth rate without high socio-economic level point to the fact that the family sizes in societies are determined also by personal and physiological factors.

The case study of Kerala

(a) The characteristics of the population.---The State of Kerala is having the highest literacy rates of 66.6 per cent for males and 54.3 per cent for females as per 1971 census. The respective rates were 39.45 and 18.72 for India as a whole. Literacy level in Kerala when compared to that of India was in the higher side since the beginning of this century as shown in Table 1 of Appendix.

The availability of health and medical amenities as provided by the Government of Kerala are of a high order. The bed population ratio (bed per lakh population) was 116 in Kerala in Government institutions itself, during 1978. Private medical institutions are also catering well in the State.

At the same time urbanisation is a very slow process in Kerala. Only 16.24 per cent of the people are living in urban areas according to 1971 census, whereas the percentage urban was 19.91 in India as a whole.

Labour participation rate was less in Kerala when compared to that of India for the last several decades. The rates in Kerala for 1951, 1961 and 1971 were 32.28, 33.31 and 29.12 per cents respectively in place of 39.10, 48.98 and 32.92 per cents for the whole country.

The standard of living of a population and economic well-being are assessed by the per capita income received by them. With this yardstick Kerala is an economically backward State as the per capita State income is low when compared to per capita National Income. During 1975-76 period the per capita State and national incomes, at current prices were Rs. 861 and Rs. 1008 respectively. See Table 2 also).

Percentage of population below poverty line was 62.25 during the previous year in Kerala while it was only 43.33 in India as a whole as shown with certain other States in Table 3. One of the major contributory factors for high incident of poverty is the unemployment problem of the State. Kerala with less than 4 per cent of India's population has to share 10.11 per cent of all India total unemployment.

(b) Birth rate in Kerala.—Inspite of all these unfavourable factors, the birth rate of Kerala is fast declining. The rate which was 38.9 in 1951-60 period according to census estimation came down to 31.9 in 1970 28.0 in 1975 and 27.8 in 1976. The corresponding all India figures are 41.7 (1951-60) 36.9 (1970) 35.2 (1975) and 34.4 (1976). These are shown in Table 4.

Reasons for this falling trend in birth rate are mainly attributed to increase in age at marriage, and enhanced acceptance rate of Family Welfare Programme.

Mean age at marriage.—Marriage age is one of the main factors affecting fertility as having direct bearing to reproductive span. Kerala has the highest age at marriage in the country, especially of women folk. In 1971 the mean age at marriage for males in Kerala was 26.3 years and for females 20.9 years while it was 22.2 and 17.2 years respectively in India as a whole.

Decline in Mortality.—Decline in mortality rate, especially in I.M.R. was also spectacular in Kerala in the second half of the present century. The death rate which was 16.9 in 1951-60 decade declined to 9.3 in 1971 and 8.1 in 1976. The corresponding rates in India were 22.8 (1951-60), 14.9 (1971) and 15.0 (1976). Figures for intervening years may be referred in Table 6.

Fall in infant, mortality was a field where Kerala has a commendable achievement. Infant Mortality Rate estimated as 120 per thousand live births in 1951-60 period, reached 60.9 in 1971 still declined to reach 53.3 in 1976 according to S.R. Annual reports of Kerala. The I.M.R. in India during 1976 was 114.6. In Kerala the expectation of life at birth as reached 61.2 for males and 64.42 for females by 1976.

Family Welfare Programme.—One of the most important factor affecting fertility is the practice of birth control methods. It is heartening to note that people of Kerala has appreciated and

encouraged the National Programme in this regard through motivation. Number of births averted by various methods from 1957-1958 period is given in Table No. 7.

Termination of pregnancies.—Yet another method to support the Famiiy Welfare Programme to avoid additional birth is abortion. Since the implementation of M.T.P. Act, Kerala shows good progress in giving medical services for termination of pregnancies as given in the table below:—

Abortion made under M.T.P. (Kerala 1973–76)

Year	*1972–73*	*1973–74*	*1974–75*	*1975–76*
No. of abortions ..	1084	4244	9564	19969

Source: Bureau of Economics and Statistics, Kerala

The two factors, age at female marriage, and family welfare programmes, are considered to be the major determinants of decline in birth rate in the State, 27 per cent attributed to the first factor and 73 to the other one(1). The contribution of social developments in the State to create favourable attitude towards age at marriage, maternal and child care, birth control programme, etc., are worth studying. But it is clear that Kerala having a death rate at its lowest level and a declining birth rate, is fast approaching the final stage of the demographic transition. The important point to be noted in this regard is that the State has reached this stage in the absence of any appreciable socio-economic development comparable to that in western countries at the time of their transition period.

Achievements in birth control programme in certain other countries.—Now it will, not be out of place to consider the achievements of certain developing Asian countries where fertility decline was caused without high socio-economic background like Sri Lanka, South Korea and Indonesia.

In Sri Lanka, the crude death rate was 18.8 in 1941, reached a higher level of 22.0 in 1945 reduced to 8.6 in 1960 (2). The crude birth rate was as high as 40.5 in 1951, declined to 36.6 in 1960 and to 27 by 1974. Thus, so far as demographic side is concerned "Sri Lanka provides an example of trends favourable to the solution of the type of demographic problems that we are about.

(1) Varghese, Mathew M. Population of Kerala, Projected for 1976-2001, Publishing.

(2) Administration report of Registrar General, Sri Lanka.

These trends were generated without any spectacular improvement at all in per capita incomes or the economy as a whole. Sri Lanka's average income is low even by third world standards and its nutritional deficiency is not above dispute. Employment is still largely precarious..... It has not taken a great deal of investment or infrastructure in socio-economic fields, certainly that is not beyond third world reach to bring down the Infant Mortality Rate almost to that of developed countries(1) (ie. below 20/1000).

Taiwan and South Korea also achieved decline in fertility during recent times. In Taiwan the vigorous and well-organised Family Planning Programme accelerated the already set declining trend under favourable conditions. "But even in Taiwan, there are fertility differentials that cannot be explained by socio-economic variables (2).

On the other hand, in Indonesia the report of World Fertility Survey suggests a considerable decline in fertility under conditions of low income and high mortality. The system of rural organizations, set out to support the programme is considered to be the major contributory factor for its success.

Future course of action in India.—The foregoing discussion on Kerala and some of the developing countries clearly shows that to engineer a demographic transition, socio-economic development of the country is not an essential pre-requisite. Moreover, transition through socio-economic development takes a long duration, by that time explosive population increase may have occurred. A vigorous effort based on innovated policies suited to the various localities is sufficient to reach the goal.

Such a policy recognising the regional diversity of the nation should be adopted in the country, integrating the process towards attaining the required socio-economic and demographic improvements. Reference to some of the fileds where immediate stress can be given are made here.

1. *Socio-economic developments.*—As coersion as a means of making people accept birth control is seen a difficult process to practice, the communication aspect of the programme has gained importance in order to motivate the people. In India there are

---

(1) Mitra—Asok—Integrated strategies for Economic and Demographic Development *Economic and Political Weekly* February 3, 10, 1979.

(2) World Fertility Survey—Summary Report.

vast differences in socio-economic status between different areas. The programme has to be set recognising the regional diversity. In areas which have already attained a minimum level of social development, strenuous efforts can be made to maintain the reduction in birth rate above death rate. In other regions an integrated strategy of socio-economic development and birth control programme should be adopted. Education will help to make change in values and attitudes, improving access to information on the programme, raising the age at marriage and reducing the dependence of aged parent on thier children for economic support.

2. *Motivation.*—A communication programme suitable for the persons of the locality should be identified in each area. As mass communication media like newspapers and radio and booklets are effective among educated people. The K.A.P. Surveys conducted in urban Kerala during 1958 and 1972 show that the majority of acceptors had heard of the programme through book, pamphlets and radios. At the same time, a change in attitude towards acceptance of the programme was mainly attributed to direct personal approach either by Family Welfare or volunteer workers or others. Direct approach to couples is seen beneficial in most cases. Communication through leaders whom people trust and respect, is found to be very efficient to change the attitude on a mass scale. Sometimes co-ordinated efforts of volunteers and Government agencies are seen creating a mass upsurge to accept the programme, as successfully experimented at Ernakulam in Kerala. Mass camps, seminars and group discussions are also helpful to create enthusiasm among the people. A sequential strategy should always be followed in communication action.

3. *Population education.*—Population education, if included in schools carriculum will help to get the population policies supported by the educated people and spread among the masses. Lessons on problems of population pressure and possibilities of controlling birth rate without hinderence to sexual enjoyments can be included in adult education programme presently set out. This will further help to climinate several notions and taboos prevalent among the rural population.

4. *Diversity of methods.*—It is good to give priority to terminal methods under conditions of low social development. But family planning workers have to pursue other methods also with equal vigour as I.U.D. and C.C. methods are very important for

spacing births. This in turn will help, to reduce the number of children born and to shift the future births. An Evaluation of Family Welfare Programme in Palghat District of Kerala revealed that several couples had evaded the practice of birth control programme as they want more children (1). They were seen not having any working knowledge of I.U.D. or other contraceptive methods to avoid birth without stopping it.

5. *Service and supplies.*—There is always a felt need for services to be made un-interruptedly available to the people at their door steps. Difficulty in getting materials regularly and confidentially, is a hinderance to use the method effectively. In this regard a best suited method for each and every couple should be identified according to their taste, convenience and facilities available, and regular supply should be ensured, without physical or psychological barrier.

6. *Incentives.*—Incentives are very much effective towards acceptance of birth control methods. Monetary incentives are seen specifically effective among the low-income groups. According to the population policy if India examined in 1976 a graduated incentive rate is proposed to acceptors of terminal methods

Group incentives are also envisaged. If a village or Panchayat or a ward achieve a target fixed for them cash awards will be given under the scheme to the village or panchayat as the case may be for social or health benefit of the area. The amiunt will be proportional to the number of acceptors. A proper evaluation of the effectiveness of such programme in the area where it had been put to practice was not seen made.

Distinctives against large families are sometimes advocated. But as these will be effected as a punishment to the parents or children for an action which cannot be rectified or reversed, they are not advocated here.

7. *Follow-up services.*—Follow-up services are of utmost importance but utterly neglected in India. Follow-up of acceptors will help to understand the problems of acceptors. The correct demographic particulars may also be collected after rectifying the defects in the hospital records which might have been filled up in a hurry. The essential motive of the visit is to get first hand information on the side effects, the practical difficulties and communication barriers of each method. K.A.P. and Evaluation

---

(1) Evaluation of Family Welfare Programme in Palghat District, Population, Research Centre, Bureau of Economics and Statistics, Trivandrum.

studies clearly show that majority of eligible couples do not practice Family Welfare Programme for fear of after effects. There were many instances of side effects which have not been properly attended to. Had a regular follow-up service was rendered, medical attendance or advice would have been given in time, which would have created a good name to the programme. Further follow-up service can be very well used to find out the point of influence in the society. Regular visit to conventional contraceptive users can help them to avoid discontinuance in practice. For those who accept terminal methods, regular attendance given to them by health staff will provide great satisfaction. Moreover, it will create a favourable attitude towards the programme in the locality.

8. *Evaluation.*—Every programme has to be evaluated and assessed for its effectiveness. In the Family Planning Programme, K.A.P. Surveys helped to assess the effectiveness of different communication methods, attitude of the people towards the programme and their reasons for non-acceptance or discontinuance of the practice.

In depth studies to understand the dynamics of non-acceptance and discontinuation will be helpful to develop strategies for renewed success of the programme. Efforts to pool field experiences and identify effective processes should also be tried.

9. *Research.*—The research programme in India has intensified much during the last decades. But factors influencing levels of fertility remain elusive. In addition to biological factors influencing fertility, there are behavioural variables like marriage patterns, practice of abstnance during amenorrhoea period secondary sterility and length of fertile periods, practice of breast feeding, etc. So also indirect influence of factors like socio-economic variables on fertility which vary from one place to another or under different conditions has to be identified and attempts made to anticipate fertility trends on the basis of trends in other socio-economic and environmental variables.

Conclusion.—The main problem related to the population of India are its size and accelerating growth rate. Attempts so far made in controlling the birth rate have not succeeded to the expected level. But in the State of Kerala there a better social environment for the acceptance of the small family norm, inspite of the poor economic conditions. The birth rate and death

rate within the State declined to levels similar to the final stage of demographic transition. Experience in certain developing countries like Sri Lanka are glaring examples of stabilising the growth rate. This helps us to conclude that India also can reach its declared goal of stabilising the population if a vigorous effect is put forth, utilising all possible means available.

ACKNOWLEDGEMENT

The author is indebted to Dr. R. S. Kurup, Additional Director, B.E.S., Trivandrum, who rendered valuable guidance for the preparation of this paper. Thanks are also due to Sri P. S. Gopinathan Nair, Deputy Director, for his valuable suggestions.

APPENDIX

TABLE 1

Literacy rates of Kerala and India 1901–1971

Census year	Kerala			India		
	Male	Female	Total	Male	Femal	Total
1	2	3	4	5	6	7
1901	22·0	4·0	12·85	9·83	0·69	5·35
1911	26·0	5·0	15·45	10·56	1·05	5·92
1921	32·0	12·0	21·95	12·21	1·81	7·16
1931	37·0	14·0	25·58	15·59	2·93	9·50
1951	50·0	31·5	47·37	24·95	7·93	16·67
1961	54·2	38·4	55·08	34·44	12·95	24·02
1971	66·5	53·9	60·42	39·51	18·44	29·46

Source (*1*) *Fact Book on Population and family welfare programme in Kerala* Population Research Centre, 1979.

(*2*) *Pocket Book on Population Statistics*, R. G, New Delhi 1972.

TABLE 2

Percapita Income of India and Kerala (1960-61 to 1975–76 at current prices) in Rupees

Area	1960–61	1965–66	1970–71	1971–72	1972–73	1973–74	1974–75	1975–76
1	2	3	4	5	6	7	8	9
India	306	426	637	657	702	856	989	1008
Kerala	259	380	586	572	646	785	861	861

Source: *Statistics for planntng*—Bureau of Economics and Statistics Kerala–1977.

TABLE 3

Percentage of Population Below Poverty line in certain States in India 1977–78

Sl. No.	*State*		*Poverty ratio (Percentage)*	*Rank from below*
1.	Kerala	..	62·25	12
2.	Orissa	..	67·50	15
3.	Andhra Pradesh	..	47·85	7
4.	Assam	..	32·95	3
5.	Bihar	..	64·06	14
6.	Gujarat	..	44·88	6
7.	Hariyana	..	32·24	2
8.	Karnataka	..	49·44	8
9.	Madhya Pradesh	..	57·50	10
10.	Maharastra	.	43·99	5
11.	Punjab	..	21·62	1
12.	Rajastan	..	43·50	4
13.	Tamil Nadu	..	60·71	11
14.	Uttar Pradesh	..	50·38	9
15.	West Bengal	..	62·28	13

Source: Report of the Finance Commission--1978.

TABLE 4

Birth rates in Kerala and India 1931–40 to 1975

Years	*Kerala*	*India*
1931–40	40·0	45·2
1941–50	39·8	39·9
1951–60	38·9	41·7
1966	37·4	..
1967	36·3	..
1968	33·2	39·0
1969	32·3	38·8
1970	31·9	36·9
1971	31·6	36·9
1972	31·2	36·6
1973	29·2	34·6
1974	27·0	34·5
1975	28·0	35·2
1976	27·8	34·4

Source: (1) *S. R. Annual Reports*.—Bureau of Economics a .d Statistics, Kerala.
(2) *S. R. Bulletins*.—R. G of India, New Delhi.

TABLE 5 (a)

Mean age at marriage, Kerala and India (1961 and 71)

Area	Year	Urban		Rural		Combined	
		Male	Female	Male	Female	Male	Female
1	2	3	4	5	6	7	8
Kerala	1961	27·12	20·89	25·59	19·91	25·84	20·06
	1971	27·20	21·58	26·11	20·74	26·31	20·88
India	1961	23·53	17·92	20·80	15·69	21·39	16·10
	1971	24·32	19·22	21·56	16·67	22·24	17·28

Source: *Family Welfare Programme in India year book 1976–77* Government of India Department of Family Welfare, New Delhi.

TABLE 5 (b)

Mean age at marriage of female in Kerala and India—decennial trend 1901–1970

Decade	*Kerala*	*India*
1901–10	17·1	13·2
1911–20	17·4	13·6
1921–30	17·8	12·6
1931–40	19·7	15·0
1941–50	19·4	15·4
1951–60	19·9	16·1
1961–70	20·9	17·2

Source: Goyal, R. P., "Shifts in Age at Marriage in India between 1961 and 1971, *Demography India* Vol. 4, No. 2, December 1975.

TABLE 6

No. of births averted by various family welfare programme in Kerala 1966–1977

Year	*Sterilization*	*I.U.D.*	*C.C. Methods*	*Total*
1966	81402	8108	44	89554
1971	97666	22774	2452	122892
1974	147192	17037	3299	167528
1975	151345	17223	3860	172428
1976	171454	16804	4006	192264
1977	219560	16337	3732	229629
Total (from 1966–77)	1368402	213207	27372	1608981

Source: Population Research Centre, Trivandrum, Kerala.

TABLE 7

Death Rates in Kerala and India 1901–1976

Decade/ Year	*Death Rate*	
	Kerala	*India*
1901–10	..	42·6
1911–20	38·7	47·2
1921–30	33·8	36·3
1931–40	29·1	31·2
1941–50	22·3	27·4
1951–60	16·9	22·8
1961–70	9·3	17·3
1971	9·3	14·9
1972	9·2	16·9
1973	8·5	15·5
1974	8·2	14·6
1975	7·6	15·9
1976	8·1	15·0

Sources: (1) *S. R. Annual Reports* Bureau of Economics and Statistics, Kerala.

(2) S. R. Bulletins, Registrar General of India, New Delhi.

PAPER FOUR

SOURCES OF FERTILITY AND MORTALITY ESTIMATES RELATING TO THE POPULATION OF KERALA STATE

By

Dr. R. S. KURUP,

Director, Directorate of Economics and Statistics, Trivandrum.

Introduction.—This note intends to present the sources of fertility and mortality rates in Kerala State such as the census, sample registration and national sample survey. Attempts to improve sample registration estimates by the conduct of intensive surveys and their results are pointed out. A discussion on the birth rate in 1971 built up from changes that would have been brought about by increase in age at marriage and impact of the family planning programme measured with reference to a previous period is also presented. It may be mentioned at the outset that this does not give any new results but only the results available are listed here.

Details of evaluation of census data by the application of statistical techniques form an important part of any examination of vital rates based on population census data. Some results of a partial evaluation of data on age and sex are included here. Also the results of the post-enumeration check conducted after 1961 and 1971 censuses are briefly indicated.

In the context of declining fertility and mortality levels of the population of Kerala, identification of a reliable source of demographic information assumes utmost importance. This is also necessary to evaluate the programme of family planning and assess the changes brought about by increasing age at marriage and the increase in the number of medical terminations of pregnancy.

2. *Source of information on fertility and mortality.*—A major source of demographic information for the State of Kerala is the decennial population census. The only difficulty here has been that the present State is formed by integrating a portion of Travancore State (without the 4 southern taluks and a major part of an eastern taluk) with Cochin State and Malabar District of erstwhile Madras State. Computation of rates for the present State, therefore involves the addition of relevant figures for the three parts. Life tables have been constructed for the State population and birth and death rates have been estimated.

National Sample Survey Organisation used to include population, births and deaths in some of the rounds of the survey which also provided estimates of vital rates. With the implementation of the sample registration scheme in the State in the middle of 1965, annual rates of births and deaths are available with a reasonable level of accuracy. Apart from the dual records system of the scheme, the State has been conducting intensive surveys to estimate events missed by both the agencies responsible for regular reporting and half yearly surveys. It has been found that these surveys used to detect more events than provided by Chandrasekhar —Deming formula.

The following table shows the details of births and deaths detected through intensive surveys (1).

---

(1) Kurup,i R. S.—*Intensive Enquiries in Kerala:* Sample Registration Bulletin of the Registrar General of India, New Delhi 1968.

TABLE 1

Details of births and deaths detected through intensive surveys

Serial number	No. of sample selected	Period of reference	No. of births detected	Births	No. of deaths detected	Deaths
1	3	1–7–1966 to 31–12–1966	6	4451	2	1359
2	23	1–1–1967 to 30–6–1967	85	4561	17	1271
3*	16	1–7–1966 to 31–12–1966	48	4644	6	1382
	16	1–1–1967 to 30–6–1967	61	4608	10	1264
	16	1–7–1967 to 31–12–1967	82	4329	18	1450

Later, the system of overlapping reference periods has been built into the scheme. Even then, whenever superior officers found time to conduct an intensive enquiry, it was done. The extra events obtained were added to the events already obtained for the concerned samples.

An evaluation of the sample registration system is an immediate necessity, now that the scheme has been in operation for a number of years. As regards Kerala, while on the one hand, the system has been established, there are difficulties due to too much familiarity with the households. It is therefore, time to change the samples. Also, as the sampling frame used for the present scheme was that of 1961 census, a new frame has to be prepared and fresh set of samples has to be selected.

There is also a system of conducting spotchecks in the Municipalities and Corporations every year and working out rates of under-registration and events occurring outside; using registration data on events to normal residents and adjusting these by the above two rates, vital rates for normal residents are worked out(1).

* This enquiry was conducted after 31st December 1967 with a reference period of 1½ years before 31st December 1967. Here these periods are shown separately.

(1) Registrar General's News letter pages 8 and 9 Vol. VI No. I January 1970 New Delhi.

3. *Evaluation of census data.*—There has been the system of conducting post-enumeration checks in India just after the census count. In March 1961 (1) a sample check was conducted. This revealed that there were 1007 persons for every 1000 persons counted in the census. In the check report it is mentioned that the 1951 census was found to show an under-enumeration of 11 persons per 1000. The under-enumeration was higher in urban areas in 1961. Kerala had lower rates of under-enumeration (but with higher standard errors).

The 1971 census (2) had an under-enumeration of 14 per 1000. Urban areas had higher values as compared to rural areas.

Females were omitted by about 16 per 1000 as compared to males 12 per 1000. In the south zone comprising the 4 States, Kerala, Tamil Nadu, Mysore and Andhra Pradesh the net omission was nearly double that in India. It is however not possible to separate out the omission in Kerala as the sample size was not large enough to have separate estimates.

Varghese, (3) in his "population of Kerala—projected upto 2000" has included an evaluation of the 1971 census data. He has found that there is under-enumeration at younger ages and over-enumeration at older ages, the graphical method and stable population method have been adopted; also for ages 0-4, comparison was made with the expected population based on the birth rate from sample registration. Regarding age reporting, preference has been high for digits 0, 5, 8 and 2 and lower for 1, 9, 7, 3, 4 and 6 in the order, as found by Myer's index: 0-4 grouping shows lowest index for males and females. The sex-ratio in the age groups does not follow any specific pattern but has irregular fluctuations. The sex-ratio at birth obtained from sample registration is 105 in 1965-67, reaches 110 in 1973 and then falls to 108 in the two succeeding years. In 1976 the sex-ratio at birth is 101. The actual growth rate for rural areas according to sample registration is 1.09 in 1976, though the natural growth rate is given as 2.02 (birth rate—death rate). The percentage of popu-

(1) Census of India 1961 Paper No. 1 of 1962—*Final Population Totals* Delhi 1962.

(2) Census of India 1971—Series I India Part IIA (i) *General Population Totals* Delhi 1975.

(3) Varghese, Mathew N. "Population of Kerala—projected upto 2000" (under publication) Bureau of Economics & Statistics, Trivandrum 1979.

lation in the age groups show a steady decline except in 0-4 and 5-9 age groups; the ratios of decline show irregular fluctuations. In the report, it has been remarked (1) that "the lower percentage of population in the age-group 0-4 is evidently the result of a slowing in the birth rate during the period under consideration. That such a decline in birth rate must have set in even earlier is evident, as the young age-group of 0-14 is much less than in 1971 (36.8 per cent in 1976 compared to 40.6 per cent in 1971". There are 1024 females per 1000 males as against 1020 in 1971. It is also noteworthy that the S.R.S. has estimated a population of 184.47 lakhs on 1st January 1971 as against the census population of 178.81 lakhs in 1st April 1971. One reason which is adduced here is that the 1961 rural areas were considered for S.R.S. while some of these might have been included as urban in 1971 census.

4. *Estimates of fertility.*—Namboodiri (2) examined the available data on the fertility level of the population of Kerala so as to arrive at a reasonable estimate. Civil registration of oirths suffer from gross under-reporting; the extent of under-reporting is estimated as 45 per cent in 1964 by the Bureau of Economics and Statistics, Trivandrum. The birth rate based on this works-out to 45 per 1000 in 1961 which has been considered as very high. Prior to 1941-61 a slight decline might have occurred. There were no differentials by socio-economic status and hence Namboodiri concluded that the birth rate might have been slightly above 38.9 say 40 +), estimated by the census Actuary for the period 1951-1960. According to estimates from the census, the birth rate was 40 in 1931-40 and 39.8 in 1941-50.

The scheme of sample registration started in the rural areas of Kerala in 1965 and in the urban areas in 1970 This scheme provides reliable estimates of birth and death rates. In 1966 the birth rate in rural areas was estimated as 37.38 as against the civil registration rate of 18.28. The rate declined to 30.9 in 1971. In 1976, the birth rate is estimated as 28.5 and in 1977, 26.1. As the urban rates used to be only one point less than the rural rates and as the percentage of urban population in Kerala according to 1971 census was only 16 per cent, the rural rates can be taken as representative of the State rates.

---

(1) Bureau of Economics & Statistics: Sample Registration Kerala Rural" Trivandrum 1978.

(2) Namboodiri, N. K. *The changing population of Kerala* Monograph No. 7. Census of India 1961. Published by the Registrar General of India, New Delhi, 1968.

The age-specific fertility rates of 1971 are shown below along with the rates in 1961 obtained by Namboodiri giving a birth rate of 38.9 and those for 1976.

TABLE II

Age-specific fertility rates

Age group	*Age specific fertility rates*		
	1961	*1971*	*1976*
15–19	99·5	49·1	42·7
20–24	253·6	213·9	193·4
25–29	265·9	226·6	202·3
30–34	195·9	175·8	137·1
35–39	129·4	118·4	80·7
40–44	78·8	43·6	25·3
45–49	20·7	7·0	6·1

Some idea about the missing of events can be formed from the following table which gives the results of intensive enquiries and the estimates of missed events by Chandra-Deming formula.

TABLE III

Intensive enquiry results for births compared to results from Chandra-Deming formula

Year	No. of births reported	No. of births detected through intensive enquiry	Overlapping survey	Percentage of events detected	No. of births missed as obtained through Chandra-Deming formula
1	2	3	4	5	6
				$5=\frac{3+4}{2}$	
1971	6766	..	258	3·8	116
1972	7082	..	67	0·9	89
1973	6628	.	120	1·8	98
1974	6009	206	126	5·5	90
1975	6361	..	401	6·3	82
1976	6724	..	138	2·1	62
1977	6213	49	128	2·8	28

It may be remarked here that the Chandra-Deming formula is not usually applied to S.R.S. data, that intensive surveys are conducted only rarely and that the overlapping of reference periods has been built into the half-yearly survey in S.R.S.

The N.S.S. (1) included population, births and deaths also in some of the rounds. The available figures are shown below along with S.R.S. rates.

TABLE IV

Birth rate from National Sample Survey compared to S.R.S. rates

Year	*Birth rate from N.S.S.*		*SRS rates for rural areas*
	Rural	*Urban*	
1958–59	36·9	30·1	..
1963–64	32·4	..	..
1965–66	30·9	33·0	36·0
1966–77	31·3	26·4	36·8 (average of 1966 and 1967 rates)

The N.S.S. rates are found to be much lower than S.R.S. rates.

A recent exercise by Pillai (2) has shown that there has been a reduction in birth rate to the tune of 5.5 points from 1961 to 1971 due to family planning and 2.8 due to increase in age at marriage. If the sample registration rate of 31.9 (rural) or 31.3 (total) for 1971 is taken as correct the birth rate would have been above 40 in 1971 and would not have remained as 38.9 as in 1961 if there were no changes due to family planning and age at marriage.

This opens up the following situations. (1) There were pro-natal tendencies because of increased health and nutritional status of women and of the population, in general. (2) As the number of spontaneous abortions and still births has declined the number of children born should have been higher. (3) The increase in

---

(1) Government of India: National Sample Survey Reports: Number 76, 175, 177, 266 and 210.

(2) Pillai, K. D. "The Components of fertility decline in Kerala—1961 to 1971" (under publication) Bureau of Economics and Statistics, Trivandrum, 1979.

age specific marital fertility rates in the younger age-groups in some years also show that there might have been an increase in the birth rate. (4) The effect of family planning might have been over-estimated. (5) The sample registration rates are over-estimates or the lower bound of the confidence interval statement has to be taken, considering the standard error of the estimate. It can also be argued that as the difference between the 1961 birth rate and the estimate based on the component method is very small and within 2 times the standard error, this can be ignored. On the other hand, the 1961 birth rate of 38.9 itself may be an under-estimate; here the analysis made by Namboodiri (1) revealing that the declining tendency started earlier say from 1921 onwards has to be borne in mind. If that be the case even if the components add to more than 38.9 in 1971, it can be argued that natural fertility would have shown a birth rate higher than 40 per 1000. But, it is also to be noted that the analysis by Pillai considers the age-specific fertility rates in 1961 giving a birth-rate of 38.9.

Mortality rates.—The death rate in Kerala was estimated from Census figures as 16.1 in 1951-60. The death rate stood at 29 in 1931-40 and 22 in 1941-50. The sample registration estimates from 1966 onwards show a decline from 10.5 to 8.3 in 1976. In 1971 the death rate was 9.2. Except for 1974, the rates for rural areas obtained from sample registration showed a decline. If the rate of 16.1 is centred at 1956, it can be seen that in 10 years the death rate declined by 5.6 points and thereafter by 2.2 points in the next 10 years. The expectation of life at birth increased from 46 for males and 50 for females in 1951-60 to 61 and 64 in 1976 in rural areas according to sample registration (2).

Infant mortality rate was taken as 120 in 1951-60. This declined to 56 in 1976 in the rural areas as per sample registration estimates. The N.S.S. estimates of infant mortality rate were 63.5 for males and 46.4 for females in rural areas in 1964-65.

According to National Sample Survey (3), the death rate was 9.7 in 1963-64, 7.6 in rural areas and 6.4 in urban areas in 1965-66

---

(1) Namboodiri, N. K. *The changing population of Kerala* Monograph No. 7. Census of India 1961. Published by the Registrar General of India, New Delhi, 1968.

(2) Bureau of Economics and Statistics: "Sample Registration Kerala, Rural"—Trivandrum 1978.

(3) Government of India: National Sample Survey Reports Nos. 76, 175, 177, 266 and 210.

and 7.0 and 6.2 in 1966-67. These rates are much lower than the SRS rates.

The following table shows the extent of detection of deaths missed in the sample registration scheme; the missing is detected through intensive surveys and overlapping surveys which have been included now as a part of the sample registration system.

TABLE V

Intensive survey and overlapping survey results on deaths compared to results of Chandra—Deming formula

Year	*Reported number of deaths*	*No. of deaths obtained through intensive enquiries and overlapping surveys*	*Percentage of missing*	*No. of deaths missed as obtained by Chandra Deming formula*
1971	1951	99	5·1	37
1972	2118	33	1·6	29
1973	1928	42	2·2	33
1974	1781	99	5·6	32
1975	1904	134	7·0	36
1976	1968	30	1·5	30
1977	1785	40	2·2	8

Note: It has been seen that out of the 40 deaths detected in 1977, 6 were from intensive enquiries. Though intensive surveys were conducted in 1974 also, the number of deaths obtained cannot be separated out from that obtained in overlapping surveys.

The extent of missing is considerable and hence the system of intensive enquiries or overlapping surveys has to be continued. The Chandrasekhar-Deming formula is not applied to the results.

Namboodiri (1) in his analysis remarked that the trend in mortality can be assessed only through the periodic censuses. The State Bureau of Economics and Statistics has prepared life tables from census data. These have been adjusted by Namboodiri by using U.N. model life tables to study the trend.

Conclusion.—In conclusion, it may be remarked that while the decennial censuses give the necessary information for wroking

---

1. Namboodiri N. K. The monograph No. 1 Census of India 1961 published by the Registrar General of India, New Delhi 1968.

out birth and death rates for the decennium, the sample registration scheme can be used to find out the rates during the intercensul years. An evaluation of the scheme has to be undertaken immediately.

PAPER FIVE

COMPONENTS OF FERTILITY DECLINE IN KERALA

(K. DIVAKARAN PILLAI)

Research Officer, Directorate of Economics and Statistics, Trivandrum.

Introduction.—The State of Kerala which lies in the South-western corner of India is having a very high density of population and a moderately high rate of population growth compared to other parts of India. The growth of population is mainly attributed to natural increase, the difference of birth rate and death rate. The birth rate has been around 40 per 1000 from 1930 to 1960 and has thereafter showed a steady decline—the 1951-60 birth rate has been estimated as 38.9 and the 1976 rate as 28 per 1000 population. In the meantime the death rate has decreased from 16.1 in 1951-60 to 8 per 1000 population in 1976. The reduction in the birth rate has often been quoted in the demographic field; there has been no appreciable economic improvement in the State and hence attempts at identifying the causes for the decline in birth rate have been made by interested demographers; the increase in age at marriage and the acceptance of family planning methods are some of these. This paper intends to examine the causes of the reduction in birth rate, by analysing the effects of increase in age at marriage and the increase in the number of acceptors of family planning. The dependent variable is naturally the birth rate but in the analysis, the total fertility rate, general fertility rate and the age-specific fertility rates, are also considered. The change from 1961 to 1971 has been broken up into its components by the method of standardisation which is an accepted statistical technique.

2. *Previous work.*—In "A note on birth and death-rates in Kerala" in October 1976, Kurup and Cecil (1) applied the methods of standardisation to the birth rate reduction in the Kerala (Rural) population. They found that, of the reduction of 15.3 per cent in

---

(1) Kurup R. S. and S. Cecil.—A note on birth and death rates in Kerala. Sample Registration report—Series No. 11 issued by the Demographic Research Centre (Mimeographed)—Bureau of Economics and Statistics Trivandrum—October 1976.

birth rate between 1961 and 1971-72, 14.8 per cent was due to family planning; the reduction upto 1973 was 21.1 per cent of which 17.9 per cent was due to family planning and 21.8 per cent of the 31.5 per cent reduction in 1974 was attributed to family planning. It seems that the effect of factors other than family planning acceptance goes on increasing from 3.3 per cent of the total reduction in birth rate in 1971-72 to 30.8 per cent in 1974. In spite of this, family planning continues to be the major contributing factor. The effect of age at marriage has not been analysed separately.

Earlier, in July 1976 Krishnan (1) in "The demographic transition in Kerala—Facts and Factors" found through a multiple regression analysis of interdistrict variations in birth rates that age at marriage and death rates are the most important factors. It may be noted here that district-wise rates taken for the analysis are not truly the estimates for the districts as the source (sample registration scheme) from which they derived the data does not provide District estimates. They also remarked that the increase in age at marriage cannot be solely attributed to female education.

In the World Fertility Survey Report of Sri Lanka 1975, (2) issued by the Department of Census and Statistics in 1978, the technique of Standardisation was adopted to work out the mean completed parity of subgroups, taking the overall age-at-marriage distribution of Sri Lanka as standard; the sub-groups have been compared on this basis.

Anderson etal (3) in "A component analysis of recent fertility decline in Singapore" decomposed the fertility rates by standardisation and found out the contribution of nuptiality birth or and marital fertility in Singapore.

The present paper will show the effects of age at marriage and acceptance of family planning in the decline in birth rate and fertility in the Kerala population.

(3) *Data.*—In the following pages, the available data on age-distribution, fertility and age at marriage are presented of these of information on age-distribution as such will not be used in the analysis as will be explained later.

---

(1) Krishnan T. N.—The demographic transition in Kerala—Facts and Factors Working paper of the centre for development studies, Trivandrum—July 1976 (mimeographed)

(2) Department of Census and Statistics, Srilanka—World Fertility Survey—Srilanka—1975 first report Colombo—March 1978

(3) Anderson, John E, Mark, C. M. Cheng and Wan Fook-Kee—A component analysis of fertility decline in Singapore.
Studies in Family Planning Vol. 8 No. 11. November 1977

(a) Age-distribution.—The distribution of population by broad age-groups as obtained from 1961 and 1971 census are given below:

TABLE I

Distribution of population by age

Age group (years)	*Percentage of population in the age-group*	
	1961	*1971*
0—4	15·14	13·38
5—9	14.62	13·47
10—14	13·27	13·42
15—19	8·38	10·95
20—24	8·38	9·32
25—29	7·59	6·50
30—34	6·29	5·67
35—39	5·94	5·99
40—44	4·41	4·65
45—49	4·19	4·51
50—54	3·29	3·24
55—59	2·62	2·68
60+	5·90	6·22
Total	100·00	100·00
Females in 15–49 years	24·47	24·30

There are slight declines in 0—14 years, 25—29 years and 30—39 years; there are also slight increase in other age-groups. These are not considered significant and hence it can be concluded that the age-distribution is mostly stable. As such there seems to be no need to find out the effect on birth rate due to age-distribution changes.

(b) Age at marriage.—Estimates of mean age at marriage obtained from census data reveal continuous rise from 1901 onwards with very minor breaks in some intervening periods, as shown in the following table.

TABLE II

Mean age at marriage

Period	*Mean age at marriage*	
	Males	*Females*
1911	23·33	17·13
1921	23·87	17·35

TABLE II—(*cont.*)

Period	*Mean age at marriage*	
	Males	*Females*
1931	23·31	17·00
1941	25·63	19·66
1951	25·69	19.35
1961	26·33	19·85
1971	26·91	21.32

(*Source.*—Fact book on population and Family Planning issued by the Demographic Research Centre, Trivandrum, 1978).

In 60 years there has been an increase of 4.2 years in the age at marriage of females. As the calculation of the mean depends upon the proportion single and married, the effect of decline in marriage rate is also brought in, here. An enquiry into the reasons for increase in age at marriage is very difficult and not relevant here. It is worth pointing out that the increase is slightly lower for the males over the years and that the difference between the male and female mean ages has decreased.

Marriage Pattern.—The Table III given below shows the marriage pattern of the population for the period 1901 to 1971.

TABLE III

Percentage distribution of polpuation according to civil conditions 1901—1971

Year	Single			Married			Widowed, Divorsed and separated		
	Male	Female	Total	Male	Female	Total	Male	Fe-male	Total
1	2	3	4	5	6	7	8	9	10
1901	56·58	44·82	50.69	39·56	39·46	39·51	3.86	15.72	9·80
1911	56.17	43·20	49·66	39·81	40·51	40·16	4·02	16·29	10·18
1921	57·88	45.29	51·55	38·31	38·97	38·64	3·81	15·74	9·81
1931	59·38	46·26	52·75	37.76	39·70	38·74	2·86	14·04	8·51
1941	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1951	60·24	48.15	54·11	37·14	39.33	38·25	2·62	12·52	7·64
1961	62·41	51·05	56·67	35·19	36·47	35·84	2·40	12.48	7·49
1971	63·42	53·32	58·33	35·05	36·04	35·55	1.53	10·64	6·12

Source.—Demographic Report of Kerala 1901 to 1971—Bureau of Economics and Statistics, Trivandrum.

The table reveals that the percentage of married males and females has declined, the decline has been 4.51 and 3.42 points respectively. Percentage of widowed, divorced and separated has been declined substantially in the case of females.

(c) Birth rate and fertility rate.—Estimates of birth rate and fertility rates were obtained previously from census data by computation of death rate by differencing and taking the sum of the death rate and the rate of increase. After the implementation of the sample registration scheme in the rural areas, the estimates of birth and death rates are obatined from the scheme. As the rural and urban rates are almost the same in Kerala, even if the rural rates alone are taken up for analysis, the results are applicable to the State as a whole.

The following table gives the estimates of birth rate.

TABLE III

Estimates of birth rate

Period	Source	Rate	Period	Source	Rate
1	2	3	1	2	3
1931–40	Census	40·0	1970	Sample Registration	32·26
1941–50	do.	39·8			
1951–60	do.	38·9	1971	do.	31·88
1966	Sample Registration	37.38	1972	do.	32.09
			1973	do.	29·91
1967	do.	36·30	1974	do.	26·96
1968	do.	34·33	1975	do.	28·11
1969	do.	33·30	1976	do.	28.45

The reduction from 1931 onwards can be seen as nearly 29 per cent till 1976. If, however, the decline from 1951-60 alone is considered it amounts to nearly 27 per cent till 1976 and 18 per cent till 1971. Nearly one point reduction has occurred every year from 1966 onwards. In view of the fact that there has been only one point reduction in 10 years before 1961, the birth rate for each year from 1951 to 1961 is usually quoted as 38.9 per 1000 population.

The age specific fertility rates are shown below.

TABLE IV

Age specific fertility rates

Age group (years)	*Age specific fertility rates*	
	1961	*1971*
(1)	(2)	(3)
15–19	99·5	48·4
20–24	253·6	210·8
25–29	265·8	223·3
30–34	195·9	173·2
35–39	129·4	116·7
40–44	78·8	43·0
Total fertility rate	5·12	4·07
General fertility rate	176·88	135·38

The age specific fertility rates for 1961 have been taken from the Census Monograph on Kerala by N. K. Namboodiri (1) and those for 1971 from the sample registration report issued by the Bureau of Economics and Statistics, Trivandrum. The age specific fertility rates show decline in all the age groups. The total fertility rate has also declined by about 20 per cent during the 10 years. The general fertility rate has declined by nearly 30 per cent considering the ages 15 to 44 years.

(d) Family Planning Programme.—The programme of family planning was implemented in the State in 1957. Initially there were 10 clinics in the State wherein advice on family planning methods and appliances were given. Later in the sixties when the All India Programme attained momentum and the extension and cafetaria approaches were adopted, the programme in the State also followed these lines. After 1965 the achievements of the programme showed improvement. The position at the end of the year 1978-79 (31st March 1979) is as follows:

Number of sterilisation done	..	1320950
Number of IUD's inserted	..	369838
Number of conventional contraceptive users (current year)	..	20840

(1) Namboodiri N. K.—Changing population of Kerala 1961 Census Monograph No. 7, published by the Registrar General of India, New Delhi-1968.

These methods together protected nearly 30 per cent of the couples in the State. Natural methods like safe period, withdrawal and obstinence are also followed by some couples which has been estimated as nearly one-eighth of the acceptors of programme methods. The number of births averted by all these methods has been estimated as nearly 18 lakhs following the methods established by Kurup (1). The effect of nearly 1 lakh abortions done under the Medical Termination of Pregnancy Act in the State has not been considered here.

The following table gives the number of births averted by programme and non-programme methods in the State till 1971. It may be seen that till the end of 1971, the number of births averted is 6.06 lakhs and the percentage of couples protected is 17.7 per cent. The birth rate obtained by considering the number of births averted is 32.4 as against 38.9 in 1961 and the general fertility rate is 150.78 as against 176.88 in 1961.

TABLE V

Births averted by various methods

	Births averted					
	Due to sterilisation	Due to IUD	Due to use of conventional contraceptives	Total	By other methods	Grand total
1	2	3	4	5	6	7
Upto 1966	81402	8108	44	89554	11194	100748
1967	38841	13682	537	53060	6633	59693
1968	53908	17791	1608	73307	9163	82470
1969	69328	21301	1664	92293	11537	103830
1970	82568	23024	2080	107672	13459	121131
1971	97666	22774	2452	122892	15362	138254
Total	423713	106680	8385	538778	67348	606126

Source.—On the effect of the Family Planning Programme on birth rate in Kerala.

(1) Kurup R. S.—A note on the calculation of births averted by the Family Planning Programme in Kerala (Mimeographed)
Issued by the Demographic Research Centre, Bureau of Economics and Statistics. Trivandrum—October 1973.

The age distribution of acceptors of sterilisation is as shown below. For conventional contraceptives, it is assumed that the number of acceptors is in proportion to the number of eligible couples in the age groups.

TABLE VI

Age distribution of acceptors of sterilisation

Age of wife (years)	*Percentage of sterilised couples*	*IUD insertions*
(1)	(2)	(3)
15–19	..	1·83
20–24	15·40	19·10
25–29	34·44	32·26
30–34	27·78	25·98
35–39	18·40	17·08
40–44	3·98	3·75
Total	100·00	100·00

Though there has been changes in the age distribution of acceptors to the effect that younger couples are larger in the later years, the same distribution is adopted for calculation of births averted. It may therefore be said that the number of births averted is actually on the lower side of the actual number. Steps are being taken into account for the changes in the age distribution of acceptors and to arrive at a better estimate of the births averted by the programme.

4. *Results of standardisation.*—The method of standardisation seeks to find out the results if the original distribution are adopted in place of the new, on the variables under study.

In the present case the following is the operational procedure adopted under the technique of standardisation.

1. *Component of fertility change due to nuptial change 1961-71.*—The proportion of married women particularly in the age group 15—24 has declined during this period. The Table 7 shows the change in proportion of married females in 1961-71.

TABLE VII

Proportion of married women 1961–71

Age group	*Proportion married*		*Change*
	1961	*1971*	
(1)	(2)	(3)	(4)
15–19	28·5	18·1	—10·4
20–24	72·3	64·2	—8·1
25–29	84·2	85·5	+1·3
30–34	84·2	86·9	+2·7
35–39	81·4	85·1	+3·7
40–44	73·6	78·8	+5·2

As a result of the decline of married females in the first two age-groups, there will be decline in birth rate since women belonging in these age-groups have higher fertility. It is also noted that the proportion of married women in the age-group 25—44 has increased. Increased facilities of maternal care and decline in the number of widow-hood may be the reasons for a slight increase in the number of married women in these age-groups.

The method applied for the calculation of the number of births as a result of a change in proportion of married women is given below:—

Population 71×ASMFR 61 (Prop. Married 61—Pro. Married 71).

TABLE VIII

Change in birth rate attributed to difference in proportion of married women aged 15–44—1961–71

Age group	*No. of females 1971*	*ASFMR 1961*	*Change in proportion married women 1961–1971*	*No. of births decrease due to change in married proportion*
(1)	(2)	(3)	(4)	(5)
15–19	1210207	349·12	—10·4	—43940
20–24	1012032	350·76	—8·1	—28753
25–29	723141	315·68	+1·	+2967

TABLE VIII—(*cont.*)

(1)	(2)	(3)	(4)	(5)
30–34	622125	232·66	+2·7	+3908
35–39	660645	158·97	+3·7	+3885
40–44	495924	107·07	+5·7	+2761
Total	4724074			—59172
Decrease in birth rate				2·77
,,	T.F.R.			0·4
,,	G.F.R.			12·52

The result of the analysis shows that there will be decline of 2.77 points in crude birth rate and 0.4 in Total Fertility Rate, and 12.52 in General Fertility Rate because of a change in the proportion of married.

Marital Fertility Rate.—The age specific marital fertility has shown declining trend between 1961-71. This change may be attributed mainly as a consequence of the family planning acceptance. The Table 9 given below shows the decrease in A.S.M.F.R.

TABLE IX

Age specific marital fertility rate 1961–71

Age group	*ASMFR*		*Difference*
	1961	*1971*	
(1)	(2)	(3)	(4)
15–19	349·12	267·40	—81·72
20-24	350·76	328·35	—22·42
25–29	315·68	261·17	—54·51
30–34	232·66	199·31	—33·35
35–39	158·97	137·13	—21·84
40–44	107·07	54·57	—52·50

In all the age groups the fertility rate has declined. The extent of change in fertility rates as a result of a decline in marital

fertility rate is calculated by applying the method of standardisation. The method of calculation of the number of births as a result of a decline in marital fertility rate is given below:—

Population 71 × Proportion married 71 × (ASMFR 61—ASMFR 71)

TABLE X

Components of change in crude birth rate and total fertility rates, general fertility rates attributed to difference in age specific marital fertility rate 1961-71

Age group	1971 Female population	Proportion married	ASMFR 1961	ASMFR 1971	Change in number of births
1	2	3	4	5	6
15–19	1210207	18·1	349·12	267·40	17900
20–24	1012032	64·2	350·76	328·35	14560
25–29	723141	85·5	315·68	261·17	33702
30–34	622125	86·9	232·66	199·31	18029
35–39	660645	85·1	158·97	137·13	12278
40–44	495924	78·8	107·07	54·57	20516
Total	4724074	..	..	..	116985
Decrease in birth rate			..		5·48
T.F.R.			..		0·80
G.F.R.			..		27·37

The table given above shows that crude birth rate has declined by 5.48 points consequent on the change on marital fertility rate between 1961 and 1971. The decline in T.F.R. and G.F.R. are 0.8 and 27.37 respectively.

Results of standardisation.—From the above analysis it is observed that the effect of change in marital fertility rate and a rise in age at marriage together contributed a total change of 8.25 points in crude birth rate and 1.20 in total fertility rate during the period. The crude birth rate of Kerala in 1961 is 38.9 and T.F.R. 5.12. In the absence of a change in marital fertility rate mainly because of the effect of family planning and a rise in age at marriage, the birth rate in Kerala in 1971 would have been at least 40.1 and have a T.F.R. 5.27.

The following Table 11 gives the figures:—

TABLE XI

Results of Standardisation

1	2	3	4	5	6	7	8	9	10	11
	1961	1971	Percentage decline	Due to Nuptial change and marital fertility	Decrease due to proportion change	Percentage	Decrease due to marital fertility	Percentage	Difference to actual rate	Percentage of difference
Crude birth rate ..	38·9	31·9	18·0	8·25	2·77	33·58	5·48	66·42	+1·25	17·86
Total fertility rate ..	5·12	4·07	20·5	1·20	0·4	33·33	0·8	66·67	+0·15	12·50
General fertility rate ..	176·88	135·38	23·47	39·89	12·52	31·39	27·37	68·61	—1·61	3·89

From the table given above shows the total decline of crude birth rate during the period is 8.25 points. If 38.9 would have remained as the birth rate in 1961 the rate shown as estimation for 1971 would have been less than 31.9 as the total decline was 8.25 points. There might have been an increase in birth rate brought out by better health and nutrition among the women. Estimation of these are not available though it is known that the general health conditions of the population has improved and the number of maternal deaths, still births and abortion have declined. This is a problem for further research. Another reason for the differences in the rates may be the non-inclusion of births to women aged 45 and above in the analysis. It may be pointed out here that the Sample Registration Rate of 31.9 for 1971 has a

standard error, whether this would make up for the difference has also to be considered. The decline in birth rate as a result of the effective implementation of various family planning programme alone shows 5.8 points in 1971. If we consider the effect of decline in birth rate due to the effect of the use of non-contraceptive like abstinance, rhythm, withdrawal, etc., the decline in birth rate will be 6.47 points in the place of 5.8. It may happen that the effect of family planning is over estimated. Reconciliation of the 1971 birth rate with the averted births and the 1961 rate is thus becoming more complex and require further analysis.

5. *Limitations and future research.*—The method of standardisation has been adopted to the available data upto 1971 only, as the later data require proper evaluation before utilising the same for analysis. Also the woman of the age group 45-49 years have not been considered here. The changes in age-distribution of acceptors and valid estimates of births averted by non-programme methods could not be obtained. The effect of abortion has not been considered separately. The estimates from sample surveys have varying levels of standard errors which have not been considered here. The operation of pronatal tendencies like increased health and nutritional status of women decline in still birth and the like has also to be studied.

In the analysis that will be undertaken in future these aspects will be considered. It is also necessary to find out the specific effects of associated variables like educational status and work participation and the effects of unemployment in postponing the age at marriage.

7. *Summary and conclusion.*—An attempt has been made here to arrive at the components of fertility change in Kerala using the method of standardisation. The 1961 and 1971 results are compared based on the data available from census and sample registration scheme. The effect of family planning programme in reducing the birth rate has been 66 per cent and that of increase in age at marriage 34 per cent. Calculation of age distribution effects has not been attempted as the 1961 and 1971 census distributions do not show much difference.

In view of the fact that increase in age at marriage is very slow, the reduction in fertility has to be achieved by increased performance of the family planning programme. The effect of

the abortions performed has to be worked out in detail; at present the effect is only marginal.

It may be remarked here that only the changes up to 1971 have been considered as the later data have to be evaluated thoroughly before utilising the same for analysis. The calculations have shown that the family planning programme has been largely responsible for the reduction in birth rate; there are however, significant changes due to the increase in age at marriage though compared to the effect of the family planning programme, the contribution is not much.

Future research will take care of the extension of the approach to later years. The effect of abortion in reducing fertility will also be found out.

Implications.—The implication of this analysis is that the family planning programme should be vigorously pursued in order to make a dent on the birth rates as age at marriage changes are slow and their effects are not appreciable.

COMPONENTS OF FERTILITY DECLINE IN KERALA, INDIA

Abstract

In this paper, the components of fertility decline in Kerala State have been delineated by the method of standardisation. After tracing the changes in the independent variables, viz., age distribution, age at marriage and performance of the family planning programme, the changes in the dependent variable birth rate/general fertility rate/total fertility rate have been indicated. Applying the 1961 fertility rates and the changes in the independent variable, the contributions due to family planning programme and age at marriage have been found out.

ACKNOWLEDGEMENTS

I am grateful to Dr. R. S. Kurup, Additional Director, Bureau of Economics and Statistics, Trivandrum for his valuable guidance in the preparation of this paper. The help from Mr. Mathew M. Varghese, Research Officer and T. Achamma,

Compiler of the Population Research Centre, Trivandrum in computing the data is thankfully acknowledged.

PAPER SIX

AN ANALYSIS OF THE CONTRIBUTION OF RURAL ELECTRIFICATION IN EXPLAINING THE VARIATIONS IN CHILD—WOMAN RATIOS IN KERALA

Dr. R. S. KURUP,

Director,

Directorate of Economics and Statistics,

Trivandrum.

Introduction.—The birth rate has been declining in Kerala for a number of years. The latest estimate shows that the birth rate in the rural areas is 25.6 and that in urban areas 24.1. It is presumed that there are variations among the districts of Kerala, though estimates of birth rate for the districts are not available; the sample registration scheme does not have enough samples in each district to provide district estimates. But from the population figures obtained from sample registration, child-woman ratios can be worked out. The attempt in this paper is to analyse the relationship between child-woman ratios and other variables which are correlated; for this analysis, 1961, 1971 and 1976 patterns are considered.

Independent variables.—The percentage of villages electrified has been taken as one of the independent variables. Electrification can be considered as a developmental variable which exerts its influence on fertility. The fact that villages are electrified does not mean that all the people get the benefit. The use of electricity in the rural areas is primarily for purposes of pumping in water for irrigation. Other independent variables considered are multiple cropping, wages of female labour, ratio of non-agricultural workers to agricultural workers among females and female literacy. Multiple

cropping may be implemented through providing sufficient water for cultivation for which electricity may be useful. Ratio of non-agricultural workers to agricultural workers can effect fertility. Similarly, wages of female labour may affect their fertility status. Other things remaining the same those getting higher wages may have lower fertility due to the income effect of fertility. But wages in the non-agricultural sector are usually higher than in the agricultural sector and in the rural areas the workers are mostly engaged in agricultural occupations. Hence the extent of change from agriculture to non-agriculture will have its impact on fertility perhaps through wages also. The role of female literacy in influencing fertility is evident.

Though the relations can be hypothesised, it may happen that only if the threshold levels are crossed, the impact can be seen in the right direction.

It may be pointed out here that the statistics on female labour in agricultural non-agricultural occupations, and female literacy are available only from census data and hence for the year 1976, these variables are not considered for analysis. In respect of wages, wages for female labour in the paddy field have been taken for 1976. The State had 9 Districts in 1971 but now there are 11 Districts. Hence data for 11 Districts have been considered for 1976 and 9 for 1961 and 1971.

3. *Trends in the variable.—(a) Child-women ratios.*—The ratio of children 0—4 years to women 15—49 years is taken as the child-woman ratio. These are computed from census data in 1961 and from sample registration data in 1971 and 1976 for rural areas. Un-adjusted age-data have been considered here. As there is no urban-rural differential in Kerala, it is assumed that the rural pattern in 1976 may represent the State and the respective districts.

The State averages of the child-woman ratios declined from 63.8 in 1961 to 54.7 in 1971 and to 48.6 in 1976 with co-efficients of variation 14.6 per cent, 6.4 per cent and 11.5 per cent respectively. Malabar districts (Palghat, Malappuram in 1976 only, Kozhikode and Cannanore) have higher values than Travancore-Cochin Districts except in 1961. Ernakulam District has the lowest ratio in 1976, followed by Alleppey, Trivandrum and Kottayam. Alleppey had low rates throughout.

(b) Electrification.—The State had 56 per cent of villages electrified in 1961, 84 per cent in 1971 and 75 per cent in 1976. Here also Malabar Districts lag behind. Except for Idukki, the newly formed District (90 per cent) and Trichur (99 per cent), all Districts in Travancore-Cochin have 100 per cent electrification of villages.

(c) Multiple cropping.—The ratio of area sown more than once to net area sown has been taken to measure, the extent of multiple cropping. The ratios are high in Trichur, Quilon (except for 1961) Trivandrum and Alleppey. The improvement in the State as a whole since 1971 is only marginal. Decrease in the ratio has been found in Palghat in 1971 and Cannanore and Kozhikode in 1976. How far the formation of Malappuram District affected this pattern is not clear. In Idukki District multiple cropping is adopted in a very small area.

(d) Ratio of non-agricultural to agricultural workers among females.—This shows a very erratic pattern if one compares 1961 and 1971 data. The State ratio, shows a decline. Decline was seen in 1971 in all the Districts except Quilon.

(e) Female literacy.—The State average shows an increase from 44.5 per cent in 1961 to 53.8 per cent in 1971. The Malabar districts showed lower percentages. Alleppey and Kottayam districts top the list. Palghat district shows the lowest percentage.

(f) Wages.—In the construction sector, there has been a doubling of wages except in Alleppey, Kottayam and Trichur districts. But the rate was reported as very high in Alleppey.

In 1976, the daily wages of female workers in paddy fields are much higher when compared to those in the construction sector in 1971. The variations is small. In Kozhikode, Ernakulam and Trivandrum districts high wages are given.

4. *Methodology.*—The methodology followed in the paper is that of multiple regression analysis. There is the problem of multi collinearity as the independent variables are correlated. Hence, step-wise regression has been used to find out the contribution of the major variable and then the additional contributions of the other variables have been found out. The latter will not be equal to the independent contributions of the other variables. With this limitation the results are presented in the following paragraphs.

5. *Results.*—The inter-correlations are shown in Table II appended. High correlation with child-woman ratios are shown by

multiple cropping and female literacy rate in 1961 and by percentage of villages electrified, female literacy and ratio of non-agricultural to agricultural labours among females in 1971. In 1976 the percentage of villages electrified showed high correlation.

The results are given in appendix Table III.

It is seen that in 1961, 84 per cent of the variation is explained Multiple cropping explains 24 per cent and female literacy 22 per cent additionally. Rank I is for multiple cropping though female wage rates explain 35 per cent additionally. Thus except for electrification which explains only about 3 per cent additionally all others have sufficiently high contribution. In 1971, 76 per cent of variation is explained. Here, electrification explains 73 per cent of variation and all others are insignificant. In 1976 also electrification (25 per cent) is having high rank, followed by multiple cropping (20 per cent).

The analysis shows clearly the influence of electrification in the later years.

6. *Limitations.*—A major limitation of the analysis is the assumption of linearity in the relationship and multicollinearity of the independent variables. Because of the small number of districts, the number of degrees of freedom for the error variance is small. There may be errors in the unadjusted data used for the analysis.

It is hoped that even with these limitations, the main objective of the analysis is realised.

APPENDIX

TABLE I

Child-women ratio (V) as dependent variable

(*a*) 1961 DR. R. S. KURUP

	V	*X1*	*X2*	*X3*	*X4*	*X5*
X1	–·53788	1·00000	·14220	–·07297	·37139	·43062
X2	·39767	·14220	1·00000	·88081	·76477	·28054
X3	.15353	–·07297	·88081	1·00000	·49181	–·13013

TABLE I—(*cont.*)

X4	·18674	·37139	·76477	·49181	1·00000	·47723
X5	·23245	·43062	·28054	–·13013	·47723	1·00000

X1 = Multiple cropping
X2 = % of rural female literacy
X3 = Average daily wage rate of female unskilled worker in construction sector
X4 = % of villages electrified
X5 = Ratio of Non-agri. to agri. among female workers.

(*b*) 1971

	V	*X1*	*X2*	*X3*	*X4*	*X5*
X1	–·85452	1·00000	·81401	·22201	·60012	·33557
X2	–·75593	·81401	1·00000	·61496	·41800	·21067
X3	–·20767	·22201	·61496	1·00000	·23018	–·02479
X4	–·52902	·60012	·41800	·23018	1·00000	·45129
X5	–·29744	·33557	·21067	–·02479	·45129	1·00000

X1 = Percentage of villages electrified
X2 = Percentage of rural female literacy
X3 = Average daily wage rate of femala unskilled worker in construction sector
X4 = Ratio of Non-agri. to agri. among female workers
X5 = Multiple cropping

(*c*) 1976

	Y	*X1*	*X2*	*X3*
X1	–·49697	1·00000	·57661	·09683
X2	–·00553	·67661	1·00000	–·14146
X3	–·27328	·09688	–·14146	1·00000

X1 = Percentage of villages electrified
X2 = Multiple cropping
X3 = Average daily wage rate of paddy field labour among women

TABLE II

Contribution of the variables (additional contributions for the variable except the first)

DR. R. S. KURUP

Variables	1961		1971		1976	
	Rank	Individual contribution (Percentage)	Rank	Individual contribution (Percentage)	Rank	Individual contribution (Percentage)
1	2	3	4	5	6	7
1. Multiple cropping ..	1	23·93	5	0·01	2	20·17
2. Rural female literacy ..	2	21·67	2	0·90	Data not available	
3. Wage rate of female unskilled wokers in construction sector (Female) ..	3	34·86	3	0·91	3	1·07
4. Percentage of villages electrified ..	4	2·80	1	73·20	1	24·70
5. Ratio of rural non-agricultural workers to agricultural workers (Female) ..	5	1·05	4	0·51	Data not available	
Total variation explained ..	..	84·31	..	75·53	..	45·94
Multiple correlation co-efficient ..	..	.91	..	.87	..	·68

TABLE III

F-values at each step, regression co-efficients and T-value in the final step-wise analysis child-woman ratio as dependent variable

(*a*) 1961

DR. R. S. KURUP

Independent variable	*Regression co-efficients*	*T-values*	*F-values*
X1	–16·783163	3·075	2·84971
X2	0·783734	2·104	2·51500
X3	12·396136	1·974	6·8667
X4	–0·059279	0·801	4·9722
X5	–1·120814	0·448	3·22305
Constant	59·252737	16·375	3·22305

TABLE III—(*cont.*)

Independent variable	*Regression co-efficients*	*T-values*	*F-values*
(*b*) 1971			
X1	–0·093737	0·596	18·94618
X2	–0·190453	0·559	8·58317
X3	1·382341	0·413	5·00272
X4	–0·584677	0·267	3·10274
X5	0·170597	0·028	3·10274
Constant	68·185329	7·595	1·86231
(*c*) 1976			
X1	–0·843508	2·226	2·95193
X2	0·150608	1·445	3·25575
X3	–1·219563	0.373	1·98315
Constant	129·574620	3·831	..

PAPER SEVEN

DEVELOPMENT OF THE NATURAL REGIONS OF KERALA SOME SOCIO-ECONOMIC AND DEMOGRAPHIC CONSIDERATIONS

By

P. S. GOPINATHAN NAIR,

Deputy Director,

Directorate of Economics and Statistics.

1. *Introduction.*—There are three well marked and distinct natural regions in Kerala namely, lowland, midland and highland. Differences in altitude, soil, topography, rain fall, temperature, cropping pattern, intensity of cultivation, livestock population and the pattern of population distribution have led to the separate identity of these regions from very early times. The rhythm and pattern of human activities, being influenced by all the above factors, could have led to differences in levels of social and economic development too. But so far the variations in the latter, among the three regions have not been the subject of any study. This may probably be due to the fact that these regions, cut across the entire length of State, and among all the administrative divisions like District, Taluk, etc., which alone are usually considered as units for collection of data for purposes of planning. But, in the context of shifting emphasis to local level planning, the unique features of each natural region within the administrative

units are important, as any attempt at regional development necessarily requires grouping together of spatial units, having the same geographical or natural characteristics.

2. *What this study is about.*—In this study, the broad features of the three natural regions are mentioned followed by a presentation of the differences in social and economic development among the regions, on the basis of certain indicators. The differences in demographic behaviour are presented next. The obvious inter-relationship is explained, though for want of data on social and economic indicators over a period of years, no statistical analysis to quantify the contribution of any variable in bringing out the demographic changes noticed, is attempted. The need for considering these natural regions, as homogeneous units for area planning is brought out. The Study could be elaborated later, by working out separately the same indicators, for the rural and urban areas of each of the natural regions within each district. This, it is hoped, will be helpful in identifying a number if homogeneous units (with more or less similar, natural features, demographic behaviour, and socio-economic conditions) within each administrative division, which could be used as units for planning.

3. *Source of data.*—The data on amenities contained in the village/town directory of the 1971 district census hand books have been used to obtain the natural regionwise data for working out the socio-economic indicators presented here. As for differences in demographic behaviour of the three natural regions, the results of the Sample Registration Scheme (SRS) in Kerala have been used. The sampling design of the SRS permits separate estimates for the natural regions. But these estimates are not of equal validity, due to different degrees of precision in the estimates, as revealed by the co-efficient of variation. Besides, SRS relates to rural areas only. But the difference between rural and urban is very little in Kerala and 84 per cent of the population are in rural area.

4. *The natural regions of Kerala—A general picture.*—In the 1961 Census the three natural regions were demarcated as far as possible on the basis of altitude—The highland consisting of areas lying 250 ft. and over, above the mean sea level, the midland comprising areas lying between 25 ft. and 250 ft. above the mean sea level, and the lowland constituting the remaining areas, namely those falling below 25 ft. above the mean sea level. The same criterion is followed in the 1971 census also.

The broad features of these regions deserve mention. The low-land, comprising a very narrow belt along the sea coast, contains the river deltas and backwaters. The soil is sandy in nature. This region constitutes only of 10.3 per cent of the State's total area; but within this region 25.8 per cent of the total population is accommodated. The result is a very high density of 1385 per sq. km. which is more than double that of the State.

The midland region is characterised by wide valleys, small hills and luxuriant vegetation. The soil is fertile. Nature of the soil is alluvial and laterite. This region consists of 41.8 per cent of the total area and 59.1 per cent of the population. The density is 778. This is much less than that in the low land, but higher than the average for the State.

The highland region consists of dense forests and extensive ravines with rich flora and fauna. With 48 per cent of the total area, this region accommodates only 15.1 per cent of the total population. The density (172) is very low compared to the other two regions and the State. Table 1 presents the broad features of the three regions.

5. *The differing conditions of Socio-economic development of the three natural regions.*—The indicators considered here are the proportion of urban population, literacy level, educational and medical facilities, number of electricity users, work participation rates and percentage of workers in manufacturing industries. Table II provides the above details for each of the three regions and the State.

The data in the Table are revealing. The proportion of urban population in the highland is very low (4.5 per cent) where as in the lowland it is as high as 25.2 per cent. The midland is more or less near to the State in this matter. In the matter of general as well as male and female literacy the highland is again much below the other two regions and the State. The low level of literacy of the highland region appears a contradiction, when one considers the existing number of educational institutions per one lakh population which is not low compared to the other two regions. In fact, the number of primary schools per one lakh population is more than that in the lowland. The apparent contradiction of more or less similar extent of educational institutions per unit of population and low level of literacy, is best explained when one looks at the number of institutions per 100 sq. km. area. This is as low as 8

in the highland against 63 in the lowland and 41 in the midland. The obvious implication is that for fuller utilisation of institutional facilities, the area covered and the nature of distribution of population within the area are as important as the size of population covered.

In the matter of medical facilities, the position of highland region is extremely poor. The number of medical institutions (both allopathic and ayurvedic) per one lakh population in the highland is less than one fourth of the corresponding number in the lowland. Though the position of the midland is next only to that of lowland the difference is not very much. The average area covered by one institution in the highland region is nearly seven times that in the lowland. Compared to the other two regions, the highland seems to have been neglected in the matter of providing medical facilities.

The extent of use of electricity could be considered a good indicator of the general level of living and the degree of industrialisation achieved. In order to find out the degree of electrification reached in each of the three regions, indicators showing both the number of domestic users, as well industrial and commercial users per one lakh population have been worked out. Both indicators show the advancement of the lowland region and the backwardness of the highland region. The difference in the number of Industrial and Commercial users per one lakh of population, may be partly due to the location of industries requiring proximity of port facilitation and hence situated in the lowland. But the wide gap in the number of domestic users per one lakh population is an obvious indicator of the difference in the level of living of the population in the respective regions. In respect of post offices per one lakh population in rural areas the position of highland is better than the other two regions.

The work participation rate is not much different between low and midland. But the same for highland, is higher. Again, the female participation rate is higher in this region. The extensive plantations in this region obviously explain this. This conclusion is reinforced by the fact that the participation rate is higher in inspite of very low proportion of workers in manufacturing industries.

All the characteristics of the high land region namely the very low proportion of urban population low level of literacy, the very

poor medical facilities, low level of electrification achieved, predominance of the non-manufacturing sector in which the majority of the workers are engaged—show, the low developmental level of the region. The lowland region is most advanced and the midland is some wherein between but nearer to lowland. And these differences have important implications on the demographic behaviour of these regions.

6. *The Demographic behaviour of the regions.*—It may be mentioned at the outset that the State as a whole has experienced different degrees of decline in fertility and mortality since 1931-40. According to the available evidence, fertility has remained without much change till 1966. Since then there has been signs of every slow decline, in fertility. This has gained greater momentum since 1971. But mortality had reached very very low levels even before 1966, as evidenced by the census estimate of 16 as death rate for the decade 1951-60. The birth and death rates for the State are in Table III.

Fertility rates in the Natural Regions.—As mentioned earlier though the S.R.S. provides measures of fertility and mortality for the three natural regions, these estimates may not be as valid as for the State. The co-efficient of variation (CV) of the estimates for the natural regions, show that CV is higher for the highland region, compared to the other two regions. Inspite of this, the trend of the relative rates, over a period of time is unmistakeable—the level of both fertility and mortality of the highland region is highest. The estimated S.R.S. birth rates of the three natural regions over a period of years are given below:

TABLE 1

Birth Rate of the Natural Regions of Kerala

Year	*Birth rate*		
	Lowland	*Midland*	*Highland*
1965–66	37·5	37·7	39·0
1970	30·4	32·5	34·4
1971	31·4	32·0	32·4
1972	30·5	32·4	33·4
1973	27·8	30·0	33·0
1974	25·6	27·0	29·3
1975	25·9	27·9	32·8
1976	26·4	28·7	30·8

Source : Annual S.R.S. reports

Other measures of fertility obtained from the S.R.S. for the latter years, also show the higher fertility level of the highland region, as may be seen from the following table.

TABLE 2

Other fertility measures of the Natural Regions

Year	G.F.R.				T.F.R.			
	Lowland	Midland	Highland	State	Lowland	Midland	Highland	State
1971	122·9	128·8	128·4	127:4	4·0	4·1	4·1	4·1
1972	116·9	129·6	128·9	126·4	4·0	4·2	4·3	4·2
1973	105·9	118·7	128·8	117·1	3·5	3·9	4·3	3·9
1974	95·9	105·2	112·4	104·0	3·1	3·4	3·7	3·3
1975	97·4	108·0	129·6	108·6	3·1	3·5	4·2	3·5
1976	100·1	110·3	117·7	109·0	3·2	3·5	3·8	3·4

Source : S.R.S. Annual Reports

The decline in the above fertility measures noticed at the State level and in the lowland region, is not seen to the same extent in the case of highland region. This region has a higher level of fertility during all years compared to the other two regions.

Mortality Rates in the Natural Regions.—The mortality rates for the natural regions also reveal the higher mortality condition of the highland region. The death and infant mortality rates, obtained from S.R.S. are given below:

TABLE 3

Deaths and Infant Mortality rates of the natural regions

Year	Death rate*			Infant Mortality Rate (IMR)			
	Lowland	Midland	Highland	Lowland	Midland	Highland	State
1965–66	9·8	9·7	12·1	56·6	61·7	85·8	64·4
1970	8·7	9·1	10·6	50·4	48·0	74·4	52·6
1971	8·5	9·2	10·4	34·4	61·3	98·6	60·9
1972	8·2	9·5	11·0	55·3	61·2	101·7	66·0
1973	8·8	8·5	9·3	46·6	46·9	78·1	51·7
1974	8·1	7·7	9·6	30·7	55·5	95·2	56·0
1975	8·5	8·4	9·1	45·8	58·1	68·5	57·3
1976	8·6	7·7	10·4	57·3	50·8	77·4	56·3

* Death rate for the State already given in an earlier section.

Source : S.R.S. Annual Reports.

Both the measures of death rate and IMR are higher for the highland than for the other two regions. But greater difference is seen in the case of IMR, which is the most important component of total deaths. The higher mortality level of the highland region is obvious.

In an earlier study by the author(5) the level and pattern of mortality differentials among the three regions have been brought out by constructing life tables for the regions, using the S.R.S. data for 1971 and 1972. This study has revealed, that the expectation of life at birth and at various ages are highest for lowland and lowest for highland though the pattern is found to be similar for the three regions. The level of mortality of the midland is closer to that of the State.

7. *Linkages between economic development and demographic behaviour.*—It has by now been were established, that regions with higher level of development have lower fertility and mortality levels, and those with lower levels of development have higher levels of fertility and mortality. This has been established in the case of Kerala also, in another study.(6) In that study, the differences between the area constituting the northern districts of the State known as Malabar, and the southern area known as Travancore-Cochin (T.C.) in the matter of development and fertility, have shown, that the T. C. area with higher level of development has lower birth rate and vice versa, and that the pace of development and decline in fertility seem to go hand in hand, in respect of the two areas. This kind of relationship is evident in the case of the natural regions also. The highland region having the lowest level of development among the three regions, has the highest level of fertility and mortality as seen from the various measures. The inverse relationship between literacy and fertility level has been established in various studies, and is found true in respect of Kerala also.(7) The low level of literacy of the highland partly

explain the higher level of fertility. Further, the higher mortality level of the region could be closely related to the poor medical facilities available—both in terms of per unit, of population and of area. This corroborates the findings of a previous study(8) that spatial accessibility of medical care and infant mortality rate are closely related. The area covered on an average, by a medical institution in the high land region is nearly seven times that in the lowland region and two times that in the midland region. The effect of the number of medical institution per 100 sq. k.m., has been found to be the maximum in bringing about the decline in birth rate in both Malabar and T.C. areas. This effect may be brought about through a decline in infant mortality, substantial enough to be perceived by couples as ensuring survival of children and leading them to practice limitation of births. This process of decline in infant mortality acting as a feed back to decline in birth rate is not evident in the highland region, due to the very poor spatial accessibility of medical institutions.

Apart from the influence of health and education variables on the higher level of fertility and mortality of the highland region, the low level of industrialisation as evidenced by the lower number of electricity users and the predominance of the non-manufacturing sector in which the majority of the workers are engaged, could mean low income and low standard of living. The need for larger family for agricultural operations could also prevent the acceptance of the small family norm.

The differences among the three regions in the level of development as shown by the indicators considered here, and the differences in the level of fertility and mortality seem to go hand in hand.

8. *The need for considering the Natural Regions as Units of Planning and Policy Implication.*—The natural regions of Kerala differ from one another in their ecological setting and geographical characteristics. These naturally influence the development of any

area. In spite of this, these regions have not been considered as separate units for any purpose of planning. In view of the disparities of developmental level among these regions, there is need to pay special attention to the highland region which is the lowest in the matter of development. In view of the relatively large area of this region and the low density, the institutional facilities should be provided in such a way as to ensure maximum spatial accessibility. Failure to take into consideration this aspect could result in poor utilisation of facilities.

Besides, the identification of the areas, coming under each natural region within each district under rural and urban as separate units, could be helpful for evolving lower level plans to suit areas with similar physical and geographical conditions. In other words, the approach for regional development should not only be in terms of traditional administrative units, which are the result of historical or accidental circumstances, but also in terms of the natural regions, having similar natural endowments and conditions. This could result in minimising the differential impact of developmental efforts, arising from natural conditions and could lead to better balanced development among the regions of the State.

List of References:

1. Census of India, 1961—Kerala, General Report
2. Census of India, 1971—General Population Tables
3. Census 1971—District Census Hand Books of all Districts of Kerala
4. S. R. S. Annual Reports, Bureau of Economics and Statistics
5. Gopinathan Nair, P. S.—Mortality differential among the natural regions of Kerala, in the proceedings of the seminar on population problem (Department of Health, Government of Kerala—1974)
6. Gopinathan Nair, P. S.—Regional Development and fertility changes, A case study of Kerala (Paper presented at the International Seminar on problems of fertility control in India, held at Annamalai University 1977)
7. P. G. K. Panickar, T. N. Krishnan and N. Krishnaji—Population Growth and Agricultural Development, Centre for Development Studies, Trivandrum 1977
8. T. N. Krishnan, "Health Indicators and Demographic Trends", in Poverty, Unemployment and Development Policy, Centre for Development Studies, Trivandrum 1975

TABLE 1

Physical and Demographic Features of the Natural Regions and the State 1971 Census

Region/State	Area in sq. km.	Population (in lakhs)	Sex Ratio	Density per sq. km.	Average household size
Lowland ..	3979·3	55·13	1027	1385	6·2
Midland ..	16231·2	126·21	1024	778	6·1
Highland ..	18653·5	32·13	970	172	5·5
Kerala State	38864·0	213·47	1016	549	6·0

TABLE II

Selected Socio Economic Indicators relating to the Natural Regions of Kerala

Serial No.	Item of Information	Low land	Midland	Highland	State
1	Percentage of urban population to the total population of the region—1971 ..	25·2	15·3	4·5	16·2
2	Percentage of rural population to the total population of the region—1971 ..	74·8	84·7	95·5	83·8
3	Percentage of General Literacy—1971 ..	60·7	60·7	47·7	60·4
4	Do. Male Literacy—1971 ..	66·5	73·5	58·9	66·5
5	Do. Female Literacy—1971 ..	55·1	54·7	45·3	53·9
6	No. of primary (P) Schools per 1 lakh population ..	27·0	33·0	31·0	31·1
7	No. of Middle (M) Schools per 1 lakh population ..	12·0	13·0	11·0	12·4
8	No. of High (H) Schools per 1 lakh Population ..	7·0	6·0	6·0	6·4
9	No. of schools (P+M+H) per 100 sq. km. ..	63·0	41·0	8·0	27·4
10	No. of colleges per 1 lakh population ..	0·6	0·6	0·3	0·6
11	No. of Allopathic Institutions (AI) per 1 lakh Population ..	13·0	10·0	3·0	13·5
12	No. of Ayurvedic Institutions (Ay) per 1 lakh Population ..	11·0	8·0	2·0	10·7
13	Total No. of Medical Institutions (AI+Ay+Others) per 100 sq. km. ..	41·0	22·0	6·0	16·1
14	No. of Electricity users (Domestic) per 1 lakh Population ..	2543·0	1775·0	1319·0	1904·7

TABLE—II (*cont.*)

Serial No.	Item of Information		Lowland	Midland	Highland	State
15	No. of Electricity Users (Industrial and Commercial) per 1 lakh population	..	1114·0	581·0	472·0	702·2
16	Worker Participation rate	..	25·9	23·2	33·5	28·4
17	Male do.	..	39·3	44·7	35·0	44·0
18	Female do.	..	12·9	12·2	17·6	13·2
19	Percentage of workers in manufacturing Industries to total workers	..	25·1	14·5	6·4	15·6
20	Percentage of male workers in manufacturing Industries to total male workers	..	21·3	13·7	7·3	14·3
21	Percentage of female workers in manufacturing Industries to total Female workers	..	36·4	17·7	3·8	19.8
22	No. of Post Offices per one lakh population—Rural 1971	..	11·7	15·8	16·9	15·1

TABLE III

Birth and Death Rates of Kerala

Decade/year	*Birth rate*	*Death rate*
1931–40	40·0	29·1
1941–50	39·8	22·3
1951–60	38·9	16·1
1966	37·4	10·5
1967	36·3	10·1
1968	34·3	10·4
1969	33·3	9·8
1970	32·3	9·2
1971	31·9	9·2
1972	32·1	9·4
1973	29·9	8·7
1974	27·0	8·0
1975	28·2	8·3
1976	28·5	8·3

Source: Census estimates upto 1951–60 and S.B.S. estimates from 1966 onwards

PAPER EIGHT

INNOVATIVE APPROACH TO FAMILY PLANNING IN KERALA

K. DIVAKARAN PILLAI,
Research Officer,
Directorate of Economics and Statistics,
Trivandrum.

Introduction.—I. *Population Problem.*—Kerala State is located at the south most corner of India. The State of Kerala has certain demographic features which distinguished it from other States in India. It is one of the small States in India, in terms of area and is the densest in terms of population. The size of the population in Kerala is too large in relation to the size of the area. High density, high literacy rate, more females than males are some of the peculiarities when compared to other States in India. The population growth in Kerala is much faster than in India as a whole. The magnitude of population growth in Kerala compared to India since 1901 is given below :

TABLE 1

Population Growth—Kerala and India

Year	Kerala		India	
	Population in lakhs	Decennial growth percentage	Population in lakhs	Decennial growth percentage
1901	63·66	..	2383·37	..
1911	71·48	+11·75	2520·05	+5·73
1921	78·02	+ 9·16	2512·39	—0·30
1931	95·07	+21·85	2788·67	+11·00
1941	110·32	+16·04	3185·39	+14·23
1951	135.49	+22·82	3609·50	+13·31
1961	169·04	+24·76	4390·73	+21·64
1971	213·47	+26·29	5479·50	+24·80

The population of Kerala was 63.66 lakhs in 1901; it increased to 213.47 lakhs in 1971 by registering an increase of 235.35 per cent over a period of 70 years as against 129.9 per cent in India as a whole. The population growth in Kerala is due to the faster decline in mortality. This again can be attributed to the public health schemes implemented in the State from very early times and the cleanliness of the population. A comparative picture of the decline in birth and death rates, compared to India as a whole is given below :

TABLE 2

Birth and Death Rate

Year	Birth per 1000 population		Death per 1000 population	
	Kerala	India	Kerala	India
1931–40	40·0	45·2	29·1	31·2
1941–50	39·8	39·9	22·3	27·4
1951–60	38·9	41·7	16·9	22·8
1966	37·4	..	10·5	..
1970	31·6	36·8	9·2	15·7
1974	26·8	34·5	7·8	14·5
1975	28·0	35·2	8·4	15·9
1976	27·8	34·4	8·1	15·0
1977	27·0	34·8	7·5	15·2

Source : Economic Review 1978.

The low death rate has, in effect, increased the expectation of life of the people. The expectation of life at birth for the population of Kerala from 1911-20 to 1976 is given below :

TABLE 3

Expectation of life at birth in Kerala

Period	*Males* *years*	*Females* *years*
1911–20	25·49	27·41
1921–30	29·54	32·70
1931–40	33·19	35·00
1941–50	39·89	42·34
1951–60	46·17	50·00
1971	60·57	61·16
1976	61·22	62·42

The expectation of life in India as a whole is only around 51 years.

There has been a rapid reduction in infant death rate also. In the earlier decades of the present century more than 25 per cent of the infants born in an year died before reaching the first year of life. The decline in infant mortality is evident from the table given below :

TABLE 4

Number of infant deaths per 1000 live births in an year

Period	*Infant mortality rate* *Kerala*
1911–20	242
1921–30	210
1931–40	173
1941–50	153
1966	68
1971	61
1976	56

The rapid population growth created many socio-economic problems in the State. The per capita cultivable land in Kerala is below 20 cents. The dependency ratio is very high. The per capita income in Kerala is one of the lowest in India. The high population growth retards the economic development of the State.

II. *History of Family Planning Programme in Kerala.*— Realising the gravity of the rapid population growth and its impact on the State's economy, family planning was made an integral part of the State's second Five Year Plan. The main goal of the programme was to reduce the birth rate by about 25 per 1000 population in as short a period as possible. But till the year 1965, much progress could not be made in family planning. Since 1965 Government intensified the activities of family planning. The programme gained momentum during the third Five Year Plan period and sterilisation has been given top priority. In 1965 facilities for I.U.D. insertion have been provided. In spite of all the efforts only 13.69 per cent of the total 30 lakhs couples could be protected by various family planning methods. Government felt that vigorous and comprehensive developmental efforts on one side and a simultaneous effort to reduce the birth rate for stabilising the growth of population on the other should be implemented.

III. *Programme Methods and Strategies.*—During the Second Five Year Plan period (1956-61) more emphasis was given to the clinical approach to family planning. Later the emphasis shifted to extension education and cafetaria approach. Camp approach or mobilisation of all resources in a particular place was developed during the early 70s.

Considering the diversity of socio-economic conditions and levels of development in a vast country like India it is only natural that innovative programmes of one kind or other has to be evolved to suit the local needs and conditions. The mass sterilisation camps organised in Ernakulam during the period 1970-71 made world wide fame. The organisational perfection, the degree of co-ordination of various departments and local involvement of the people, achieved in the conduct of the camp had given a new direction to the management aspect of population control programme. The demographic impact and the removal of secrecy with which the subject was handled have been no less impressive.

IV. *Mass Vasectomy Camps in Kerala.*—The first Vasectomy camp in Kerala was organised in Ernakulam during the year 1970-71. Government of India in 1970 as part of their decision to improve the programme selected 51 districts for organising mass camps. In Kerala, Ernakulam district was selected by Government of India for the intensive programme. Hitherto the programme was managed by the Department of Health Services. This intensified programme was to be organised in such a way as to ensure the participation of the entire community. Vasectomy operation was selected as the method. As a trial a pilot vasectomy camp for one day was conducted at Kalamassery in Ernakulam district. This camp was a great success and about 746 vasectomies were conducted in a single day. The success of the one day camp inspired the district authorities to take up an ambitious programme of organising vasectomy camps of one month duration at Ernakulam with a sub camp at Thodupuzha, a taluk quarters in November-December 1970 with the active co-operation of all official and non-official agencies and organisations in the district. The aim of the camp was to carry the family planning programme in a high tempo and try to bring all the eligible couples in the district with the family planning programme through concerted efforts in specified time. All segment of the population supported the camp. Even those people who are strictly opposed to the family planning programme helped to organise the camp by remaining silent and not opposing the promotional efforts and conduct of the camp. The camp succeeded in overcoming the apprehension of prospective acceptors resulting from wrong notions and fears associated with Vasectomy such as loss of potency and health. This was achieved by effective technical advice, information and propaganda. The family planning mass camp made intensive use of group approach in the campaign strategy for motivation and acceptance.

Encouraged by the success of the first mass vasectomy camp in 1970, the district authorities organised another mass camp at Ernakulam on July 1971. The organisers could create a festival atmosphere throughout the district. Effective community support was mobilised for participation of couples in the campaign. The success of the camp can be assessed by the number of acceptors. 63418 persons accepted sterilisation against a target of 50000. Inspired by the success of these camps, similar camps were organised in the district headquarters. Targets were fixed in advance and targets were exceeded within the specified time.

The total achievements based on the number of acceptors and the total births averted by sterilisation are given below :

TABLE 5

Number of sterilisation and number of births averted by the camps organised during 1970–73

Year		*Place of Camp*	*Total No. of sterilisation*	*No. of briths averted**
December	1970	Ernakulam	15005	38113
July	1971	,,	63418	161082
January	1972	Trivandrum	16420	41707
February–March	1972	Trichur	20921	53139
March–April	1972	Cannanore	17990	45695
July–August	1972	Ernakulam	15628	39695
January–February	1973	Palghat	10285	26124
March–April	1973	Kottayam	12723	32316
March–April	1973	Quilon	15780	40081
		Total	188170	477052

* It is calculated that 2.34 birth could be averted by a sterilisation over a period of 23 years in Kerala by considering the mortality and fertility level prevailed, evolved by Kurup, R. S.

In terms of the number of acceptors in a short period, the organisation of mass camps conducted in Kerala during 1970-73 were considered as great achievement in propagating family planning. Later organising mass camps were discontinued in view of criticisms levelled against the camps. These are some of the criticisms levelled against organising camps.

(1) In mass vasectomy camps individual attention is hardly possible.

(2) Persons who are not eligible for sterilisation, came forward due to high incentive offered.

(3) Proper follow up become difficult since the number of cases in a short period is large.

(4) Technical perfection of the operation is said to be not satisfactory since large number of persons came forward for operation.

(5) It is difficult to educate the post operation care.

V. *Mini Camps.*—The criticisms levelled against the camp approach made the Government to take a decision to discontinue the mass camps. Mini camps were organised in Primary Health Centres and other hospitals, so that more attention could be available to the acceptors. The follow up work become easier if the number in one centre is less.

VI. *Post-partum Programme.*—Another important programme launched by Government of India in the field of family planning is the introduction of All India Hospital Post-partum Programme. At the beginning the programme was confined to hospital premises, but by 1974, a composite type of post-partum unit has been organised with the objective of maximising the extent of effective contraception among target population. The hospitals, implementing the programme have to be arranged for informing each delivery and abortion case through individual and group talks, teaching aids and other means about the safety of family welfare methods, their effectiveness and also the necessity of accepting a suitable method either temporary or permanent. A steady increase in number of persons accepted permanent methods of family planning through this scheme is evident from the table given below :

TABLE 6

Achievement of Family Planning Programme

Year	*Deliveries and abortions*
1971–72	27171
1972–73	33308
1973–74	37514
1974–75	61459
1975–76	71433
1976–77	79388
1977–78	68000
1978–79	78782

VII. *Medical Termination of Pregnancy (M.T.P.).*—Government of India by an Act in 1971 empowered qualified Medical Practitioners to terminate pregnancies if

(1) The continuance of the pregnancy would involve a risk to the life of the pregnant woman or grave injury to her physical or mental health.

(2) There is substantial risk that if the child was born alive it would suffer from such physical or mental abnormalities as to be seriously handicapped.

The proviso on physical or mental health includes failure of contraceptive practice as a reason for resorting to M.T.P. Also M.T.P. can be done for economic reasons (that the parents could not be able to receive the child). The number of pregnancies terminated since 1972 is given below :

TABLE 7

Number of Pregnancies Terminated

Year	*Number of pregnancies terminated*
1971–73	1084
1973–74	4244
1974–75	9564
1975–76	19969
1976–77	25389
1977–78	30834
1978–79	25140

VIII. *Mini Laprotomy or Mini Lap.*—This is a device of females sterilisation; which has been adopted on a large scale in Kerala since February 1976. It is considered as one of the simplest and less expensive means of birth control. The number of females undergone this device is not separately taken, since they are included in the Tubectomised persons.

IX. *An innovative sterilisation camp at Kozhikode.*—During December 1975 to January 1976 a mini sterilisation camp was organised in the premises of a football ground in Kozhikode where 'Santosh Trophy Football Tournament' was held. A large number of people especially in the young age groups could be expected in such a tournament. In addition to normal incentives, a free ticket costing Rs. 15 to witness the Semifinals and Finals of the tournament were offered to those who are willing to be sterilised. Rs. 17 more were paid in addition to this in the last nine days of the Camp. Acceptors were also given Vitamin tablets and tonics and 103 prizes to winners (among sterilised persons) in the lucky draw held on the last day of the camp. A total of 1018 persons were undergone sterilisation in this camp. A large number of acceptors are in the younger age groups. The success of the camp is based on the idea of taking family planning services to those who are in need and people have the facility to assemble in a particular place. Additional incentive offered in this camp is

the free ticket to witness the tournament. This has influenced the football lovers who availed of the family planning facilities of the camp.

X. *Impact of the programme.*—The impact of the family planning programme can be assessed broadly in terms of two indicators (1) percentage of couples protected against the risk of conception and (2) total number of births averted by the programme. The impact of the programme based on the above indicators are given in Table No. I and II in Appendix. It is seen from the tables that only 30 per cent of the eligible couples were protected by various family planning methods.

XI. *Strategy for future programme.*—When compared to other States in India, the performance of family planning programme in Kerala is worth. Even then more efforts should be made to stabilise the population growth. Adequate steps should be taken to make the programme widely acceptable to the mass. The advantages of small family should be propagated. The common man should understand that small family is for the future well being of their children. For achieving this objective family planning programmes should be organised in such a way that it should be acceptable to all.

XII. *Target setting.*—Target setting is an important aspect of the implementation of the programme. Government is responsible for the successful implementation of the family planning programme. There should be a planned approach whereby the eligible couples could be motivated to accept one or the other method of contraceptive. Any such planned approach will necessarily have a goal to be attained. The Indian Plans are Five Year Plans and hence the goal of the programme of family planning can be stated as reduction of birth rate to a pre-determined level often the 5 years. In order to achieve this, the programme should have specific targets of contraceptive every year. The present practice is to allocate target to each area and worker without considering the feasibility or the possibility of this being achieved by the efforts of the workers in the area. Whereas there is a register showing details of eligible couples, no use has yet been made of this register in most places. The eligible couple register contains details of age and number of children in respect of each couple. Most of the workers have also noted whether the couple is favourable to family planning or undecided. These information can provide a break-up of the eligible couple by age and number

of living children in each of the categories favourable, unfavourable undecided. With the knowledge of the area and the couples that the workers has, he would be able to find out how many can be motivated that year and the coming years for acceptance of various methods of family planning. The worker will be satisfied as he himself sets in targets and will therefore put in the maximum efforts for fulfilling the target.

XIII. *Development and Family Planning achievements.*— Though specific projects intended to assess the influence of developmental variables on Family Planning acceptance have not been tried out in Kerala, it is known that acceptance has been highly correlated with development. For example, the developed districts of Trivandrum and Ernakulam have shown high rates of acceptance of family planning while the backward districts of Malabar especially Malappuram have shown low rates of acceptance. The consequent differences in fertility are also known. It is also to be remembered that health and family planning facilities are more in the developed districts, the socio-economic profile of the people are better and hence the actual influence of developmental variables other than health has to be properly delineated.

The example of Athoor block in Madurai district of Tamil Nadu which is the demonstration centre of the Gandhigram Institute of Health and Family Planning is often quoted in this connection. Here the birth rate was reduced from about 40 per 1000 in the late fifties to 27 by 1975. The work on family planning started only after determining the felt needs of the community and providing for the same like digging wells for drinking purposes, employing people in piece rate work for Khadi spinning etc. This is usually known as the community development approach.

In the Allahabad Agricultural Institute in U. P., India, the method adopted for propagation of family planning ideas was to do the agricultural extension first, create confidence and then talk about the family size. This also was a useful method.

In Kerala, direct approach to tap the influence of developmental variables may not yield the desired results as people are aware of their needs and the methods of approach. It is only a question of timing of the adoption, as a large percentage of the people are willing to adopt family planning.

Other approaches.—In the tea gardens in South India the workers were motivated though offering insurance policies linked with the number of children born after insurance. In some of the industrial concerns like the Madurai-coats a system of no-birth bonus was tried. The Tatas implemented a scheme of added incentives at the time of sterilisation. Government of India itself tried to create infrastructural facilities like roads, water supply, electric connections etc. in disadvantaged areas before starting family planning centres and posting family planning staff.

Input output model.—A general model of family planning acceptance as output in relation to the input variables comprising of service centres and staff, environmental variables and organisational-psychological variables can be established by considering data on the variables for each of the districts/Primary Health Centres of Kerala State, as was done in an ESCAP study of input-output relationship in Tamil Nadu by Dr. R. S. Kurup and in Korea, Malaysia and the Phillippines. (The ESCAP report is being finalised/under print).

Na=F (E, I, O)

Where Na denotes the numbers of acceptors,

E, the environmental variables: Development of the community in the various spheres.

I, the family planning and health inputs (service centres, staff):

O, the organisational variables (How the programme and facilities are organised, the Cohesion of the group of workers, therein work.....).

The functional form (f) can be the linear form and the influences can be obtained through stepwise regression.

The same type of model can be based for setting targets for contraceptive methods. But as has been shown in the study by Kurup in Gandhigram under the auspicious of ESCAP, planning by use of statistical data obtained from the eligible couple registers also contribute though slightly to explain the variations in performance, (as measured by the number of acceptors), optimal use of the eligible couple registers in the Primary Health Centres in Kerala might improve the performance of the programme. This is what is envisaged under the experiment in target setting. Besides this, the experiment also tries to involve the field workers more deeply in the crucial stages of the implementation and

management of the programme. Thus in terms of the acceptance model, the variables under F, I and O will all get increments at least to a small extent which will result in bettering the contribution to Na (Details of the experiment may be seen elsewhere).

The experiment can succeed only with the whole hearted support and co-operation of the staff of the Primary Health Centres. To some extent, the higher authorities have also to co-operate by not insisting on the targets set for the Primary Health Centres in which the experiment has been planned. It is hoped that a feasible set of targets can be set for each centre by following the practical methods of operation of the experiment in the selected centres.

References :

1. A study of the Second Mass Vasectomy Camp in Kerala—DRC. No. 126, Trivandrum, 1972.
2. Kurup, R. S.—A note on the calculation of Births averted due to the family planning programme in Kerala DRC. Trivandrum, 1973.
3. G. S. Nair. An innovation sterilisation campaign DRC. Trivandrum, 1976.
4. Report of the Committee for evaluation of Family Welfare Programme (Kerala). Government of Kerala, Trivandrum—1978.
5. Kurup, R. S. Experiment in Target Setting. DRC. Trivandrum, 1978.

68/472—8a

APPENDIX

TABLE I

Number and percentage of couples protected—method-wise

Year	No. of couples at mid year (lakhs)	Sterilisation	No. of couples protected by			Percentage of couples currently protected by			
			I.U.D.	C.C. Users	Total	Sterilisation	I.U.D.	C.C. Users	Total
1	2	3	4	5	6	7	8	9	10
1957	22·8	671	..	..	671	0·03	..	..	0·03
1958	23·3	3757	..	..	3757	0·16	..	..	0·16
1959	23·8	9959	..	..	9959	0·42	..	..	0·42
1960	24·3	14692	..	..	14692	0·60	..	..	0·60
1961	25·5	20777	..	..	20777	0·81	..	..	1·81
1962	26·0	27291	..	..	27291	1·05	..	..	1·50
1963	26·4	39702	..	..	39702	1·50	..	..	1·25
1964	26·8	60391	..	..	60391	2·25	..	..	2·62
1965	27·3	101064	17836	..	118900	3·70	·65	..	4·36
1966	27·7	136562	46412	667	184641	4·97	1·68	0·02	6·67
1967	28·1	193535	62197	6066	261798	6·89	2·21	0·22	9·32
1968	28·5	266101	76591	5925	348617	9·34	2·69	0·21	12·23
1969	29·0	318511	84850	7184	410546	10·98	2·93	0·25	14·16
1970	29·4	379517	87894	9650	477061	12·91	2·99	0·33	16·23
1971	29·8	470655	79581	7824	558060	15·19	2·67	0·26	18·73
1972	30·5	564139	73530	5622	644191	18·50	2·41	0·21	21·12
1973	31·1	634426	65588	11797	711811	20·40	2·11	0·38	22·89
1974	31·8	674318	66861	14104	755281	21·20	2·10	0·44	23·75
1975	32·5	728634	64483	15584	808701	22·42	1·88	0·48	24·88
1976	33·1	974839	64939	13330	1053108	29·45	1·96	0·40	31·82
1977	33·8	106057	53700	1331	1128938	31·38	1·63	0·39	33·40
1978	34·5	981806	50398	..	1032104 (excluding C.C. Users)	28·46	1·46	..	29·92 (Excluding C.C. Users)

TABLE II

Birth averted by various methods of family welfare programme calendar year-wise

Year	Birth averted			
	Due to sterilisation	Due to I.U.D.	Due to C.C. Users	Total
1	2	3	4	5
1957	47	..	..	47
1958	403	..	..	403
1959	1472	..	..	1472
1960	3050	..	..	3050
1961	4345	..	..	4345
1962	5894	..	..	5894
1963	7869	..	..	7869
1964	11570	..	..	11570
1965	18218	1237	..	19455
1966	28535	6871	44	35450
1967	38841	13682	537	53060
1968	53908	17791	1608	73307
1969	69328	21301	1664	92293
1970	82568	23024	2080	107672
1971	97666	22774	2452	122892
1972	118288	20483	2000	140771
1973	136850	18645	2090	157583
1974	147192	17057	3299	167528
1975	151345	17225	3860	172430
1976	171454	16804	4006	192264
1977	219560	16337	3732	239629
1978	226675	15717	..	242392

PAPER NINE

RURAL DEVELOPMENT, AGRICULTURAL PRACTICES, WOMEN'S ROLE AND FERTILITY IN INDIA

(Dr. R. S. KURUP)
Director, Directorate of Economics and Statistics, Trivandrum.

Abstract

In this paper available data on the four sets of variables, rural development, agricultural practices, women's role and fertility have been collected for the States in India. An analysis of the trend in the variables is presented. By using step-wise regression techniques, the contributions of the variables in explaining the variations in fertility have been found out. It is seen that there is a linkage between the independent variables and fertility which is considered as the dependent variables. But a secular pattern of relationship has not been seen. Perhaps at the present level of development of the country, firm patterns cannot be envisaged.

A through examination of the available data on the variables is warranted. It would also be necessary to include other variables falling under the purview of each of the processes so that a lot more of the variations in fertility could be explained. Further research on these lines may throw up worthwhile results. There is only to be taken as a preliminary attempt in that direction.

It may be remarked here that in the State of Kerala, these variables seen to exert a large influence on the fertility pattern.

RURAL DEVELOPMENT, AGRICULTURAL PRACTICES, WOMEN'S ROLE AND FERTILITY IN INDIA

(R. S. KURUP)

Introduction.—The need for examining the development strategies followed in the context of increasing inequalities and social injustice among areas and groups and for paying attention

---

Paper presented at the International Workshop Seminar on fertility impacts of rural development, agricultural practices and women's role convened by the Population Council, Bangkok during 1979.

to rural development and human resource development at sub-national levels has been emphasised in many forums. This is amply illustrated in the recommendation of UNESCAP(1) "A systematic examination should be undertaken of experiments at the regional and local levels of community development projects, national extension schemes, intensive development area schemes, development of small farmers' schemes, etc. Research into facts of demographic processes at the subnational level and their inter-relations with other social and economic processes should be encouraged". The IUSSP Committee on Economics and Demography in its interim report on agrarian change and population change(2) has drawn attention to the world population plan of section adopted in Becharest in 1974, formulating recommendations for rural development as the improvement of rural areas has a bearing on population growth. Agrarian change has been considered very broadly to include changes in methods of production and the processes by which economic and social relations within the countryside and with the outside world are altered over time. The available case studies give some clue as to the influence of agrarian change on demographic variables. At the micro level, the agrarian household is both a unit of production and a unit of consumption. The backwardness of the rural farm households is matched by the backwardness of the women in society, in general. Urquidi(3) while examining the world population plan of action has pointed out that social and economic improvement is a condition necessary for significant changes to occur in demographic behaviour, particularly in order to bring down the birth-rates accompanying or following lower mortality. There have been attempts at emanicipation of women, improvement of their status and their roles. It would be interesting to find out the impact of the agrarian changes and the status of women on the population variables especially fertility. This is what is attempted in this paper with the data available in

---

(1) UNESCAP: Population growth and economic development in sub-national areas—Report of an expert group meeting, Bangkok, 1977.

(2) IUSSP: Agrarian change and population growth—Interim report—IUSSP Paper No. 6 Liege (Belgium).

(3) URAQUIDI, VICTOR, L.: "Population and a new international order—A missing link" presented at the IUSSP Conference at Helsinki, 1978.

India. Specifically, the fertility impacts of rural development, agricultural practices and women's roles will be examined, as far as data.

Review of literature.—Eva Mueller (4) booked at the historical changes in Japan, Taiwan and Punjab an Indian State and reviewed the information from other cross-sectional studies. The interconnections between agricultural change and fertility change have been discussed under various heads like labour, income, education, age at marriage and the effect of green revolution. The author does not agree with the expectation that the green revolution will give rise to psychological, demographic or economic changes that will bring about a decline in birth rates. Sinha (5) deals with agricultural overpopulation and discusses the consumption approach, production approach and the mobility approach. His analysis in its conceptional and empirical dimensions lies in the relationship between employment and population growth in a dynamic perspective. He sums up the main issues ending with the identification of new lines of research that in his, judgment, are necessary for the clarification at micro and macro levels of the reciprocal linkages between population growth and agrarian change. Earsterline(6) has found that economic factors have been responsible for the abrupt decline in age at marriage, household formation and consequent fertility increase earlier and for the recent slow-down and gradual reversal of the demographic movements later. In "Toward a restatement of demographic transition theory" Coldwell (7) has examined all recent evidences and compared with the conditions under which demographic transition theory was framed .Fertility decline in the third world is not dependent on the spread of industrialisation or even in the rate of economic development, according to his analysis; fertility decline may precede industrialisation and help to bring it about rather than follow it.

---

(4) Eva Mueller: "The impact of agricultural change on demographic development in the third world". A chapter in Tabah (ed)" "Population growth and Economic Development in the third world". Ordina Editions, Dilhain for IUSSP, Belgium 1976 quoted in reference (3).

(5) Sinha J. N. "Population and agriculture" quoted in ref. (2).

(6) Easterin Richard A. "On the relation of economic factors to recent and projected fertility changes"—Demography Vol. 3 No. 1. 1966.

(7) Caldwell, J. C. "Toward a restatement of demographic transition theory"—Population and Development Review Vol. 2. Numbers 3 & 4, 1976.

In the ESCAP study of population growth and agricultural change in India (8) close association between the growth rates of output and those of rural population has been found. Several districts in Punjab with high rates of increase in agricultural labour showed equally greater rises in labour productivity although the trend was not uniform. This also occurred in some of the districts of Orissa.

Das and Patel has (9) considered the relation between population growth during 1961-71 in the States in India and literacy percentage of workers in manufacturing, agriculture and the tertiory sector, dependency ratio, urban-rural ratio, medical and paramedical personnel per 10,000 population, percentage of gross irrigated area, surfaced roads per 100 sq. km. of area and percentage of electrified villages. They have found that urban-rural proportion of manufacturing workers and workers in tertiory sector have high loading. The factor which explains 36 per cent of the total variance, has been termed as industrial development. The second factor, social development explains 30 per cent, the third factor agricultural development 15 per cent and the 4th which they call "development constraint" explains 13 per cent of the variables the latter consists of social services and infrastructure besides dependency ratio. When they considered the independent contributions, it was found that development constraint explains 45.5 per cent, followed by social development 41.3 per cent industrial development 6.5 per cent and agricultural development 2.3 per cent. The total variance explained is 95.6. They have stated that "the study indicates that social development and the adequate and the right investment in the social services and infrastructure development can play a significant role in lowering the level of natural growth rate of population. On the other hand, it is doubtful whether the factors of industrial and agricultural development alone can lower the population growth rate to a low level unless accompanied by other changes such as massive improvement in educational level, health care and other social services".

Quantification of the influence of socio-economic demographic variables, health variables and family planning acceptance, on the

---

(8) UNESCAP—"Comparative Study of population growth and agricultural change—case study of India"—Bangkok 1975.

(9) Das, Narayan and N. L. Patel—"Inter-relations between population growth and development in India"—Paper presented at IASP meeting in Hyderabad 1978.

fertility of the population has been done in other papers also. Family Planning and age at marriage effect fertility directly while the other variables act through their correlations with fertility. It has been seen(10) that death rates, female literacy, percentage of persons in non-agricultural occupations and other-population ratio are significantly correlated with general fertility rate. They explain nearly 86 per cent of the variation in the general fertility rates among the States in India, of which doctor-population ratio explains half the variation (43 per cent). Raman and Sengupta(11) found that per-capita national income, percentage of agricultural population and infant mortality rate together explain 50 per cent of variation in birth rate in 1955, considering 18 Asian countries; it is seen that urbanisation and income have depressing effects on birth rate; they point out that Weintraub(12) in a similar study of 30 countries in the early fifties found about 67 per cent of variation in birth rate explained by these variables.

The papers by Iftikar Ahmed on technological change in agriculture and employment in developing countries (13) and by Djaved Salahi-Isfahani(14) on population growth and adoption of agricultural techniques also deal with the inter-relations.

Specific influence of socio-economic conditions on the fertility of women in the third world have been discussed by Weiss-Altaner(15). Weller(16) has presented a review of the literature

---

(10) Kurup R. S.—Trends in fertility in India and influence of associated variables—An over view in studies on Fertility in India Monograph series No. 7. R. S. Kurup(ed) Gandhigram Institute of Rural Health and Family Planning, Madurai District 1975.

(11) Raman M. V. & B. Sengupta: Relation between Fertility and Economic Development—in studies on Fertility in India R. S. Kurup(ed) Gandhigram Institute & Rural Health and Family Planning, Madurai District 1975.

(12) Weintraub R: "The birth rate and economic development—an empirical Study" Econometrics 30th September 1962.

(13 Ahmed, Iftikar: "Technological change in agriculture and employment in developing countries". IUSSP Conference papers, Mexico 1977.

(14) Salahi-Iafahani, Djavad: "Population growth and adoption of agricultural techniques" IUSSP Conference papers, Mexico 1977.

(15) Weiss-Altauer Eric. B: "The influence of socio-economic conditions on the fertility of women in the third world". IUSSP Conference papers, Mexico 1977.

(16) Weller, Robert:—"Demographic correlates of woman's participation in Economic activities"—IUSSP Conference papers, Mexico 1977.

relating to the studies on women's participation in economic activities and the family size. He quotes Gendalls who concludes that there is no secure basis for ascertaining the nature of the relationship between economic activity and meternal responsibility in India. A negative relationship between Child-woman ratio and female labour force activity in Pakistan has been pointed out. In Bangladesh, fertiility is negatively correlated with agricultural activity and positively correlated with non-agricultural activity. Japanese data show that women who work outside home have lower fertility as compared to others. Finally, 4 types of possible casual relationships are suggested *(i)*, the observed relationship is spurious and is caused by common antecedents of both variables *(ii)* women's family size affects their labour force participation *(iii)* women's labour force participation affects their family size (*iv)* both family size and labour force participation affect each other. Caldwell(17) has presented the inter-relationships between fertility and other variables in a number of population groups in Africa and has indicated that the demographic transition theory requires a re-examination and fresh elucidation in the context of the development that take place in the third world.

In an analysis of the decline in birth rate in Kerala State Krishnan(18) has found that education, lower mortality and longer expectation of life, reflecting the state of health are significant factors. The district-wise variations are also largely explained by those variables. But the birth rates for these districts which he has taken are not truly representative of the district.

3. *Variables and sources of data.*—The States in India and the Districts in Kerala have been taken as the Units of study. The years 1961, 1971 and 1976 are the time periods considered. Data on four variable sets are necessary for the analysis herein envisaged: Fertility, Rural Development, Agricultural practices and Women's role.

(a) Fertility rate and birth rate are taken for the study of fertility. For the States in India, these rates have been estimated from the Census and the Sample registration scheme (for 1971 and 1976). Child-women ratios can also be used as a variable to measure fertility. For the study of the variation in fertility in

(17) Coldwell J. C. (ed) "The persistence of high fertility Part I" Department of Demography, Australian, National University, Canberra 1977.

(18) Krishnan T. N.—"The demographic transition in Kerala—Facts and Factors" Economic and Political weekly, Bombay 1976.

the Districts of Kerala, the child-woman ratios have been considered. This is calculated as the ratio of children 0-4 to woman 15-49 years multiplied by 1000. For the year 1976, these have calculated from the sample registration scheme in the rural areas of Kerala—See references (19), (20) and (21).

(b) Rural development.—In order to study rural development, three variables are considered here. The number of co-operative societies per 100 persons, the extent of road mileage per 100 persons and electricity generation in Kilo watt hours per capita. It has not been possible to find out the number of co-operative societies in the rural areas (urban population in India as a whole is only 20 per cent of the total). The urban part of road mileage is very small compared to the rural part. Though electricity is used mostly by the urban people, as data on this is not readily available the separation of generated units by urban and rural is not possible.

The number of villages electrified is considered for 1976 [See references(22) and (23).] Comparable figures in electricity consumption, transport vehicles etc. are not available. General literacy percentage is also an index of rural development.

(c) Agricultural practices.—Though a lot of variables can be thought of under this head, the lack of comparable data for the States in India and for the Districts in Kerala which are the units of study here limits our choice. Area irrigated taken as per cent of gross cropped area is one variable and multiple cropping (ratio of area sown more than once to net sown) is another. The necessary information for the States is taken from the Statistical Abstract and for Kerala from the Statistics for Planning(24).

---

(19) Kurup, R. S., P. S. G. Nair and K. D. Pillai "Foctbook on Population and Family Planning", Bureau of Economics and Statistics, Trivandrum, 1974.

(20) Department of Family Welfare, Govt. of India: "Family Welfare Programme in India" Year Book for 1975-76 and 1976-77 New Delhi.

(21) Bureau of Economics and Statistics: Sample registration Kerala—Rural for 1975 and 1976—Trivandrum 1977, 1978.

(22) Central Statistical Organisation, Govt. of India Statistical Abstract 1973-69 and 1972 New Delhi 1975-73.

(23 Transport Research Division, Govt. of India Basic Road Statistics, New Delhi.

(24) Bureau of Economics and Statics: "Statistics for Planning" Trivandrum —1977

(d) Women's role.—Three variables have been considered here: female literacy percentage, mean age at marriage for females and ratio of non-agricultural to agricultural workers among females. The work participation rates for females are much too low and the trend during 1961-71 has not shown any increase and hence this variable has not been taken. Data on literacy have been taken from Census publications (25) (26) and those on age at marriage from the Family Welfare Year Book [vide reference *(20)*]

It may be remarked here that there has been substitution of these variables when the District data of Kerala are analysed. In view of the paucity of data for the States in the year 1976, only the percentage of villages electrified, percentage of gross area irrigated and ratio of women employees in organised sector to 1000 women in the population have been considered as independent variables and rural birth rate obtained from the sample registration scheme as the dependent variables. For the districts of Kerala in 1976, child-women ratio has been taken as the dependent variables, for which data are available from the sample registration scheme in the rural areas. The independent variables considered are percentage of area sown more than once to net area sown, percentage of villages electrified and the average daily wage rates of woman labour in paddy fields.

4. *Methodology.*—The methodology adopted in this paper can be briefly indicated as a trend analysis over time starting from 1961, followed by a study of the variations in fertility variables among the units of analysis. Contributions of the variables in explaining the variations in fertility (birth rate general fertility) in 1961 and 1971 have been found out by stepwise regression analysis. The model assumed is the multiple regression equation but the analysis is so designed as to avoid the effects of multi-collinearity. It may happen that the relationships among the independent variables may complicate their influence on the dependent variable but the stepwise regression model adopted here, will pick up the major variable first, eliminate its effect that then pick up the next variable whose additional contribution by itself after eliminating its effect through the first variable picked up and so on. Two points are worthy of mention here; one is that while we have only 15 values of the variable in the analysis of State

---

(25) Census of India 1961. Final population tables New Delhi—1965.

(26) Census of India 1961—Part IA(1) General Report for Kerala, 1965.

variations the number of independent variables is 9. The analysis is done with fertility birth rate as dependent variable and with and without the variable mean age at marriage as the latter is conceived of as direct casual variable. While analysing the variations among the districts in Kerala, the number of units is only 9 for 1961 and 1971 and hence the number of independent variables has been reduced to 6. What ultimately happens is that the number of degrees of freedom for the residual (error) is very much reduced which affects the significance of the values, though an idea of the contributions of the variables is obtained. The techniques are not used for the analysis of 1976 data as the data are scanty.

5. *Analysis of trends.*—In this section, the trend in the data over time is analysed for each variable and the range of variations over the units of analysis are pointed out.

(a) Birth rate.—Up to 1921, India was in the first stage of demographic transmission with birth and death rates of 48 and 47 respectively in 1911-21 (27). Later there has been a decline and in 1951-61, the birthrate was estimated as 41.7 by the Census actually, though demographers have estimated it to be between 43 and 45. In 1961-71 the birthrate has been estimated as nearly 40. Death-rate in the meantime declined 19. Estimated birth rates for the Provinces of Bengal, Bombay, Madras, Punjab and United Provinces ranged from 56 to 47 during 1901-11. Estimates from the national sample survey have shown a rate of 36-37 from 1961-62 to 1966-67 in the rural areas while for urban areas the variation is from 31 to 34 except for 1965-66 when the birthrate for India in the urban areas has been estimated as 27.2. Later, when the sample registration scheme began to throw up estimates of birth-rate, the rural rates from 1969 to 1972 were of the order of 38-39 while the urban rates ranged from 30 to 33. In 1973, the birth-rate in the rural areas was estimated as 36 and that in the urban areas 29. The overall birthrate has therefore been 35-37 according to national sample survey during 1961-67 and 35-38 in 1969-1973 according to sample registration. It may be remarked here that there seems to be a large amount of under reporting in the national sample survey while sample registration suffers much less from under-reporting, though the earlier estimates do not consider all the sectors in India.

---

(27) Kurup, R. S.—"Trends in fertility in India and influence of associates variables—an over view" in studies on Fertility in India, R. S. Kurup.

Note.—The discussion here follows the pattern in this reference where in data from all sources and from all papers have been assembled.

*TABLE 1

Birth rate and general fertility rates in Indian States

Serial number	Name of State	Birth rate					General fertility rate	
		1961 Rural and Urban	1971 Rural and Urbnn	Rural	1976 Rural	Rural and Urban	1961 Rural and Urban	1971 Rural
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh ..	39·7	34·8	35·8	34·6	33·7	182·7	150·9
2	Assam ..	49·3	38·5	36·4	33·7	32·8	253 8	181·7
3	Bihar ..	43·4	32·8	33·1	31·4	31·1	204·5	155·1
4	Gujarat ..	45·7	40·0	40·2	39·6	37·4	220·0	196·3
5	Jammu and Kashmir ..	36·6	32·9	31·6	34·6	32·1	203·3	155·5
6	Karnataka ..	41·6	31·7	31·5	31·1	29·4	201·3	139·1
7	Kerala ..	38·9	31·1	31·2	28·1	27·8	182·1	133·8
8	Madhya Pradesh ..	43·2	39·1	39·3	41·0	39·8	203·1	220·3
9	Maharashtra..	41·2	32·2	33·2	30·1	29·3	194·9	156·4
10	Orissa ..	40·4	34·6	34·5	35·3	34·8	183·4	151.0
11	Punjab ..	44·7	34·2	36·6	32·4	31·6	234·6	167·2
12	Rajastan ..	42·7	42·4	42·4	34·7	33·4	208·7	209·5
13	Tamil Nadu..	34·9	31·4	32·4	32·2	30·7	153·3	140·1
14	Uttar Pradesh ..	41·5	44·9	43·2	41·2	40·0	203·8	222·6
15	West Bengal..	42·9	37·0	36·6	34·1	31·9	215·0	174·0
	All India ..	41·7	36·9	38·9	35·8	34·4	195·0	174·4
	Average of the rates for 15 States standard ..	41·8	35·8	35·8	34·3	33·1	203·0	170·6
	Deviation ..	13·3	4·5	14·9	3·4	3·0	88·4	108·5
	Co-efficient of variation (per cent) ..	31·8	12·6	35·6	9·9	9·1	43·5	63·6

*The figures for Punjab include those for Haryana and Himachal Pradesh in 1961 and the figures for Assam include the hill states which formed part of Assam in 1961. In later years, these are not included and thus there is some loss of comparability. The rates for Bihar are considered as under-estimates. For the year 1976, the averages and standards deviation do not take into account the rates for Haryana (37·6) Himachal Pradesh (33·2) and Meghalaya (35·2) but in the regression analysis these have also been taken. (The rates given here in brackets are for rural areas.)

The 1961 birth rates show higher values than the average for the States, Assam, Bihar, Gujarat, Madhya Pradesh, Punjab (including Haryana and part of Himachal Pradesh) Rajasthan and West Bengal while the States of Karnataka, Maharashtra and Uttar Pradesh showed a rate almost equal to the average. While the 1971 rural birth rates showed a variation of 35.6 per cent, the combined rates had only 12.6 per cent variation. Except for Karnataka and Maharashtra the other States mentioned above showed higher rates than the average in 1971 also (excluding Bihar whose rate is supposed to be unreliable—However, this has also been taken in working out the statistical constants). The 1976 rural pattern resembles that in 1971, except for West Bengal, Punjab (excluding Haryana and part of Himachal Pradesh) and Assam. Jammu and Kashmir had its rate almost equal to the average. The co-efficient of variation is only 9 per cent.

Comparing the general fertility rates, it is seen that in India as a whole there has been a decline from 195 to 174 (10 per cent nearly) in about 10 years. The States which had higher rates in 1961 compared to the average of 15 States are: Assam, Bihar, Gujarat, Jammu and Kashmir, Madhya Pradesh, Punjab (including Haryana and part of Himachal Pradesh), Rajasthan, Uttar Pradesh and West Bengal. The co-efficient of variation a little high but in 1971 it is still higher, Jammu and Kashmir, alone calls out of the pattern in 1971.

States which show low birth rates and low fertility rates are few in number: Kerala has low rates throughout while in 1971 Karnataka, Maharashtra and Tamil Nadu show low rates. In the following section, the trend in fertility in the Districts of Kerala is presented. The following table gives the child-woman ratios in the 9 districts of Kerala which existed in 1961. It may be remarked here that there are no estimates of birth rate or fertility rates for the districts. There are now 11 Districts in the State and hence for 1976 the child-woman ratios for the 11 Districts are presented. The rates for 1961 and 1971 have been calculated from the census data while for 1976, these have been calculated from the sample registration scheme in rural areas. It is also worth noting that the urban population in Kerala is only 16 per cent of the total and that there are no significant rural-urban differentials. For 1961 and 1971, against Idukki and Malappuram districts, estimates are not given as these are new Districts.

TABLE II

Child-woman ratios in the District of Kerala

Sl. No.	*Name of District*	*Child-woman ratios*		*(No. of Children 0–4 years per 100 women in 15–49 years) 1976*
		1961	*1971*	
(1)	(2)	(3)	(4)	(5)
1	Trivandrum ..	65·4	50·6	41·8
2	Quilon ..	68·1	53·2	50·5
3	Alleppey ..	59·5	48·2	41·1
4	Kottayam ..	67·4	55·1	44·3
5	Idukki ..	..	..	50·5
6	Ernakulam ..	65·9	54·6	38·3
7	Trichur ..	61·7	54·3	58·3
8	Palghat ..	58·9	57·2	52·5
9	Malappuram ..	..	..	54·2
10	Kozhikode ..	64·4	61·2	51·7
11	Cannanore ..	62·5	57·8	50·9
	Average ..	63·8	54·7	48·6
	Standard deviation ..	9·3	3·5	5·6
	Co-efficient of variation (per cent) ..	14·6	6·4	11·5

The calculations have been made on the basis of unadjusted data which suffer from misreporting of age and under enumeration.

There is significant decline in the averages over the years and in all the Districts. Malabar Districts (Palghat, Malappuram, Kozhikode and Cannanore) generally have higher values than Travancore-Cochin Districts.

(b) Rural development.—In this discussion rural development will refer only to the three variables, namely, the number of co-operative societies per 100 persons, the road mileage per 100 persons, electricity generation in Kilowatt hours, per capita and general literacy percentage. This is very restricted approach, adopted here because only data on these variables could be readily collected for 1961 and 1971 and processed. For the year 1976, only the percentage of villages electrified could be obtained. This is, as regards State-wise information. The following table gives the information on the three variables for the 15 States under study along with the statistical constants. For 1976, data for Haryana, Himachal Pradesh and Meghalaya are also noted separately.

TABLE III

Data in respect of variables on rural development in the 15 states

Serial number	Name of State	Co-operative Societies for 100 persons		Road mileage per 100 persons		Electricity generation in Kilowatt hours per capita		Percentage of villages electrified
		1961	1971	1961	1971	1961	1971	1976
1	Andhra Pradesh ..	·08	·07	·15	·23	0·30	0·68	49·6
2	Assam ..	·08	·04	·02	·31	·04	0·25	9·1
3	Bihar ..	·07	·05	·10	·22	0·03	0·24	26·9
4	Gujarat ..	·07	·08	·12	·20	0·74	1·56	38·9
5	Jammu and Kashmir ..	·04	·04	·26	·41	0·20	0·36	35·2
6	Karnataka ..	·06	·06	·30	·31	0·49	1·62	54·8
7	Kerala ..	·04	·04	·18	·27	0·42	1·00	95·6
8	Madhya Pradesh ..	·07	·04	·14	·27	0·25	0·66	19·5
9	Maharashtra ..	·08	·08	·14	·16	1·02	1·81	56·5
10	Orissa ..	·06	·03	·22	·36	0·47	0·80	27·8
11	Punjab ..	·16	·12	·18	·39	1·17	1·58	100·0
12	Rajasthan ..	·09	·06	·23	·30	0·05	0·59	25·1
13	Tamil Nadu ..	·05	·05	·15	·30	0·78	1·37	98·6
14	Uttar Pradesh ..	·10	·05	·14	·19	0·25	0·65	29·2
15	West Bengal ..	·05	·04	·19	·14	0·60	0·92	28·3
16	Haryana ..	..	..	..	..	..	..	100·0
17	Himachal Pradesh ..	..	..	..	..	..	..	42·8
18	Meghalaya ..	..	..	..	..	..	..	7·4
	Average of the values ..	·07	·06	·16	·27	·45	·94	46·8
	Standard deviation ..	·11	·09	·26	·30	1·32	1·97	129·2

As the percentage co-efficients of variation exceed 100 these have not been presented here. Evidently the data requires much scrutiny, though they can be still be used to detect linkages with fertility. The very low development of these sectors are clearly visible from the figures.

For example, there were only 7 co-operative societies per 10,000 persons on an average in the States in 1971 with a co-efficient of variation of 157 per cent. In 1971, the situation did not improve to maintain the level in 1961 because the increase in the number of co-operative societies was below per with the increase in population. Decline in the proportion was noticed in the States

of Andhra Pradesh, Assam, Bihar, Madhya Pradesh, Orissa, Punjab, Rajasthan, Uttar Pradesh and West Bengal. There was increase only in Gujarat.

Regarding road mileage, there was, of course, an increase in the proportion from 16 to 27 per 10,000 persons though the standard deviation also increased. It is worth nothing that some of the States which were above average in 1961 like Andhra Pradesh and West Bengal became below average in 1971 though Andhra Pradesh could increase its proportion (In West Bengal, the proportion* declined.) *Other States which were above average could maintain that position or at least become equal to the average Jammu and Kashmir, Karnataka, Kerala, Orissa, Punjab, and Rajasthan fall in this group. The States which improved their position vis-a-vis the average are Tamil Nadu, Madhya Pradesh (reached the average in 1971) and Assam.†

In the case of electricity generated, the overall improvement is more than a doubling with slight decline in the large co-efficient of variation. Gujarat, Karnataka, Maharashtra, Punjab and Tamil Nadu stood above in 1961 and 1971. Kerala was slightly below average in 1961 but increased faster. Orissa and West Bengal had a less than average increase. Assam, Bihar, Jammu and Kashmir, Madhya Pradesh and Rajasthan were very poor as regards electricity generated, in 1961 and continued to be below average but could improve the generation substantially in 1971.

Kerala, Maharashtra, Punjab, Tamil Nadu, Haryana are above the average: of these Kerala, Tamil Nadu, Punjab and Haryana have 96 per cent or more villages electrified. It is not necessary here to point out the differences in the concepts underlying the variables adopted in 1961, 1971 and 1976 except that the generation figures per capita relate to rural and urban together which limits its applicability as a rural developmental variable though it may still reveal some linkages.

As regards general literacy in 1961, Kerala State topped the list with 48 per cent persons literate. Tamil Nadu (31.4) and Gujarat (3.0—30.5) follow with just above 30 per cent literacy while Maharashtra had nearly 30 per cent literacy and West Bengal 29 per cent literacy. In 1971 also Kerala topped the list with 60.2 per cent literates with the other States mentioned above following with above 30 per cent literacy. Punjab also showed a

---

* I may be remarked here that this phenomenon cannot be explored before the figures are scrutinised thoroughly and methodology of collection followed and checked.

† Here also in 1971, increase seems to be much larger which require thorough recording of data.

literacy above 30 per cent. The average literacy for these 15 States in 1961 and 24.7 and in 1971, 30.00 with co-efficient of variation 138 per cent and 136 per cent respectively. (The individual State figures are not given, as these are readily available in any relevant statistical and or census publication.)

Referring specifically to the Kerala Scene it is seen that the Co-operative sector was alone not showing up even near the average level. It was not however possible to get the district-wise breakup of the data. Only the number of villages electrified could be obtained. In 1961, the position was not good in the districts of Palghat, .Kozhikode and Cannanore (Malabar area) where only 50 per cent of villages were electrified. Ernakulam, Alleppey and Quilon had more than 75 per cent villages electrified in 1961. In 1971, Ernakulam, Alleppey, Trivandrum, Quilon had 98—99 per cent villages electrified and Trichur had 92 per cent villages electrified. Kottayam district of 1971 including all the highland villages which are now mostly in Idukki District had 87 per cent villages electrified. The Malabar Districts continued to lag behind, though in Palghat 70 per cent of villages were electrified. In 1976, the newly formed Idukki District (90 per cent) Cannanore (85 per cent) and Malappuram (83 per cent) are found to be behind the State average pattern. The co-efficients of variation declines from 103 to 21 from 1961 to 1976. The figures are given in the following table.

TABLE IV

Percentage of villages electrified in the Districts of Kerala in 1961, 1971 and 1976

Sl. No.	*Name of District*	*Percentage of villages electrified*		
		1961	*1971*	*1976*
1	Trivandrum ..	56·3	98	100
2	Quilon ..	75·5	98	100
3	Alleppey ..	75·8	99	100
4	Kottayam ..	58·4	87	100
5	Idukki ..	..	..	99
6	Ernakulam ..	79·4	99	100
7	Trichur ..	67·6	92	90
8	Palghat ..	47·3	70	95
9	Malappuram ..	..	..	83
10	Kozhikode ..	28·1	54	74
11	Cannanore ..	23·0	55	85
	Average ..	56·3	83·6	95·1
	Standard deviation ..	58·3	53·4	20·4
	Co-efficient of variation per cent ..	103	68	21

(c) Agricultural Practices.—Table V gives the relevant ratio under this head: Per cent of irrigated area out of gross cropped areas in 1961, 1971 and 1976 and ratio of area sown more than once to net area sown in the States in India in 1961 and 1971.

TABLE V

Per cent irrigated area and ratio of area sown more than once

Serial number	Name of State	Per cent irrigated area			Ratio of area sown more than once	
		1961	1971	1976	1961	1971
1	Andhra Pradesh ..	29·53	31·59	33·3	·10	0·14
2	Assam ..	23·80	20·51	18·4	·18	·24
3	Bihar ..	16·53	24·78	28·1	·37	·32
4	Gujarat ..	6·47	12·16	17·5	·06	·06
5	Haryana ..	..	..	53·6	..	..
6	Himachal Pradesh ..	..	..	16·5	..	..
7	Jammu and Kashmir ..	40·48	39·26	39·6	·19	·22
8	Karnataka ..	8·57	12·09	13·6	·04	·06
9	Kerala ..	22·25	20·20	21·5	·21	·35
10	Madhya Pradesh ..	5·18	7·21	8·3	·14	·11
11	Maharashtra ..	6·47	8·35	9 3	·06	·05
12	Meghalaya ..	..	..	28·3	..	..
13	Orissa ..	18·85	16·98	17·9	·08	·38
14	Punjab ..	39·83	56·33	80·8	·30	·40
15	Rajasthan ..	11·38	16·96	20 10	·09	·09
16	Tamil Nadu ..	42·30	45·69	46·7	·19	·18
17	Uttar Pradesh ..	26·23	34·66	40·3	·27	·31
18	West Bengal ..	22·44	22·53	20·0	·16	·19
	Average for the States ..	21·35	24·61	28·5	·15	·21
	Standard deviation ..	47·34	53·40	75·0	·36	·46
	Co-efficient of variation ..	221	216	263	240	219

Regarding irrigated area, the average show an increase. The following States show higher than average figures in all the years.

Andhra Pradesh, Jammu and Kashmir, Punjab, Tamil Nadu, Uttar Pradesh. Punjab has a remarkably high percentage under irrigation in 1976. Haryana has about 54 per cent. Assam, Kerala, West Bengal had higher than average irrigation in 1961 while Bihar had a higher figure in 1971. As regards area sown more than one compared to net area shown Assam, Bihar. Jammu and Kashmir, Kerala, Punjab and Uttar Pradesh show above average

ratios while Tamil Nadu and West Bengal showed higher figures in 1961. The ratio shows improvement in 1971 over 1961 in all States except Bihar, Madhya Pradesh, Maharashtra and Tamil Nadu. The co-efficients of variation of all the varieties under agricultural practices are very high.

The ratio of area sown more than once to net area sown in Kerala in 1961, 1971 and 1976 are given in Table VI.

TABLE VI

Ratio of area sown more than to net area sown in the District of Kerala

Sl. No.	*Name of District*	*Ratio of area sown more than once*		
		1961	*1971*	*1976*
1	Trivandrum ..	·33	·60	·63
2	Quilon ..	·24	·50	·66
3	Alleppey ..	·40	·43	·59
4	Kottayam ..	·11	·16	·35
5	Idukki ..	..	..	·07
6	Ernakulam ..	·10	·27	·35
7	Trichur ..	·56	·77	·79
8	Palghat ..	·32	·17	·47
9	Malappuram ..	..	·1	·30
10	Kozhikode ..	·12	·42	·20
11	Cannanore ..	·12	·22	·12
	Average ..	·26	·40	·41
	Standard deviation ..	·45	·60	·75
	Co-efficient of variation (per cent) ..	173	150	182

Trivandrum, Quilon (except for 1961) Alleppey, Trichur, Palghat (except in 1971) show higher figures while Kozhikode shows a higher figure only in 1971. The variation is very large in all the years. Almost steady increases are seen in all Districts except Palghat in 1971 and Kozhikode and Cannanore in 1976. Some amount of deterioration is noticed in the latter two districts in multiple cropping.

(d) Women's role.—As already said, the variable taken here are: female literacy percentage, mean age at marriage and ratio of non-agricultural workers to agricultural workers among females. The following table shows the figures in 1961 and 1971. As similar

data were not available for 1976, the number of women employed in organised sector per 1000 women in the estimated population in 1976 was considered for this purpose. The figures are given below:

TABLE VII

Literacy mean age at marriage ratio of non-agricultural to agricultural occupations in 1961 and 1971 and ratio in organised sector in 1976 among women in the states in India

Serial number	Name of State	Female Literacy percentage		Age at marriage		Ratio of non-agricultural to agricultural occupations among females		Nnmber of women in organised sector to 1000 women in the populaton
		1961	1971	1961	1971	1961	1971	1976
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh ..	12·0	15·8	15·12	15·94	·27	·29	5·37
2	Assam ..	16·0	20·0	18·52	18·21	·23	·16	28·20
3	Bihar ..	6·9	8·7	14·54	15·34	·16	·08	3·68
4	Gujarat ..	19·1	24·8	16·77	17·86	·21	·20	3·20
5	Haryana ..	..	..	..	..	..	..	6·54
6	Himachal Pradesh ..	..	..	..	..	..	..	9·39
7	Jammu and Kashmir ..	4·3	9·3	15·89	17·25	·17	·26	5·03
8	Karnataka ..	14·2	21·0	16·01	17·33	·22	·29	7·64
9	Kerala ..	38·9	54·3	19·91	20·74	·05	·39	26·54
10	Madhya Pradesh..	6·7	10·9	14·01	14·66	·12	·10	4·55
11	Maharashtra ..	16·8	26·4	15·10	16·56	·13	·16	10·91
12	Meghalaya ..	..	..	..	..	..	..	11·25
13	Orissa ..	8·6	13·9	16·45	17·15	·37	·28	2·56
14	Punjab ..	14·1	21·1	17·21	18·33	·25	·29	9·23
15	Rajasthan ..	5·8	8·5	14·41	15·02	·13	·13	4·49
16	Tamil Nadu ..	18·2	26·9	18·23	19·03	·41	·30	11·32
17	Uttar Pradesh ..	7·0	10·6	14·46	15·09	·19	·14	3·02
18	West Bengal ..	17·0	22·4	15·20	16·78	·47	·45	9·46
	Average ..	13·7	19·6	16·12	17·04	·29	·25	9·30
	Standard deviation ..	32·1	43·5	0·47	6·97	·88	·58	29·54
	Co-efficient of variation (%) ..	234	221	40	40	302	232	·7

Literacy of females shows very wide variations among the States in India. In 1961 the average was only 13.7 per cent. This increased to 19.6 in 1971. Only a few States have high rates of literacy among females. Kerala is the topmost, among them. Other States which are to be mentioned here are Gujarat, Tamil Nadu and West Bengal followed by Assam, Maharashtra, Punjab and Karnataka.

Considering the ratio of women workers in non-agricultural occupations compared to agricultural occupations, it is seen that the figures are mostly less than .29 the average in all except Kerala (where it is above 1) West Bengal, Tamil Nadu, and Orissa in 1961. In 1971 the ratio has declined at the all India level showing thereby that there was a shift to agriculture. The States mentioned above and the States of Andhra Pradesh, Jammu and Kashmir, Karnataka and Punjab had above average ratios. Decline in rates occurred in all States except Andhrapradesh, Jammu and Kashmir, Karnataka, Maharshtra and Punjab. It is noteworthy that in Kerala the percentage has declined to 69 from 105. Whether the change is real or due to misclassification cannot be ascertained.

Regarding the number of women in the organised sector per 1000 women in the population, it is seen that Assam tops the list with 28.20 per 1000 followed closely by Kerala. Workers in plantations naturally fall in this group along with these in industries and services.

The mean age at marriage of females shows only 40 per cent variations while between 1961 and 1971 the averages increased only by .92. Kerala, Assam, Tamil Nadu and Punjab have somewhat higher mean ages at marriage compared to others.

Coming to the Districts of Kerala, we have values for the two variables: female literacy in the rural areas and ratio of non-agricultural to agricultural workers in the rural areas; we can also use the available information on daily wage-rates of female unskilled workers in the construction sector; The figures for 1961 and 1971 are shown in Table VIII. For 1976, only the daily wage rates of female labourers in the paddy fields are available and they have been used for the analysis.

TABLE VIII

Female literacy ratios of female non-agricultural workers to agricultural workers and wage rates in the Districts of Kerala

Serial number	Name of District	Female literacy percentage (Rural)		Ratio of female non-agricultural workers to agricultural workers (Rural)		Unskilled labour in construction		Daily wage of female paddy field workers
		1961	1971	1961	1971	1961	1971	1976
1	2	3	4	5	6	7	8	9
1	Trivandrum ..	40·45	54·60	1·9	1·6	1·06	3·18	6·06
2	Quilon ..	50·40	39·60	1·8	2·4	1·74	4·00	5·75
3	Alleppey ..	57·65	65·90	1·5	0·8	2·43	4·25	5·88
4	Kottayam ..	58·21	62·70	0·4	0·3	2·55	3·71	5·06
5	Idukki ..	..	..	..	..	..	..	5·57
6	Ernakulam ..	48·55	58·60	0·9	0·7	1·95	4·15	6·29
7	Trichur ..	47·87	56·10	1·2	0·6	1·80	3·14	5·32
8	Palghat ..	29·94	37·90	0·4	0·2	1·14	2·46	5·21
9	Malappuram ..	..	..	..	..	..	..	5·71
10	Kozhikode ..	33·21	43·30	1·0	0·3	1·37	3·87	7·00
11	Cannanore ..	33·99	45·70	0·5	0·3	1·57	3·70	5·39
	Average ..	44·47	53·82	1·1	0·8	1·73	3·31	5·75
	Standard deviation ..	29·83	26·77	1·6	2·1	1·47	1·63	1·76
	Co-efficient of variation ..	67	49	145	262	84	46	30

Between 1961 and 1971, there has been substantial improvements in female literacy in all Districts though Malabar District continued to be below average. In 1971, nearly 50 per cent of the females in the State were literate. Alleppey and Kottayam District top the list with 66 and 63 per cent respectively.

The ratio of non-agricultural workers to agricultural workers among females show a pattern which is quite distinct from others. Even in Districts where non-agricultural workers were more among females compared to agricultural workers in 1961 only Quilon showed an increase in 1971, the ratio decreased in 1971 in Trivandrum slightly in Alleppey to nearly half, in Kottayam, in Ernakulam, in Trichur and Palghat half, in Kozhikode to a third and in Cannanore to 60 per cent. The variation is also very high. Regarding wages in construction sector, there has been a doubling except in Alleppey Kottayam and Trichur Districts between 1961

and 1971. But the rate was reported as very high in Alleppey. In 1976 the daily wages of paddy field workers (females) are seen to be much higher when compared to the 1971 wages in the construction sector. The variation is very small. Kozhikode Ernakulam and Trivandrum Districts give high figures of rates.

6. *Correlation and state-wise regression analysis.*—Separate analysis has been made for 1961, 1971 and 1976 with the States as units and with the Districts of Kerala as units. Of these, the variables differ in 1976 as compared to 1961 and 1971. Two dependent variables (Birthrate and general fertility rates) have been adopted for the State-wise analysis in 1961 and 1971 while for 1976 only one dependent variable has been used. For the Districts of Kerala, information on only the child-woman ratio was used. These various types will be discussed separately in the following paragraphs. All the correlation metrices are appended.

State-wise data analysis with general fertility rate/Birthrate as dependent variable.—The following table shows the variables which have major contribution to make in explaining the variations in general fertility rate in 1961 and 1971 along with their contribution and total variations explained by all the variables. As already pointed out, the results with age at marriage as a variable and without are obtained.

TABLE IX A

Results of State-wise regression analysis General Fertility Rate as dependent variable

		Model variable and their contributions (cumulative percentage)	Conributions individual additional contribution	Multiple correlation Co-efficient
1	2	3	4	5
Including age at marriage as an independent variable	Co-operation ..	23·82	23·82	..
	Age at marriage* ..	24·02	0·20	..
	Irrigation ..	30·50	6·48	..
	Female literacy ..	37·47	6·97	..
	General literacy ..	44·52	7·05	..
	Non-agricultural to agriculture ..	46·78	2·26	..
	Multiple cropping ..	51·86	5·08	..
	Electrification ..	53·13	1·27	..
	Road mileage ..	53·42	0·29	·73

* Significant at 5 per cent level.

TABLE IX A—(*cont.*)

1	2		Model variable and their contributions (comulative percentage)	Contributions individual additional contribution	Multiple correlation Co-efficient
Excluding age at marriage	Co-operation	..	23·82	23·82	..
	Female litracy	..	23·97	0·15	..
	Non-agricultural to agriculture	..	29·99	6·02	..
	Electrification	..	45·07	15·08	..
	General literacy	..	45·55	0·48	..
	Irrigation	..	45·82	0·27	..
	Multiple cropping	..	46·45	0·63	..
	Road mileage	..	46·56	0·11	·68

Interestingly the 1961 data of the States in India show that co-operation explains a large part of the variation. Four other variables, irrigation Female literacy, General literacy and multiple cropping have substantial contributions in the first model while electrification and ratio of non-agricultural to agricultural female workers have major contributions to make in the second model (excluding age at marriage).

TABLE IX B

Birth rate as dependent variable 1971

Model	*Variable*		*Commulative percentage contribution*	*Individual contribution*	*Multiple correlation co-efficient*
Including age at marriage					
Road milege			6·32	6·32	..
General literacy		..	30·44	24·12	..
Female literacy		..	31·96	1·52	..
Non-agricultural to Agricultural		...	34·58	2·62	..
Multiple cropping		..	35·07	0·49	..
Age at marriage		..	36·09	1·02	..
Electrification		..	38·29	2·20	..
Irrigation		...	38·31	0·02	..
Co-operation		...	38·32	0·01	0·62

TABLE IX B—(*cont.*)

Model	*Variable*	*Commulative percentage contribution*	*Individual contribution*	*Multiple correlation co-efficient*
Excluding age at marriage				
	Road mileage ..	6·32	6·32	..
	General literacy ..	30·44	24·12	..
	Female literacy ..	31·96	1·52	..
	Non-agricultural to Agriculture ..	34·58	2·62	..
	Multiple cropping ..	35·07	0·49	..
	Electrification ..	37·47	2·20	..
	Irrigation ..	37·58	0·11	..
	Co-operation ..	37·58	0·00	0·6

General literacy has the large contribution followed by road mileage. Age at marriage does not have any significant effect.

TABLE IX C

Birth rate as dependent variable

Model	Rank of variables 1961	Comulative variation	Percentage of explained	Individual additional variation explained (%)	Multiple correlation co-efficient
1	2	3	4	5	6
Including age at marriage	Co-operation ..	22·14	..	22·14	..
	Irrigation ..	27·21	..	25·15	..
	Age at marriage ..	52·72	..	5·43	..
	Road mileage ..	65·54	..	12·82	..
	Electrification ..	71·07	..	5·53	..
	Non-agricultural to agriculture ..	72·77	..	1·70	..
	Multiple cropping ..	72·87	..	0·10	..
	Female literacy ..	72·94	..	0·07	..
	General literacy ..	72·95	..	0·01	·85
Excluding at marriage	Co-operation ..	22·14	..	22·14	..
	Irrigation ..	47·29	..	25·15	..
	Road mileage ..	63·54	..	16·25	..
	Electrification ..	66·21	..	2·67	..
	Multiple cropping ..	66·40	..	0·19	..
	General literacy ..	67·50	..	1·10	..
	Non-agriculture to agricultural ..	67·52	..	0·02	..
	Female literacy ..	73·42	..	5·90	·86

The significant contributions here are from irrigation co-operation, road mileage, electrification and age at marriage. If age at marriage is excluded, female literacy also comes into explain nearly 6 per cent variation.

TABLE IX D

1971

Model	*Fertility as dependent variable*			
(1)	(2)		(3)	(4)
Including age at marriage	Non-agricultural agricultural	to	32·38	32·38
	Female literacy		32·57	0·19
	General literacy		35·38	2·81
	Co-operation		36·39	1·01
	Electrification		37·39	1·00
	Age at marriage		49·52	12·13
	Road mileage		50·51	0·99
	Multiple cropping		51·88	1·37
	Irrigation		52·35	0·47 ·72
Excluding age at marriage	Road mileage		6·27	6·27
	Non-agricultural agricultural	to	37·45	31·18
	General literacy		40·56	3·11
	Female literacy		45·12	4·56
	Electrification		45·22	0·10
	Co-operation		48·51	3·29
	Multiple cropping		50·04	1·53
	Irrigation		50·05	0·01

In 1971, the significant contributions are by the ratio of non-agricultural female workers to agricultural female workers and age at marriage but if age at marriage is excluded, road mileage and literacy (General and female) and co-operation come in but with not much contribution (less than 5 per cent each).

In 1976, the total variation among the State rural birth rates explained by the three variables come to only 37.74 per cent with multiple correlation co-efficient equal to .61. Electrification explains 15.25 per cent of variation and is ranked as number one variable. *Ratio of women employed in the organised sector explains 17.92 per cent* and irrigation explains 4.57 per cent of variation.

7. *Discussion of results.*—Variations in birth rate are explained by road mileage in 1961 and 1971 supported by general literacy in 1971 and by co-operation and irrigation in 1961. Age at marriage, female literacy and ratio of non-agricultural to agricultural female workers also contribute in 1961. As regards fertility, co-operation is a major variable in 1961 while ratio of non-agricultural to agricultural female workers is the major variable in 1971 supported by age at marriage, road mileage; female literacy, co-operation and general literacy replace age at marriage. It is therefore clear that all the three groups of variables have linkages with fertility or birthrate but the exact nature of the linkage differs with year and fertility index.

In 1976 also, though the total variation explained is only 38 per cent in birthrate, electrification (rural development) female employment in the organised sector (women's role) and irrigation (agricultural practices) are having significant contributions. It may be remarked here that the evidence can be termed as conclusive only after further analysis. It is also noteworthy that the co-efficient of variation are very large in most cases and hence the analysis has to be done after stractification. It is also necessary to scrutinise all the data before the analysis is taken up as they are at different levels of accuracy in the various State. More relevant variables can be introduced if data are available so that a large percentage of variation in fertility are explained.

8. *Results of analysis of district-wise data of Kerala State.*—The following table gives the contributions of the variable in explaining the variations in child-woman ratios in Kerala in 1961, 1971 and 1976.

TABLE X

Contribution of the variables (additional contributions for the variables except the first)

Serial No.	Variables	Rank	1961 Individual contribution (per cent)	Rank	1971 Individual contribution (per cent)	Rank	1976 Individual contribution (per cent)
1	2	3	4	5	6	7	8
1	Multiple cropping ..	1	23·93	5	0·01	2	20·17
2	Rural female literacy ..	2	21·67	2	0·90		data not available
3	Wage rate of female unskilled worker in construction sector (female) ..	3	34·86	3	0·91	3	1·07
4	Percentage of villages electrified ..	4	2·80	1	73·20	1	24·70
5	Ratio of rural non-agricultural workers to agricultural workers (female) ..	4	1·05	4	0·51		data not available
	Total variation explained ..	..	84·31	..	75·53	..	45·94
	Multiple correlation co-efficient ..	..	·91	..	·87	..	.68

It is seen that in 1961, 84 per cent of variation is explained of which female rural wage rates explain nearly 35 per cent additionally. Multiple cropping explains 24 per cent and female literacy 22 per cent additionally. Rank 1 is for multiple cropping Thus except for rural development variable (electrification) all others have sufficiently high contribution. In 1971, 76 per cent of variation is explained. Here electrification explains 73 per cent of variation and all others are insignificant. In 1976 also electrification (25 per cent) is having high rank, followed by multiple cropping (20 per cent).

The analysis shows clearly the influences of the three sets of variables but with varying emphasis. In recent years rural development seems to except a large influence.

9. *Limitations and need for further research.*—The data regarding the states in India used in this analysis cannot be said to be absolutely reliable. No checking of the data could be done. Also information on other variables which may have sufficient influence on fertility is lacking. Because of the limitations of data or otherwise the results do not show any firm pattern. But it may be remarked here that at the present levels of development in India, the linkages may not be clearly brought out though there are evidences of the influences of the variables on fertility. Further research in this area is needed to unroyal any pattern they may be existing. The present attempt can however be considered as a beginning in this direction.

Such sophisticated techniques as step-wise regression may not also be required for detection of linkages among the sets of variables.

ACKNOWLEDGMENTS

The author wishes to acknowledge the services of M/s Purushothaman Nair and M. N. Rajan for helping in the computerisation of the data and of Smt. Syamala and Shri K. Divakaran Pillai for collection of necessary data. The typographical assistance of Smt. Lalithakumari and Smt. Indira are also gratefully acknowledged.

In the recent years, the sample registration estimates have shown some more decline and the rate in the rural areas in 1977 has been put at 34.2 and in the urban areas at 27.8 (provisional) giving a combined estimate of 32.9 for all India(28).

The estimates of birth rate in the State follow the declining trend pointed out above but with major differences among them. The following table gives the rates in 1951-56 (referred to as 1961 rates) 1971 and 1976 in respect of the 15 major States in India along with the general fertility rates. In 1971 and 1976. rural rates are shown; the arithmetic mean of the rates, the standard deviation and the co-efficient of variation are also given.

(28) Registration General of India "Sample Registration Bullettin" New Delhi 1978

PAPER TEN

REGIONAL DEVELOPMENT AND FERTILITY CHANGES—A CASE STUDY OF KERALA

By

P. S. GOPINATHAN NAIR,

Deputy Director, Directorate of Economics and Statistics, Trivandrum-1, Kerala.

I. *Introduction.*—The present State of Kerala was formed in 1956, as a result of the reorganisation of States on a linguistic basis. Prior to 1956, the area constituting the present four northern districts of the State, was known as Malabar. This was part of the then Madras Presidency. The remaining 7 districts consisted of two princely States—namely Cochin and Travancore—which had already been integrated earlier in 1949.

The State of Kerala is small in size, with an area of only 38864 sq. km. But there are certain unique features, which make the State different from other States. Of these, special mention may be made of the scattered dwellings each with its own compound, as against the cluster of houses, which is so characteristic of other Indian States. The majority of the population live in villages, which are modernised, having amenities like electricity, school, roads etc. The social structure was marked by the system of matriliny (mother-right or what is locally known as Marumakkathayam) which is rapidly giving way to modern influences. The percentage of workers in manufacturing industries is low indicating the low level of industrial activities. But the near monopoly of valuable cash crops, the abundant marine and forest wealth, the huge potential of hydroelectric power, and the plentiful manpower are the real assets of the State which could be fully exploited to advantage.

Some of the distinctive demographic features compared to other States of India, which deserve special mention are the comparatively higher population growth rate during all the Census decades from 1901 to 1971, highest density among the States of India, the fact that the number of females exceed males during every Census, higher expectation of life at birth for females, higher average age at marriage of females, and the lowest death rate. The literacy level is the highest, including that of females. Provision of health services has made tremendous progress. This together with the traditional cleanliness of the people, has brought

down the mortality level to something comparable to that of the advanced countries of the world. Table I provides a comparison of Kerala with other States of India, in respect of some of the above features.

Against the above broad picture of the State, there are noticeable differences within the State between the Northern and the Southern Zones. For the purpose of this study, the four northern districts of the State namely Cannanore, Kozhikode, Malappuram and Palghat—constitute the Northern Zone and will hereafter be referred to as Malabar. The remaining seven districts —namely Trivandrum, Quilon, Alleppey, Kottayam, Idukki, Ernakulam and Trichur—form the Southern Zones and will be referred to as Travancore-Cochin (T. C.). For historical, political and administrative reasons, the pace of development of Malabar has not been keeping up with that of Travancore-Cochin. The benevolent and farsighted administration of the two former princely States of Travancore and Cochin, gave this area an earlier start in economic and social development, long before the planned efforts of post-independence era. This has helped in accelerating the momentum of development of Travancore-Cochin area during the years after independence, resulting in imbalances with the Malabar area. Inspite of the concern often expressed and the measures adopted in favour of Malabar, differences in the levels of development between the two zones continue to exist.

An earlier study classifying the then nine districts of the State based on a large number of socio-economic variables has conclusively proved that the districts in the Malabar region are economically and socially backward, as compared to the districts in Travancore-Cochin Studies at All India Level, classifying the districts of India, have also shown the relative backwardness of the northern districts of the State vis-a-vis the southern districts, though these studies suffer from an important limitation, so far as Kerala is concerned—namely that the districts of Kerala are ranked more or less in one category. Besides, the data for all the above studies relate to 1961. Since then, the relative input of developmental efforts favouring the advancement of Malabar, would have changed the nature of regional differences in several ways. However, no attempt will be made in this study to rank or classify the individual districts; instead the districts are clubbed into two zones for the purpose of analysis and comparison.

II. *What this study is about.*—This study attempts to present the differences in the levels of development between Malabar and Travancore-Cochin areas of the State by considering some of the important socio-economic and demographic variables. This will be followed by a presentation of the level and pace of decline of fertility as indicated by birth rates of the two regions, as far as data permit. An attempt is also made to find out the influence of some selected socio-economic variables on birth rate, by working out the simple and multiple correlations for the two regions separately, so as to identify the probable developmental variables that could have influenced the decline in birth rate.

Incidentally, the differences in birth rate between the three well marked natural regions of the State namely Highland, Midland, and Lowland—will also be indicated, though no attempt will be made in this study to find out the relationship of these differences with the differential development of these natural regions.

III. *Sources of data and their limitations.*—The data used are from Census, the Economic Review of Kerala for several years, and the various Statistical Publications of the Bureau of Economics and Statistics. The data on each item for the Malabar and Travancore-Cochin areas, have been obtained by consolidating the district-wise data. As for the data on fertility difference between the two zones, the main source is the Sample Registration Scheme (SRS) which is implemented in the State from 1965-66 onwards. The birth rates over the years for Malabar and Travancore-Cochin areas have been estimated from the birth rates of the Sample Registration Scheme, sample villages in each zone. Of the 150 sample villages selected for Sample Registration Scheme from the State, 72 (48 per cent) are from Malabar and 78 (52 per cent) are from Travancore-Cochin. Thus, the number of samples from each area is large enough, for the estimates of each area to be considered valid, even though the sample design of Sample Registration Scheme is not meant to obtain separate estimates of these two zones. Further, it may also be remarked that of the total sample population covered by the Sample Registration Scheme in the State in 1974, 48.8 per cent is from Malabar and 51.2 per cent from Travancore-Cochin area. Thus the sample size of each zone conforms to the original sample design of allocating the samples in proportion to the population. Hence, even the separate estimates could be considered as valid from a theoretical point also. Besides, the co-efficients of variation of the mean birth rates obtained for Malabar and

Travancore-Cochin areas also testify the validity of the estimates These are given in Section V. Another limitation of using the Sample Registration Scheme data, is that the Sample Registration Scheme birth rates relate to the rural areas of the State, whereas the data on socio-economic variables relate to the rural and urban areas. But considering the fact that the rural urban differences in Kerala are very little and that 84 per cent of the population live in rural areas, the effect of this limitation could be very little. It may also be added that Sample Registration Scheme is subject to normal sampling fluctuations and non-sampling errors of a sample survey like this.

IV. *Difference in the levels of Development—Malabar and Travancore Cochin areas—Malabar.*—The three natural regions mentioned above have their own distinctive characteristics in altitude, rainfall, soil conditions etc. These natural regions cut across both Malabar and Travancore-Cochin areas. The Malabar area consists of 45 per cent of the State and 37.5 per cent of the State's population, which comes to 80.1 lakhs (1971). The percentage of area under the lowland and proportion of population in the lowland, are very low—just 5 per cent and 13 per cent respectively. The density is only 459 per sq. km., which is lower than that of the State and Travancore-Cochin area. The sex ratio of 1024 females per 1000 males is higher in this area. The growth of population of this area during the seventy year period (1901-1971) is 177 per cent, as against the State's growth of 233 per cent during the same period.

Travancore-Cochin.—The Travancore-Cochin area consists of 55 per cent of the State's area. The population of this area is 133.4 lakhs (1971 Census) and accounts for 62.5 per cent of the State's population. Quite unlike the Malabar area, 15 per cent of the Travancore-Cochin area is under low-land, with its high density of population. Almost 34 per cent of the population is in the lowland region. The density is 623—much higher than State's, 549 per sq. km. The sex ratio of 1012 is slightly less than that of the State. The growth of population of the Travancore-Cochin area during the seventy years of the present century (1901-71) is 280.5 per cent—much higher than that of the State.

Differences between the two areas.—In the matter of socio-economic development, significant differences between the two areas are noticeable. The female literacy rate in Malabar (44 per cent) is less by 16 per cent as compared to Travancore-Cochin. In respect

of the percentage of male literacy also, the position of Malabar area is less by 10 per cent. The religious composition shows a substantial percentage of Muslims (34 per cent) in Malabar and a small proportion of Christians. Just the reverse is the position in Travancore-Cochin area, where Christians form a sizeable proportion (30 per cent) with a low proportion of Muslims. The percentage of agricultural labourers among the workers in the Malabar area is 10 per cent more than that of the Travancore-Cochin area. The relatively low position of manufacturing industry in Malabar is evident from the number of workers in manufacturing industries per 1000 population, which is 39 as against 50 for Travancore-Cochin area. This difference is all the more great, when the number of workers in registered factories per one lakh population is considered. It is only 474 for Malabar and 1266 for Travancore-Cochin area.

The relative backwardness is also reflected in transport facilities and in power consumption. As against 34 kilometer of roads per 1000 sq. km. in Malabar, the figure for Travancore-Cochin area, is 61. There is only small difference in the matter of Post Office facilities. The degree of modernisation, as reflected in the number of motor vehicles per one lakh population (297 for Malabar and 450 for Travancore-Cochin) and the number of radio sets per one lakh population (1192 for Malabar and 1379 for Travancore-Cochin) shows, glaring differences between the two regions. In the matter of the number of consumers of electricity per one lakh population and per capita consumption also, the differences between the two zones are considerable. While there are 2308 consumers per one lakh population in the Malabar area, there are 3714 in Travancore-Cochin; similarly as against 5.2 kwh of domestic consumption per capita in Malabar, the corresponding figure for Travancore-Cochin area is 8.5 While 98.3 per cent of the rural population live in electrified villages in Travancore-Cochin area, the corresponding percentage for Malabar is only 60.

In the matter of provision of health services also, the difference between the two areas of the State, is marked. The number of hospital beds (modern and indigenous medicine) per one lakh population is 141 for Travancore-Cochin as against 85 for Malabar. The inequality is also reflected in the number of medical institutions per 100 sq. km. which is 3.5 for Travancore-Cochin and 2.5 for Malabar. Difference in educational advancement is also marked.

While there are only 2494 high school students per one lakh population in Malabar (1973-74) the corresponding figure for Travancore. Cochin area is 4359. Table II provides the data for both the areas and the State, for some of the socio-economic indicators.

V. *Differences in the level and decline of fertility between Malabar and Travancore-Cochin.*—Separate estimates of birth rates for the two zones before the introduction of Sample Registration Scheme are scanty, and even the available data are not strictly comparable due to differences in the methods of estimation and the lack of uniformity in periods of reference. Hence only a passing reference will be made of these data, -without trying to discuss their reliability. The differences in fertility level and decline, between the two areas will be mainly brought about by the Sample Registration Scheme data on birth rates for the past one decade.

In the census report of 1931, the birth rate of Travancore for the decade 1921-30 has been estimated as 41.5.(1) According to the census report of 1931 of Madras, the registered birth rate of the West Coast Region (which includes Malabar) for the year 1930 is 44.2.(2).

On the basis of indirect evidences, it has been estimated in another study(3), that the death rate in Malabar during 1951-60, was around 23, as against 12 in Travancore-Cochin during the same period. In the same study it is also mentioned that "the infant mortality in Kerala was estimated at 210 per 1000 live births for the period 1921-30, while the Vital Statistics enquiry found it to be only 120 in Travancore in 1930"(4). As high death rate and infant mortality rate usually go hand in hand with high birth rate, it is only reasonable that the birth rate also would have been higher in Malabar than in Travancore-Cochin. The Sample Registration Scheme birth rates since 1967 also show differences ranging from 2.5 to 8.7 points during all the years. The birth rates are higher for Malabar area as compared to Travancore-Cochin.

---

(1) Census of India—1931, Volume XXVIII—Travancore Part I Report—Page 33.

(2) Census of India—1931, Volume XIV—Madras Part I Report—Page 125.

(3) T. N. Krishnan, "Health Indicators and Demographic Trends", in Poverty, Unemployment and Development Policy" by the Centre for Development Studies, Trivandrum 1975, Page XI—5.

(4) Ibid—Page XI—5.

The gap in birth rate between the two zones has widened since 1970. As already mentioned in Section III, the validity of these separate estimates could be judged by the co-efficient of variation of the mean birth rates for the latter four years (1971-74) given along with Table III.

Besides the birth rates, the General Fertility Rate (GFR) for the two zones has been estimated for, three years 1973 to 1975 for which period detailed data could be goat. The General Fertility Rate for Malabar area for the three years 1973, 1974 and 1975 are 132.0, 117.5 and 121.6 respectively; for Travancore-Cochin area the corresponding figures are 103.0, 91.4 and 92.5. This, again confirms the difference in fertility between the two zones. Thus, the available data conclusively prove that during the past one decade, the two zones are at different levels of fertility and that this difference continues.

There is considerable variation in the extent of decline between the two zones, during the period 1967 to 1975. The birth rate decline in Malabar is 16.4 per cent, as against 23.8 per cent in Travancore-Cochin area. The 1975 birth rate of Malabar is very near the rate of Travancore-Cochin in the 1967. The General Fertility Rate also indicates the continuing difference between the two zones even in 1975.

VI. *Relation of some selected variables on birth rates in Malabar and Travancore-Cochin areas.*—The difference in the level of fertility and the pace of decline in each of the zones may be the result of quite a number socio-economic and demographic variables which interact on each other. Only three variables have been selected here to find out the inter-relationship of the change in birth rate decline. Though other variables have not been considered here, their influence could be important, especially the interaction of reduced mortality rates on birth rates, female literacy etc., each of which have different levels in the zones.

The matrix of correlation co-efficients and the multiple correlation of the selected variables have been worked out for each zone separately so as to explain the individual, and joint effect of the selected variables on birth rate.

The variables selected for analysis are the number of medical institutions per 100 sq. km. areas, equivalent sterilisations (No. of sterilisations plus one third IUD) per 1000 population, and the

number of high school students per one lakh population. Even though the number of beds per one lakh population, and the number of medical institutions per 100 sq. km. are highly correlated positively (0.61 and 0.81 for Malabar and Travancore-Cochin respectively) the latter has been selected for the analysis, as this would probably take into account at least partially the effect of the spatial distribution of medical facilities. Similarly, the number of high school students per one lakh population, rather than the total number of school going population has been considered, as it has been brought out in some other studies that at least an educational attainment upto the high school level alone has a significant effect on fertility.

For the purpose of this analysis, the period covered is ten years from 1965-66 to 1974-75. It is pertinent to note the significant differences between the two zones in the levels of attainment in respect of these selected variables at the beginning and the end of the period selected.

No. of medical institutions per 100 sq. km.		No. of equivalent sterilisations per 1000 population		No. of high school students per one lakh population	
Malabar	T.C.	Malabar	T.C.	Malabar	T.C.
1	2	3	4	5	6
1965–66					
1·28	2·35	1·75	5·59	1862	4018
1974–75					
3·25	4·11	2·23	5·76	2815	4768

It may be seen that in the matter of high school education, the Malabar area, even in 1974-75 is far behind the level, which Travancore-Cochin area had attained, even ten years back. Similarly the rate of sterilisations per annum done in Malabar area even in 1974-75 is only less than half the rate in Travancore-Cochin in 1965-66. In the matter of medical institutions there has been a better levelling up in Malabar area during the ten year period.

The correlation matrix for each zone is given in Table IVA and IVB.

The inverse correlation between the health and education variables considered here, and birth rate is highly significant in both Malabar and Travancore-Cochin areas. But the significance of the family planning variable is not so significant.

The multiple correlation co-efficients (R) and the contributions (R2) of the groups of variables studies, on birth rate decline for the two zones, are separately given below:

	Malabar		*Travancore-Cochin*	
	R2	*R*	*R2*	*R*
(1)	(2)	(3)	(4)	(5)
All the 3 variables together ..	0·94	0·97	0·94	0·97
Medical institutions per 100 sq. km. and equivalent sterilisation per 1000 population ..	0·81	0·90	0·93	0·97
Medical institutions per 100 sq. km. and high school students per one lakh population ..	0·85	0·92	0·90	0·95
Equivalent sterilisations per 1000 population and high school students per 1 lakh population ..	0·46	0·68	0·49	0·71

It is seen from the above that in both the zones, 94 per cent of the variation in birth rate is explained by the three variables together.

The individual effect and joint effect of the three variables on birth rate are as follows:—

	Malabar	*Travancore-Cochin*
(1)	(2)	(3)
Individual effect of medical institutions per 100 sq. km. on birth rate ..	0·48	0·45
Individual effect of equivalent sterilisations per 1000 population on birth rate ..	0·09	0·04
Individual effect of high school students per 1 lakh population on birth rate ..	0·13	0·01
Joint effect of the above three variables on birth rate ..	0·24	0·44

It may be seen that the number of medical institutions per 100 sq. km., is the one single factor having the maximum effect on the birth rate decline (48 per cent for Malabar and 45 per cent for Travancore-Cochin). The individual effect of the educational variable considered here, is 13 per cent in Malabar but only 1 per cent in Travancore-Cochin. This may be due to the great strides made in Malabar area during the period considered here, while Travancore-Cochin area had already reached a very high level even in 1965-66 (the beginning of the period considered) so that the progress since then is not as fast as in Malabar. The analysis made here shows that the individual effect of equivalent sterilisation per 1000 population is 9 per cent in Malabar and 4 per cent in Travancore-Cochin. This again may be due to the higher increase in the rate of sterilisation attained in Malabar from the base year (from 1.75 on 1965-66 to 2.23), as compared to more or less steady rate in Travancore-Cochin during the period (5.59) in 1965-66 to 5.76 in 1974-75).

The joint effect of the three variables is much higher in Travancore-Cochin area than in Malabar—may be because of the much higher levels reached in respect of all three variables so as to exert a more effective influence in bringing down the birth rate.

VII. *Difference in birth rate between the three natural regions.*—As mentioned in Section II, this will be just indicated, as Sample Registration Scheme birth rate data for these natural regions are readily available. These show considerable variations between the regions.

It may be seen from the Table that the birth rate is highest in the highland and lowest in the lowland, consistently for all the years. It may incidentally be mentioned that both the death and infant mortality rates are also highest in the highland and lowest in lowland. The differences in the levels of mortality among these three natural regions have been brought out in a study by working out separate life tables for each region.

Though the purpose of this paper is not a study of the inter relationship of birth rate changes and developmental factors among these regions, a brief indication of the relationship of one of the three variables analysed in the above section, will be illuminating and will lend support to the conclusions that have emerged from the above analysis. The health facilities in the three natural

regions show large differences. For instance, the number of beds per one lakh population in 1970-71, in the lowland, midland and highland are 142.0, 87.0 and 46.0 respectively; and the average area covered by a medical centre is 29.4 sq. km. in lowland, 65.4 in midland and 101.9 in highland.(5).

The number of beds per one lakh population in the highland region (where both fertility and mortality are the highest among the three natural regions) in 1970-71 is less than one third of the number in the lowland region. Added to the relative paucity of beds, the difference in the area covered by medical centres is also staggering. Whereas, one medical centre covers only 29 sq. km. in the lowland, the corresponding figure for highland is 102 Sq. km. Thus, both the availability of beds and the spatial distribution of medical institutions in the highland region are far below that in lowland.

VIII. *Conclusions and Implications.*—It is evident from the above paragraphs, that the level of development in all respects is much lower in Malabar as compared to Travancore-Cochin area. This was so in earlier periods and at the beginning of the period considered here namely 1965-66. As already pointed out in Section III, the difference between the two zones is seen in respect of agricultural and industrial development as well as in the provision of infrastructure in respect of transport, power etc,, and other indicators of modernization. Though, of late, the gap is getting narrowed in some respects, glaring disparities continue to exist even in 1974-75. For instance, in respect of the crucial variable viz., health facilities the number of medical institutions per 100 sq. km. in Travancore-Cochin was higher by 84 per cent than in Malabar in 1965-66 and the number of beds per one lakh population was higher by 92 per cent. These disparities came down to 26 per cent and 58 per cent respectively by 1974-75, indicating faster development during the years 1965-66 to 1974-75 in the Malabar area. Similarly, in respect of high school level education, the position in Travancore-Cochin area in 1965-66 was 116 per cent higher than in Malabar and this came down to 69 per cent by 1974-75. Thus, the two zones were at vastly different levels of socio-economic development at the beginning of the period considered here, and inspite of faster development in Malabar during the period, differences between the two zones continue to exist.

---

(5) T. N. Krishnan "Health Indicators and Demographic Trends", in poverty, Unemployment and Development Policy by the Centre for Development Studies, Trivandrum 1975.
Ibid—Page XI—12.

Almost corresponding to the above differences in the level and pace of development in the two zones, fertility as indicated by birth rates shows difference between the two zones, the zone with lower level of development having higher birth rate and vice versa. Inspite of the gap getting narrowed in respect of health and educational variables considered here, the difference in birth rates between the two zones continues. This may be due to the carry over effect in future years of the higher levels of development attained in earlier years in Travancore-Cochin area, and the fact that in spite of faster development during the period, Malabar area in 1974-75 has not yet reached the level of Travancore-Cochin area. The pace of development and decline in fertility seem to go hand in hand in respect of both the zones.

As the analysis in Section V has shown that progress in health facilities is the one single factor exerting the greatest influence on birth rate decline(6), further expansion of medical facilities in Malabar area, so as to bring it to a par with Travancore-Cochin area will have a salutory effect in bringing down the higher birth rate of Malabar. This will incidentally help to bring down the birth rate of the State also.

Next to expansion of medical facilities in Malabar which would have better pay off, educational advancement in Malabar upto the high school level, (in which respect there is great difference with Travancore-Cochin) will also help in bringing down the birth rate to a level with that of Travancore-Cochin. Much leeway in this respect could be made by avoiding the heavy drop out in Malabar area, which alone can explain the more or less similar rate of primary students per one lakh population in the two zones and the great disparity in the corresponding rate for high school students.

Considering the levels and changes of development in both the zones, vis-a-vis the changes in birth rates, the linkages between development and birth rate seem to be firm. Of the several developmental factors, the two considered here for detailed analysis, namely health and education seem to be the crucial ones in helping to bring down the birth rate. May be these factors exert their influence in other ways like bringing down the infant mortality or

---

(6) Dr. R. S. Kurup—'A Note on the possible Influence of Certain Crucial Health Variables on birth and death rates in Kerala'. The importance of health variable on birth rate has been brought out in this study also.

by ensuring larger family planning acceptance. Incidentally, the analysis made here seems to lend support to the hypothesis that the decline in birth rates is largely determined by socio-economic variables like health and education. May be other variables which have not been considered here, like age at marriage etc. are also important.

The lesson from the present analysis is that diversion of more inputs to backward areas to improve their pace of economic development—especially their health and education standards—is warranted not only on egalitarian grounds, but also on grounds of enabling those areas to reach the third stage of demographic transition, along with other areas in the country, which due to some fortuitous circumstances or other, have gained a lead in socio-economic advancement.

ACKNOWLEDGEMENT

The computational assistance by Research Officers Sri Kumaran and Sri P. Gopinathan Nair is gratefully acknowledged.

List of References:—

1. Biplab Das Gupta .. "Socio-economic Classification of Districts—A statistical Approach" —Economic and Political weekly— Vol. VI—No. 33.

2. Census of India .. Paper No. 6—1954.

3. Davis Kingsley .. The Population of India and Pakistan—Princeton University Press 1951.

4. Krishnan, T. N. .. Health Indicators and Demographic Trends in "Poverty, Unemployment and Development Policy" Centre for Development Studies, Trivandrum 1975.

5. Mitra Ashok .. Levels of Regional Development in India—Part I (a) (i) 1961.

6. Nair P. S. Gopinathan .. "Mortality Differential among the Natural Regions of Kerala" paper presented and published in the proceedings of the Seminar on Population Problems—Department of Health, Government of Kerala, Trivandrum 1974.

7. Pillai K. Divakaran .. Socio-economic and Demographic Profile of the Districts in Kerala State—Paper presented at the International Institute for Population Studies—Bombay 1972.

PAPER ELEVEN

POPULATION GROWTH AND ECONOMIC DEVELOPMENT IN KERALA

By

MATHEW M. VARGHESE,

Research Officer, Directorate of Economics and Statistics, Trivandrum.

Abstract

Kerala is the most densely populated State in Indian union. The high population pressure leads to heavy dependency load, low per capita income and low per capita consumption expenditure, defeciency in food and acute unemployment. At the same time other indicators like high level of literacy, higher age at marriage, good health and medical facilities indicate a better quality of life inspite of low per capita income and low level of industrialization. An attempt is made in this paper to examine this paradox. For this purpose economic performance of Kerala in those areas where impact of demographic pressure is expected to be felt is discussed in this paper.

1. *Introduction.*—It is well known that large and rapidly growing population is generally conducive to economic development upto a certain stage mainly, because of its growing labour force and expanding markets, but after a certain limit population can become an obstacle to economic development owing to heavy dependency load and less capacity to save and invest. How far and to what extent the rapidly growing population will hamper the economic development of a country depends on many factors, such as, the resources base of the country, strategy of development adopted, available opportunity for migration and people's capacity to adjust their behaviour, particularly fertility behaviour. Though, generally, it is difficult to achieve or maintain substantial improvement in the standard of living in the face of rapid population growth, history, shows that different nations have responded in a variety of ways to the demographic pressure. Even different parts of the same country respond in different ways to this problem. Migration within the country to more developed or less populated part is also

---

* This paper was originally submitted to the seminar at the International Institute for Population Studies, Bombay, as a part of the requirement for the certificate course, presently up dated. Thanks are due to Mrs. Sumathy Kulkarni, Reader of the institute for guidance and other faculty members and fellow students for their valuable suggestions.

one of the ways open to them to relieve the pressure. From this point of view, it is interesting, particularly, in a vast country like India, to study the response of a part of the country of the demographic pressure in the context of its efforts for economic betterment.

An attempt is made in this paper, to make such a study for Kerala, the most densely populated State in India. The case of Kerala is especially unique because on the one hand it is known for its high density and dependency, load, low income deficiency in food production and acute unemployment, on the other hand, it is known for such indicators of social development, such as, high literacy rate, better health and other public amenities, high age at marriage etc. It is unique in the sense that while in most countries economic development goes hand in hand with social development and in certain countries like Iran, Kuwait etc., social development has lagged far behind economic development Kerala's is a case of better quality of life and social development with a low level of income.

In this paper the demographic situation in Kerala is briefly described in order to give an idea of existing population pressure, then economic performance in some fields where impact of demographic pressure is expected to be felt and some significant variable of social development relevant to the State are discussed.

Population Pressure in Kerala—Size and Growth.—Kerala is a State where population pressure is most acute among all the States in India. According to 1971 census about 21.35 millions of people in Kerala live in a small strip of land with a geographical area of 38846 sq. km., making a density of 549 persons per unit area. The density of population in India is only 178 persons per sq. km. The number of inhabitants in a Sq. Km. of arable land is estimated to be 973 in the State as against 427 in the Country. This phenomenal over population is the result of high growth rate from very early period. Kerala was a centre of foreign trade even before 1000 B.C., where increase in number was an asset. Fertility of the soil, regularity of monsoon rains, equitable climate, dense forest, long sea coast and diversified landscapes made the area highly inhabitable and attracted people from outside for occupation. Kerala had contacts with all countries of early civilization from time immemorial and its benevolent rulers welcomed all important cultures and religious to this land. Thus the State had to accommodate imigrants of persons engaged in religions and cultural persuits.

of the medivial period, the first western settlement in Indian Continent was in Kerala by Portugal followed by Dutch, French and English settlements in this small land. The natural sanitary conditions of the area, habitual cleanliness of the people, development of Ayurvedic treatment from very early period, medical and health and educational services provided by Christian Missionaries all played its part in increasing the population of Kerala.

The density of 165 persons per sq. km. of Kerala in the first year of this century itself was higher than the density of the majority of Indian States, even in 1971. Since then a rapid growth is witnessed, always at a higher rate than that of India as can be seen from Table 1.

TABLE 1

Growth of Population of Kerala and India, 1901–1971

	Kerala		*India*	
Year	*Density (Sq. Km.)*	*Decennial growth rate (percentage)*	*Density (Sq. Km.)*	*Decennial growth rate (percentage)*
1901	165	..	77	..
1911	184	11·75	82	5·73
1921	201	9·16	81	—0·30
1931	245	21·85	90	11·00
1941	284	16·04	103	14·23
1951	349	22·82	117	13·31
1961	435	24·76	142	21·64
1971	549	26·29	179	24·80

Sources. Registrar general of India, Pocket Book on population Statistics, 1972, New Delhi p. 18.

The ever increasing growth rate in Kerala during this century is attributed to spectacular fall in death rate unaccompanied by equally rapid decline in birth rate. Birth, death and natural growth rates are given in Table 2.

TABLE 2

Birth rates, death rates and natural growth rate in Kerala 1901–1977

Year	Birth rate		Death rate		Growth rate	
	Kerala	India	Kerala	India	Kerala	India
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1901–10	..	49·2	..	42·6	..	6·6
1911–20	..	48·1	38·7	47·2	..	0·9
1921–30	..	46·4	33·8	36·3	..	10·1
1931–40	40·0	45·2	29·1	31·2	10·9	14·0
1941–50	39·8	39·9	22·3	27·4	17·5	12·5
1951–60	38·9	40·9	16·9	22·0	22·0	18·9
1961–70	37·5	41·2	13·7	19·0	23·8	22·2
1971	31·9	36·9	9·3	14·9	22·6	22·0
1972	32·1	36·6	9·2	16·9	22·9	19·7
1973	29·9	34·6	8·5	15·5	21·4	19·1
1974	27·0	34·5	8·2	14·6	18·8	19·9
1975	28·0	35·2	8·4	15·9	19·6	19·3
1976	27·8	34·4	8·1	15·0	19·7	19·4
1977	..	32·9	..	14·7	..	18·2
1978	..	..	..	..	..	..

Source: Family Welfare Programme in India, Year Book 1977-78—Department of Family Welfare, New Delhi.

Part played by migration cannot be properly assessed due to paucity of data. Figures of net outmigration to other parts of India as shown in Table 3 reveal that Travancore-Cochin area, the Southern half of the present Kerala State, accommodated additional people from outside. This trend changed only after 1931 and Kerala started sending more and more persons outside for employment. But in 1961-71 decade the outmigration rate slightly slowed down, perhaps due to lack of proper employment opportunity in other States of India in a period when 'son of the soil' spirit was rampant. The unprecedented flow of people to countries outside India especially to Middle East countries, the data of which are not coming in census data, may also have caused for the slackening of the flow to other States in India. Still, but for the net out migration of about 3 lakhs of people, *population would have

* Mahrotro, G. K. Birth Place Migration in India, Census of India, Special Monograph No. 1, New Delhi, Office of the Registrar General of India 137.

increased at a faster rate of 27.6 per cent instead of 26.3 during 1961-71.

TABLE 3

Net Migration rates in Kerala 1901–11 to 1961–71

Area and Period	*Net out migration*	
(1)		(2)
Travancore—Cochin		
1901–11	—	1·06
1911–21	—	1·07
1921–31	—	0·05
1931–41	+	0·06
1941–51	+	1·10
Kerala		
1951–61	+	1·87
1961–71	—	1·32

Source: Zachanah, K. C. Migration Population Growth in Kerala—Kurup, R. S.
Government Press, Trivandrum 1966 Page 95.

Age Structure.—The age and sex structure of population also acts as an inhibiting factor to economic development. The high birth rate and comparatively low infant mortality rates of Kerala make its population continues to be young. According to 1971 census, 40.26 per cent of people were children below 15 years of age and 6.22 per cent were aged 60 and above, making a dependency load of 87 per cent to person in the working age groups. The situation is still worse because even among those in the working age groups, only a small portion is actively employed.

Sex Composition.—Another disturbing factor to economic development in the State is its sex ratio. As in any underdeveloped country, women in Kerala are engaged in reproductive activity in a lesser proportion than men as seen in Table 4. Hence the higher proportion of females in the population, forms an inhibiting factor to economic advancement as it means a labour force at a smaller proportion of total population. Kerala is the only State in India with a sex ratio favourable to women. At the same time, female participation in labour activity is not high, though the educational level attained by women folk in Kerala is the highest.

TABLE 4

Sex Ratio and Work Participation in Kerala and India 1951–71

Year	*Kerala*				*India*			
	Sex Ratio	*Percentage working*			*Sex Ratio*	*Percentage working*		
		Total	*Male*	*Female*		*Total*	*Male*	*Female*
1951	1028	32·28	46·66	10·18	946	39·10	54·05	23·30
1961	1022	33·37	47·20	19·71	941	42·98	57·12	27·96
1971	1016	29·12	45·00	13·49	930	32·92	52·53	13·18

Source: Census of India, Paper No. I 1972.

Urban distribution.—Urban non-agricultural sector which can create employment opportunities, mainly for educated men and women is also not expanding rapidly, in Kerala. According to 1971 census only 16.2 per cent of its population lived in urban areas as compared to 19.9 in the country as a whole.

The proportion of urban population to total population of all Southern States of India are given in Table 5 to show the low status of Kerala in this regard.

TABLE 5

Percentage of urban to total population of India and Southern States 1971

No.	*State*		*Per cent Urban*
1	Kerala	..	16·24
2	Andhra Pradesh	..	19·81
3	Karnataka	..	24·31
4	Tamil Nadu	..	30·26
5	India	..	19·91

Source: Family Welfare Programme in India Year book 1974-75 Ministry of Health and Family Welfare, Government of India, New Delhi.

Thus, for Kerala the size, structure composition and distribution of population act as inhibiting factors to economic development. How far it actually affected can be examined in the coming part.

Economic Development of Kerala—Economic development of a community depends on the availability of natural resources and the efficiency of the people to exploit it. Kerala possesses fertile soil with diversified land scape for cultivation of a variety of

crops, water resources of ever flowing rivers for irrigation and several material resources required for industrial purposes. It has the unique position as the major producer of some agro-based raw materials like rubber, cashew, coconut, etc. Nature also provides it with forest resources and long coast of fish-rich Arabian sea, in addition to rare minerals like Monozite, Ilmenite, etc., and also China clay and Magnalite. The Scenic beauty of this narrow strip of land provides ample scope to make it a tourists' paradise. Kerala has a perennial supply of hydro-electric power at low cost. The State with its high level of literacy and educational attainments has the necessary human resources to utilise these benevolence of mother nature. How far the population of Kerala has been successful in exploiting these resources efficiently can be examined with reference to indicators like rate of growing of per capita income, quality of life and employment situation.

Population size and Income.—The standard of living of a population is generally assessed by the per capita income received by them. With this yardstick, people of Kerala are extremely poor having a per capita income lower than that of India as depicted in Table-6. India itself is a poor country with an income per capita per day only 93 ps. even during 1973-74, the position of Kerala is still worse with only 82 ps. per person per day. But for the sky-rocketing population growth, the income of the people would have been much better. While the total income of the State at 1960-61 prices increased by 67.8 per cent from Rs. 40,271 lakhs in 1956-57 to Rs. 67,573 lakhs by 1973-74, the corresponding increase in the per capita income was only 14.1 per cent from Rs. 263 to Rs. 300. At the same time National per capita income has moved up by 18.4 per cent. (Figures given in Table 6).

TABLE 6

Estimate of Income of Kerala and India 1956–60 to 1973–74 at 1961–62 prices

Year	*Kerala*		*India*		*Difference between State and National per capita Income*
	Total (Rs. in Lakhs)	*Per Capita Rs.*	*Total (Rs. in Crores)*	*Per Capita Rs.*	
(1)	(2)	(3)	(4)	(5)	(6)
1955–57	40,273	263	..	287	24
1961–62	43,828	256	13,335	309	53

TABLE 6—(*cont.*)

(1)	(2)	(3)	(4)	(5)	(6)
1966–67	51,363	268	15,409	308	40
1971–72	64,996	302	19,479	348	46
1972–73	66,437	302	19,322	337	35
1973–74	67,573	300	19,910	340	40

Source: Government of Kerala, *Economic Review, Kerala, 1975*—The State Planning Board Trivandrum, 1976, pp. 223-225.

So also, the pattern of sectoral composition of the State income as shown in Table 7 does not indicate a bright future for industrialisation. During 1973-74, income derived from agriculture sector showed an upward trend while the share from Industrial sector reached a low ebb of 10.9 per cent of the total income. The percentage of income generated in the industrial sector at all India level was 18.3 in the same year which is 67.9 per cent higher than that of Kerala.

TABLE 7

Sector-wise Percentage Distribution of State Income at 1960–61 Prices (1956–57 to 1973–74)

Sector	*1956–57*	*1961–62*	*1966–67*	*1971–72*	*1972–73*	*1973–74*	
						Kerala	*India*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture	53·3	50·7	47·2	44·3	54·6	57·5	52·8
Mining and Industry	15·5	14·7	17·2	18·1	15·0	10·9	18·3
Commerce, Transport, etc.	15·4	15·4	19·4	21·2	15·7	16·0	15·1
Other services	15·8	19·2	16·2	16·4	14·7	15·6	13·8
Total	100·0	100·0	100·0	100·0	100·0	100·0	100·0

Source: 1. Bureau of Economics and Statistics, Trivandrum. *Basic Statistics Relating to Kerala Economy: 1975*, p. 13.

Consumption Expenditure.—The standard of living of the people of Kerala can also be seen from another indicator, viz., per capita consumption expenditure. According to 18th round N.S.S. report, the monthly per capita consumer expenditure in the State during 1963-64 was only Rs. 19.69 in rural areas and 25.62 in urban. This rate was the lowest among the Indian States as seen in

Table 8. Generally, it is expected that at a lower level of expenditure on consumption purposes, the larger proportion of that amount is spent on food items. But paradoxically enough, the Keralities set apart a lower percentage of their consumer expenditure on food items, compared to other States and proportionately more amount they spend for clothes and other food non-items. Partly, this can be due to the price structure of food items consumed by the people. But the figures shown in column 8 of the Table 5 shows that the average daily per capita calorie intake in Kerala is the lowest among the States and far below the required minimum of 2,250 calories. This depicts a different attitude of the people towards life.

TABLE 8

Per Capita monthly consumer expenditure 1963–64 and Nutritional Intake in Different States of India

Serial number	State	Average consumer expenditure (Rs.)		Expenditure on Food (Rs.)		Percentage to consumer Expenditure		Average daily per capita Calorie Intake
		Rural	Urban	Rural	Urban	Rural	Urban	1961
1	2	3	4	5	6	7	8	9
1	All India ..	22·81	32·81	15·46	19·57	67·81	59·6	2445
2	Kerala ..	19·69	25·62	13·05	15·46	66·3	60·3	1606
3	Andhra Pradesh ..	20·84	27·93	14·08	17·38	67·6	62·2	2147
4	Assam ..	26·27	42·02	19·30	26·97	73·5	58·6	2336
5	Bihar ..	21·15	29·63	16·00	20·03	75·7	67·6	2514
6	Gujarat ..	22·15	32·61	16·56	19·21	74·8	58·9	2387
7	Jammu and Kashmir ..	27·42	37·79	19·63	20·02	71·6	66·5	2933
8	Madhya Pradesh ..	23·02	30·35	15·36	17·74	66·7	58·5	2789
9	Tamil Nadu ..	23·45	31·45	15·64	18·89	66·7	60·1	2144
10	Maharashtra ..	21·48	37·59	14·19	21·39	66·1	56·9	2195
11	Karnataka ..	20·92	26·33	14·28	16·48	68·3	62·6	2598
12	Orissa ..	19·45	31·11	14·65	20·13	75·3	64·7	2362
13	Punjab and Haryana ..	27·91	33·00	18·64	19·32	66·8	58·5	2891
14	Rajasthan ..	24·68	32·26	17·16	19·66	69·5	60·9	3020
15	Uttar Pradesh ..	21·48	28·69	15·00	16·95	69·8	59·1	2716
16	West Bengal ..	23·73	41·40	18·02	25·22	75·9	60·99	2152

Sourle: Government of Kerala, *Income and consumption,* The State Planning Board and Bureau of Economics and Statistics, Kerala 1972, pp. 8-9 and 25-25. (Results of 18th Round N.S.S. 1963-64).

(ii) Badhan, Pranab, K. "On Life and Death Question" *Economic and Political Weekly,* Vol. IX, Nos. 32-34, Special Number 1974, Table 1, p. 1295.

Agriculture and Food.—Though major portion of State Income is generated in agricultural sector, the condition of that sector is far from satisfcatory. High rate of growth of population without corresponding improvement in industrial sector has increased the pressure on the cultivable land in Kerala. Since the culturable waste land is almost negligible in the State, extensive growth of cultivation is almost impossible. The per capita culturable area (including net area sown, current and other fallow lands, cultivable waste and land under tree crops and groves) was estimated to be only 0.11 Hectares in 1973-74. This small availability of land and the preference of the people to live in houses each having its own compound, has led to uneconomic fragmentation of available area. Table 9 helps us to see that 72 per cent of the rural house-holds in 1971-72 own land less than 0.40 Hectare (or 1.00 Acre) each.

TABLE 9

Land ownership of rural hoseholds in Kerala, 1971–72

Area of land owned (hectares)	*No. of household ('000)*	*Percentage of total households*
(1)	(2)	(3)
No land	358	11·94
0·00— 0·40	1,819	60·58
0·40— 1·00	486	16·21
1·00— 4·00	300	9·99
4·00—10·00	33	1·12
10·00 and above	4	0·16
Total	3,000	100·00

Source.—Data Bank State Planning Board Trivandrum, *Kerala Economy-Basic Statistics 1975,* p. 6.

Further, a large portion of the cultivated area is under cash crops. Though rice is the staple food of the State, total area under paddy cultivation is only 29 per cent of the cropped area. Coupled with large population size this makes the per capita production of

foodgrains the lowest among all the States in India. During the period 1969-72, the per capita gross production of food grains in Kerala was only 155 gms. while corresponding figure for India was 522 for Punjab 1473 and for Haryana 1246 gms. Next to Kerala, the State which had very low per capita food-grains production was Maharashtra with 314 grammes, which was double that of Kerala. The effect of population growth on the availability of food can be clearly understood from data given in Table 10. During the period 1971-75 though the food production increased by 2.8 per cent, the per capita availability from internal source dwindled by 8 per cent because of the increase of population by 8.8 per cent.

TABLE 1

Availability of Food in Kerala, 1971–75

Sl. No.	Particulars	Unit	1971	1972	1973	1974	1975	1978
1	2	3	4	5	6	7	8	9
1	Population of State as on 1st April ..	Lakhs	213·5	218·3	223·4	227·5	232·2	248·5
2	Production of rice in the State ..	Lakh tons	12·98	13·52	13·36	12·57	13·34	12·95
3	Per capita availability from Internal Production ..	Gms.	150	155	158	136	138	130
4	Per capita availability from imported in State account ..	,,	96	98	88	90	64	180
5	Per capita availability of wheat from import ..	,,	7	10	24	29	61	13
6	Per capita rice equivalent of tapioca ..	,,	201	231	237	232	223	192
7	Per capita total availability of food ..	,,	454	491	507	487	486	515

Source: Government of Kerala, *Economic Review, Kerala, 1978,* Trivandrum, State Planning Board.

As a result the Government had to make huge investment for importing foodgrains of the quantity more or less equal to home production. In addition, to meet the deficit, people have resorted to consumption of tapioca, a tuber useful for industrial purposes in the production of sago, Starch, etc. Thus its use as a food is detrimental to the development of these industries.

Population and Employment.—The proportion of persons in Kerala engaged in economic activity is one of the lowest among Indian States. According to 1971 Census there were 62 lakhs workers in Kerala which was only 29.12 per cent of the total population, while in India as a whole, the corresponding percentage was 32.92. Barring West Bengal and Assam, Kerala has the lowest percentage of workers.

TABLE 11

Decadal variation of number of workers in Kerala, 1951–71 (in lakhs)

Year	Total workers	Percentage variation	Per cent to total population	Number of persons engaged in each sector					
				Primary		Secondary		Tertiary	
				Number	Percentage to total workers	Number	Percentage to total workers	Number	Percentage to total workers
1	2	3	4	5	6	7	8	9	10
1951	43·73	..	32·27	24·52	56·1	8·95	20·3	10·32	23·6
1961	56·30	28·7	33·1	26·93	47·0	10·89	19·3	18·98	33·7
1971	62·16	10·4	29·12	34·80	56·0	10·85	17·5	16·51	26·5

Source: K. Kurup (Dr.) R. S. etc. *Fact Book on Population and Family Planning,* Trivandrum, Demographic Research Centre, Bureau of Economics and Statistics, 1974 p. 10.

At the time of the 1971 Census, 56 per cent of the workers were engaged in agricultural persuit. High population pressure on arable land and lack of any culturable waste rule out the possibility of creation of further employment in agricultural sector. Nearly, 47 per cent of total cropped area is utilized for perinnial crops for which the labour requirements are smaller than that of seasonal crops. The other two sectors are not making enough rapid progress to accommodate more labours. Thus the situation continues to be unsatisfactory.

A direct result of this situation is the rampant unemployment prevailing in the State. Since the dependancy load on working population is high, saving potentiality in the economy is low. At the same time a higher proportion of investment in social over heads like education, health, transport and other public utility service is required due to population pressure and in Kerala priority is given to invest in these items. So domestic investment in directly productive activity, like Industry is comparatively less, which limits the possibility of creating employment opportunities on large scale.

Disguised unemployment is a general feature in under-developed countries, but in Kerala due to spread of education it has come on the surface because educated persons are more likely to register their names in Employment Exchanges. The female literacy also is very high in Kerala and their enterance into the labour market has made the problem more acute.

Though, reliable and up-to-date on the unemployment situation in the State are not available, the backlog of unemployed at the beginning of 2nd plan was estimated to be 2.4 lakhs and at the beginning of 3rd plan as 5 lakhs.(2) The unemployment survey conducted in 1965 by the Kerala Bureau of Economics and Statistics revealed that the number of unemployed in the year was 5.47 lakhs, which was 9.1 per cent of the total estimated labour force of 60.15 lakhs. Out of the total unemployed, 2.5 lakhs were females, which constituted 14 per cent of the female labour force while unemployed males formed only 1.1 per cent of the male labour force. Of the unemployed, only 17.9 per cent were illiterate while 26.5 per cent were matriculate and above including technical and professional graduates and postgraduates some with very fine academic records.

In 1970, the committee on unemployment was appointed by the Government. They estimated the total number of unemployed as 5.47, 6.83 and 9.06 lakhs in 1965—1968 and 1970 respectively(3). According to the draft outline of the Fifth Five Year Plan of Kerala State, the Estimated backlog of unemployment in 1974 is to the tune of 10.6 lakhs and the expected new enterance in the plan period upto 1979 is 8 lakhs. It is also estimated in the plan

---

(2) Report of the Committee unemployment in Kerala Part I, Trivandrum, State Planning Board, Kerala, 1971, p. 9.

(3) Idid., p. 13.

outline that the additional employment that is expected to be created during the plan period will be 11 lakhs, still leaving 7.6 lakhs without any job.

Another important factor of discomfort is the problem of unemployment among the educated and technical personnels. In Table 12, the number of technical and professional work seekers as existing in the live registers for last few years is given.

TABLE 12

Number of professional and technical work seekers in Kerala 1967–78

Calendar year	Medical graduates	Engineering graduates	Engineering diploma	I.T.I. certificate	Agricultural graduates	Veterinary graduates
1967	20	417	N.A.	N.A.	N.A.	N.A.
1970	281	1852	3547	8380	133	70
1971	405	2068	3450	9894	128	116
1972	654	2014	4163	11540	101	52
1973	902	2135	3836	10003	80	40
1974	726	1450	3611	16883	Nil	Nil
1975	809	1850	3690	20163	32	117
1976	696	1752	4009	20747	29	75
1977	490	1784	3585	21376	78	32
1978	668	1755	4305	23821	51	58

Source: The State Planning Board, Economic Review of Kerala 1979.

The full dimension of the unemployment problem can be guaged only when we try to understand the magnitude of underemployment and disguised unemployment in the economy. But a real picture of disguised unemployment is almost impossible to get. The survey on unemployment of 1965 provides some data on underemployment. According to its findings 13.78 lakhs persons were underemployed during the reference year, which is 25 per cent of the total labour force(4). There were likely to be 4 lakhs new entrants between 1965-70 bringing the number of underemployment to 17.78 lakhs in 1970(5).

(4) Report of the Committee unemployment in Kerala Part I, Trivandrum, State Planning Board, Kerala 1971. P. 13—14.

(5) Ibid., p. 14.

Another study on Employment and Unemployment on sample basis conducted by the Bureau of Economics and Statistics, Kerala in 1977, provides a comparison between the employment positions in 1965 and 1977. (See Table 13)

TABLE 13

Employment position in 1965 and 1977

Activity status	*1965*		*1977*	
	Persons (lakhs)	*Percentage to population*	*Persons (lakhs)*	*Percentage to total population*
(1)	(2)	(3)	(4)	(5)
Employed ..	54·68	29·1	70·66	29·24
Unemployed ..	5·47	2·9	11·74	4·86
Labour force ..	60·16	32·0	82·40	34·10

Figures are provisional

Source: Unemployment Survey 1977-78.

Bureau of Economics and Statistics, Trivandrum, Kerala. (unpublished).

Investment in public amenities and social services and quality of life.—One of the notable feature of Kerala is the priority given both by Government and people to public utility and social services. Inspite of its acute population pressure Kerala could provide a high level of educational service and health amenities to her people. She got this tremendous achievement as a legacy of the past when the people were economically well settled because of their trade relations with early civilization and economically advanced countries of later era. Her products like Sandalwood, Spices and ivory are highly demanded in foreign countries, all the time.

Christian religion received a warm welcome in this land from its very beginning and flourished under the Hindu rulers and among culturally developed people of the land who tolerated all ways of thinking. This attracted Missionaries from Europe more to Kerala and in collaboration with them the local Christians managed to start English Schools and Allopathic Medical Institutions. These institutions were patronised by other religious groups also who in their turn followed the same example. Thus public service institutions sprang up in Kerala without much aid from the Government. Even now, it is usual that educational, medical or such

other institutions are started by Government, in buildings built and surrendered by the people of the locality. In addition there are number of institutions run by private agencies.

The investment by Government during each plan period as presented in Table 10 brings out the comparative importance given to social service sector. Here it may be recalled that the proportion of expenditure in this sector is of the same order in the Indian Five Year Plans. In the 4th Plan 32.6 per cent of amount is spend on this account in Kerala and in 5th Plan 36.1 per cent has been earmarked against 32.6 per cent and 34.9 per cent in India as a whole.

TABLE 14

Plan expenditure of Kerala (1st to 5th plan)
(Sector-wise percentage expenditure)

Item	First plan	Second plan	Third plan	Annual plans	Fourth plan	Fifth plan target
1	2	3	4	5	6	7
Agriculture, Community Development and Irrigation ..	70·4	57·4	62·1	64·7	59 9	56·0
Industry and mining ..	2·0	7·5	7·9	9·2	7·5	7·9
Services .	27·6	35·1	30·0	26·3	32·6	36·1
Total ..	100·0	100·0	100·0	100·0	100·0	100·0

Source : The State Planning Board, Trivandrum, *Plan Expenditure in Kerala,* 1976, pp. 2-3.

Education.—Kerala has achieved the highest position in literacy among Indian States. In 1971, 60.42 per cent of the population was literate as against 29.46 per cent in India. To this end Government has contributed by providing free education upto matriculation. In 1974-75 there have been one school per 3.48 sq. km., i.e., for every 2033 population. And out of the total population, 23 per cent are students in the Schools(6). Contribution

(6) The Statistical Unit, Directorate of Public Instruction, Kerala, *Selecte Educational Statistics* 1975, Government of Kerala, 1975, p. 4.

by private agencies is of the highest order. 65.5 per cent of the 11,183 general education schools and 73.3 per cent of the 105 training schools are under private management. Government are paying maintenance charge for education institutions run by private agencies. Besides, full salaries of teachers and non-teaching staff of schools and colleges are being paid by Government. There is surplus of qualified trained teachers.

Health.—In health facilities also Kerala State is in the forefront. Despite the abnormal increase in population, the number of medical institutions (including Allopothic, Homoeopathic and Indigenous) increased from 4.00 in 1967-68 per lakh of population to 6.31 in 1974-75. During the period the number of beds provided in those institutions also increased from 105 to 122 for one lakh of population. Per capita Government expenditure on Health Services moved up from Rs. 9.87 in 1973-74 to Rs. 11.23 in 1974-75 while the corresponding increase in all India level was only Rs. 7.90 to Rs. 8.81. Recent progress in this field is so tremendous with the establishment of rural dispensaries under the "Special Empolyment Programme" that there is not a single Panchayat left in the State without having a Government medical institution under a medical graduate, giving free medical aid. In addition to this there are numerous hospitals and dispensaries managed by different missions or other private parties, functioning in every nook and corner of the State. Some of them are very famous for availability of up-to-date equipment, efficient treatment and nursing.

TABLE 15

Number of Government medical institutions and number of beds provided in Kerala 1967–75

Year	*Medical institution*		*Beds provided*	
	Total number	*Per lakh population*	*Total number*	*Per lakh population*
1967–68	795	4·00	20777	105
1972–73	1196	5·38	25556	115
1973–74	1436	6·31	26992	122
1974–75	1449	6·32	27005	122

Source : Government of Kerala, *Indicators of Regional Development—An Appraisal,* Bureau of Economics and Statistics, Trivandrum, 1976 pp. 53-54.

Housing and Transport.—Recent progress in providing housing facilities is worth mentioning as an example of peoples contribution towards Social Development in the State. During 1901 there were 182 dwelling houses per thousand population. But the availability of housing facilities deteriorated since 1931 and reached a low ebb of 160 houses per thousand population by 1971, mainly due to increase in population ahead of progress in construction of dwelling houses. But after 1971, Government under the "one lakh houses scheme" constructed more than 50 thousand houses and gave to landless labourers along with 5 cents of land around it. The notable phenomena of the scheme is that the expenditure incurred for construction of these houses was mostly met from contributions with very little burden on State exchequer.

At present, the State Housing Board has undertaken public housing schemes, to provide land and financial assistance to middle and low income groups and economically weaker sections. "Aided self-help co-operative Housing Scheme" is a new venture to provide financial assistance to economically weaker sections from different financial agencies.

Kerala has an excellent road transportation system. Almost all parts of the State is connected by roads. These roads are mostly constructed by local people giving financial assistance and land free of cost; and later improved by local bodies or the Government.

Effect on population—Death rate.—The quality of the people of Kerala helped to maintain a progressive outlook on the whole. Due to better medical facilities and health amenities available in the State and the awareness among the people of the need for healthy and hygienic way of life, the death rate in the State has fallen down. As seen in Table 2, the crude death rate was only 8.1 during 1976 as against 15.0 in India as a whole.

Infant mortality rate was also came down to a low level of 60.9 per thousand live birth in 1971, in place of 122 in the country. The rate in Kerala for 1976 was only 53.3.. Expectation of life at birth in Kerala during 1971 was 60.57 for males and 61.16 for females. The corresponding all India figures are 47.1 and 45.6. Higher expectation of life for females than that of males, as seen in developed countries, is a rare phenomenon in other parts of India.

Birth rate.—The decline in birth rate, as shown in Table 2, is also commendable. This was mainly attributed to two factors, the increased age at marriage, especially among females, prevalent in the State and the spectacular performance under Family Welfare Programme. The Table No. 16 shows that even in the beginning of the present centuary, the mean age at marriage in Kerala was at a higher level of 17.1 years which India could reach only during 1961-70 decade.

TABLE 16

Mean age at marriage of women in Kerala and India (1901–1970)

Decade	*Mean age at marriage*	
	Kerala	*India*
1901–10	17·1	13·2
1911–20	17·4	13·6
1921–30	17·8	12·6
1931–40	19·7	15·0
1941–50	19·4	15·4
1951–60	19·9	16·1
1961–70	20·9	17·2

Source : Goyal R. P.—Shifts in age at marriage in India between 1961 and 1971, "Demography India" Vol. 4 No. 2 Dec. 1975.

The attitude of the people of Kerala, with good educational and social background created an attitude towards small family norm, resulted in a better acceptance of Family Welfare Programme.

Table below shows the progress made in this field since 1966.

TABLE 17

Progress achieved under Family Welfare Programme in Kerala 1966–78

Year	*Methods adopted as equivalent to sterilization*			
	Vasectomy	*Tubectomy*	*I.U.D. and others*	*Total*
1966–67	33069	7205	14182	54456
1970–71	113747	27364	9842	150953
1975–76	94270	62352	10735	167361
1976–77	129829	84566	11950	226945
1977–78	15188	67225	3472	85885

Source : FACT BOOK on Population and Famiy Planning, Population Research Centre, Trivandrum, 1979.

Contribution of outmigrants to development of Kerala.—Outmigrants from Kerala who are mostly educated young men and women going outside their State to different parts of India and to all corners of the world, also contributed to the improvement of the quality of life of the people by sending substantial remittances from outside. This helps to pull down the pressure of unemployment problem in the State and also to enable the dependents of the migrants, living in Kerala to lead a better life. It is the habit of the "Malayalees" not to sever their connections with their State though they migrate to far off places.

Hence large part of their savings flows to their original place. So in a way, it can be said that per capita income is not a proper indicator of the quality of life in Kerala, because income received by the State by exporting its "talents" is not reflected in the State income figures and the per capita income figures. But at the same time precise estimate of the contribution of migrants in terms of remittances are not available.

But there is also the other side of the picture. Though outmigration has so far helped to relieve the demographic pressure in the State, the problem is, will it be possible to rely on this factor for a long time? Especially migration to other countries, gulf countries will always depend on changes in international migration laws, changing international political situation etc. So the better course would be to invest this flow of foreign money in a more systematic and planned manner for the development of the State resources. This will help to create more employment opportunities at home and absorb the available skill and talent for creating a stronger development base in the state itself.

Conclusion and future course of action.—It can be seen from the foregoing discussion that Kerala is a peculiar case with certain unique demographic and social characteristics. Judged by the usual routine indicators of economic development, the State is a problem case due to its high density, low level of income and consumer expenditure, inadequate home production of food which is only 50 per cent of the requirement, stagnant agricultural front, under developed industrial sector and acute unemployment situation. All these do create big hurdles in the forward movement of Kerala economy. But at the same time "Kerala leads not only tht rest of India, but several of the rich countries of the world in the quality of life it is offering its people". [9]This is shown in the

---

(9) A Statement made by the prestegious private foundation of the "Overseas Development Council" reported in Indian Express Bombay, dated 18th August 1977.

spectacular improvements in living conditions, indicated by the standard of housing facilities, literacy and other public amenities and also by other indices of social developments like low level of infant mortality, higher expectation of life at birth and mean age at marriage etc. One is almost tempted to say, that Kerala shows that, for these kind of achievements one need not wait for rise in income or industrialisation and that progress can be made in spite of rapid population growth. Surprisingly enough, the percentage share of investment in Kerala in the 'Service sector' is not much higher than that in case of India. It seems that the success in these fields can be mainly attributed not so much to the financial investment, but the strong will to implement these programme, which may be due to the pressure from masses, the predominance of socialist thinking and general awareness among the people. The contribution of migrants in improving the standard of living of the population in their home State also, cannot be ignored.

But in spite of all these, the fact remains that the basic structure of the economy has remained weak and from the long term development point of view, it is detrimental to the economy itself. The growth of population, food deficiency, unemployment, lack of industrialisation etc. continue to be the several problems, which clamour for immediate solution. Planned migration to thinly populated territories like Andaman and Nicobar Islands where climate, rainfall, nature of the soil etc. are similar to that of Kerala and effective birth control programmes can limit the population pressure to some extent. Intensive cultivation and use of improved techniques by the educated and progressive farmers of Kerala alone can increase the food production adequately, as proved by countries like Thaiwan which developed into an agriculturally advanced country, in spite of high density of population and small land holdings. Fisheries is another field with tremendous potentialities for additional food supply, to be developed systematically. As for unemployment is concerned planned efforts for industrialisation is the only ultimate solution. Proper strategy to utilise the forest resources, minerals and other resources for industrialisation should be adopted instead of sending them out as raw materials. Effort made so far to improve the quality of life will also contribute further, to this long term development, because it is an investment in human capital. The educated skilled, progressive labour force which has emerged out of it, will be an asset in these future efforts of industrialisation, in the proper strategy is adopted.

68/472—13

410