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## **Inter-Generational Changes in Birth Intervals in Kerala**

### **Introduction**

IN Kerala, the birth rate started showing signs of decline in the 1970's and a sharp decline was noticed in 1980's which is being continued in the 1990's. Before 1970, the crude birth rate was above 31 and declined to 26.8 in 1980 and further decreased to 17 in 1993 (Registrar General of India, 1993). This implies a changing pattern in the family formation of married couples now and in the past. From the clear evidences of the decline of birth rates in the past, we can specify more or less, how many children a woman will have, on average, in future. Further, the knowledge of timing of births will help intervention strategies towards containing population growth more effectively. The trends in birth rates show that married women have fewer children, but we cannot say whether there is any increasing tendency to delay child bearing. Length of time spent in different stages of family formation has very important social implications (Krishnamoorthy, 1979).

With this scenario, the main objective of the present research attempt is to study the levels and patterns of birth intervals in Kerala—a transitional society. The study compares the timing of birth of women belonging to two generations.

### **Data and Methodology**

The study draws data from two comparable surveys conducted in a suburban area (Kazhakkuttom Panchayat) of Trivandrum in Kerala during 1971-72 and 1990. The erstwhile Family Planning Communication and Action Research (FPCAR) Centre of the University of Kerala conducted the survey during 1971-72 to study the fertility behaviour and the extent of knowledge, attitude and practice of family planning methods in a rural

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community. Details of marriage and pregnancy history of currently married women below 45 years of age were collected in the survey. Complete households were interviewed from the area for that survey. From the above mentioned survey, the demographic and socio-economic details of currently married younger women below 35 years of age with at least one live birth at the time of survey were taken for the present analysis. There were 1,184 such women.

During November-December 1990, a comparable survey was conducted in the same panchayat area. Among the 11 wards of the panchayat, 5 wards were selected randomly. Women below 35 years of age as in April 1989 and have borne at least one child were interviewed. A total of 515 women could be contacted at the second survey.

Censoring is common for birth interval data, since it is not feasible to observe the women till all of them complete their fertility behaviour. So for some women, the information are partial. Hazard model technique is an appropriate method to reduce the problems associated with truncated data.

In this method open as well as closed birth intervals are used to examine the pattern of timing of births. One measure that can be computed from this model is the proportion of women having a birth after, say, one year or two years etc. Statistical tests are performed to test whether the two sets of data differ significantly in the probability of proceeding to the next birth at different durations. Mantel test has been used to gauge the difference between the women in not having a birth within one year or two years and so on in the two sets of data.

Analysis of birth intervals utilising censored observations (for the present analysis, intervals which are not closed) may contribute interesting insights. Hence, the technique of hazard model is used for each birth interval of the two data-sets to peruse the pattern of changes in timing of births over time. Further, this technique permits the examination of recent experience including that of many women who have not borne another child at the time of interview, but will have birth in future. The behaviour of women who may not proceed to next birth can also be investigated. Many studies reveal that open birth interval is a better measure of fertility performance (Srinivasan, 1966, 1967, 1968; Pathak, 1971; Singh *et al.*, 1979 and many others). Hence we are not constrained to limit our analysis to women who have already completed specified births.

The technique of multiple classification analysis (MCA) is also used to gauge the effect of socio-economic and demographic factors on various birth intervals. Three covariates—religion, education of husbands, education of wife and two factors—age at marriage and duration of breastfeeding—are included in the MCA.

## Findings

### *Socio-demographic Profile of Women*

The socio-economic and demographic characteristics of the women of the two survey periods are compared in Table 1. Both the data-sets have more or less equal proportion

TABLE 1: SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF COUPLES: 1971-72, 1990

<i>Characteristic</i>	1971-72 %	1990 %
<b>Religion</b>		
Hindu	75.51	83.11
Christian	10.81	11.07
Muslim	13.68	5.82
<b>Education (Wives)</b>		
None	14.36	7.18
1-4 years	30.49	8.35
5-7 years	14.36	15.53
8-10 years	29.65	23.69
Matric and above	11.14	45.25
<b>Education (Husbands)</b>		
None	9.14	6.60
1-4 years	31.25	11.65
5-7 years	10.98	15.14
8-10 years	32.85	25.64
Matric and above	15.88	40.97
<b>Occupation (Husbands)</b>		
Service	13.18	15.15
Farmers and Business	4.56	3.69
Agricultural workers	31.00	19.42
Skilled workers	12.58	5.63
Other labourer	38.68	56.11
<b>Age (Wives)</b>		
15-19	431	1.55
20-24	30.58	19.61
25-29	37.58	39.42
30-34	27.53	39.42
<b>Age at Marriage</b>		
< 16	28.21	21.55
17-19	41.81	38.25
20-22	20.52	28.55
23-25	7.75	10.10
26+	1.00	1.55
<b>Duration of Marriage</b>		
0-4	27.87	20.78
5-9	33.19	39.61
10-14	29.56	25.05
15-19	9.38	14.56
<b>Parity</b>		
1	21.62	21.36
2	26.35	56.70
3	23.48	21.75
4	17.06	0.19
5 and above	11.49	—
Total	1184	515

of Christians, at about 11 percent, while a larger proportion of the 1990 sample are Hindus. The levels of education of both husbands and wives show very high difference between the two time periods. Larger proportions of husbands and wives of the latter data have an educational level of matric and above. A striking increase is observed in the proportion of 'other labourer' group such as coolies and semiskilled workers, while similar decrease in the agricultural labourers is seen in the recent data.

A sizeable proportion of the women of the former data is in the age group 20-24 years compared to the latter data. For the recent data a high increase is seen in the age group 30-34 years. The mean age of the sample women of the 1971-72 survey is 26.42 years (SD 4.30) and that of 1990 survey is 27.88 years (SD 4.76). Both the samples are more or less similarly distributed according to their age at marriage compared to other characteristics. The mean age at marriage of the former and latter data are 18.39 years (SD 2.90) and 18.96 years (SD 3.11) respectively. A major portion of women in both the groups married for 5-9 years. The mean duration of marriage of the first data set is 8.02 years (SD 4.77) and of the recent data 8.67 years (SD 4.89).

A striking increase in the proportion of women having two live births is observed for the 1990 data set. In both the samples, equal percentage (78.4 and 78.6) of women with one live birth proceed to second birth, while very high difference is noticed in the proportion of women with two live births going to a third birth. For the 1971-72 survey, 56.38 per cent of the women with two children progressed to third birth while the corresponding percentage for 1990 survey is only 27.90. This shows that very high fraction of recent couples either delay or stop their higher order births. Now we will examine whether there is any change in the timing of births of high fertility (1971-72) and declining fertility (1990) periods.

#### *First Birth Interval*

Since the women in our sample had borne at least one child, all the first birth intervals are closed. Table 2 presents the survival rates and hazard rates for the two samples. Each term of the survival rates can be thought of an estimate of the conditional probability of not having a birth at time  $t$ , given that no birth occurred till time  $t$ . So these rates can be used to compare the fertility behaviour of the two sets of women. It is clear that till twenty months after marriage, the proportion of women not having a birth was very high for the two groups especially the recent data, but, afterwards lower rates are seen for the same. It is really interesting that all women of the second data set had their first child within 4 years, while the women of the 1971-72 survey took more than 8 years to have a baby for all of them. To test whether the unconditional probability of having a birth between marriage and the beginning of third year after marriage for the data sets differ significantly, the Z value is computed. It is found to be 3.29 which is greater than the 5 percent value (Z is approximately normally distributed with mean 0 and variance 1). Hence the two probabilities differ significantly at 5% level. At the beginning of the fifth year after marriage, the Z value is 6.33 and the probability of having the first birth between marriage and the beginning of fifth year among the two groups differ significantly.

TABLE 2: FIRST BIRTH SURVIVAL RATES AND HAZARD RATES: 1971-72, 1990

First Birth Interval (in months)	Survival Rate		Hazard Rate	
	1971-72	1990	1971-72	1990
5-10	1.0000	1.0000	0.0101	0.0036
10-15	0.9510	0.9825	0.0932	0.0734
15-20	0.5946	0.6777	0.0785	0.1472
20-25	0.4012	0.3184	0.0945	0.1664
25-30	0.2492	0.1340	0.0795	0.1086
30-35	0.1672	0.0777	0.0611	0.1185
35-40	0.1233	0.0427	0.0795	0.1712
40-45	0.0828	0.0175	0.0673	0.1570
45-50	0.0591	0.0075	0.0794	0.4082
50-55	0.0397	—	0.0481	—
55-60	0.0312	—	0.0354	—
60-65	0.0262	—	0.0354	—
65-70	0.0220	—	0.0962	—
70-75	0.0131	—	0.0269	—
75-80	0.0118	—	0.0878	—
80-85	0.0076	—	0.0505	—
85-90	0.0059	—	0.1616	—
90-95	0.0025	—	0.0000	—
95-100	0.0025	—	0.4040	—

In order to examine whether the two survival distributions for the 1971-72 and 1990 data differ significantly, the Mantel test is used. It is found that the Z value, which provides the equality of the two survival distributions (computed as suggested by Mantel) is 3.32 which is significant statistically. This Z value also is normally distributed approximately for large samples. This shows that the survival distributions of the first birth interval of two data sets differ significantly from each other.

The survival experiences of the two groups of data (Fig. 1) clearly show that both the samples are more or less similar in prolonging their first birth in the early part of their marital life, but after that the earlier data show an increase in time taken for first birth. This shows that waiting time for first birth has decreased over time. The use of contraceptives to delay first birth is not common in Kerala as in other developing countries even today (Ngallabes *et al.*, 1993; Central Bureau of Statistics, Indonesia, 1992). The fecundity level among the women may have increased during the two decades between the surveys. Moreover, the well crystallised socio-cultural norm of non-delaying first conception may also be playing a role here. (The mean age at marriage of women is more or less equal for both data.)

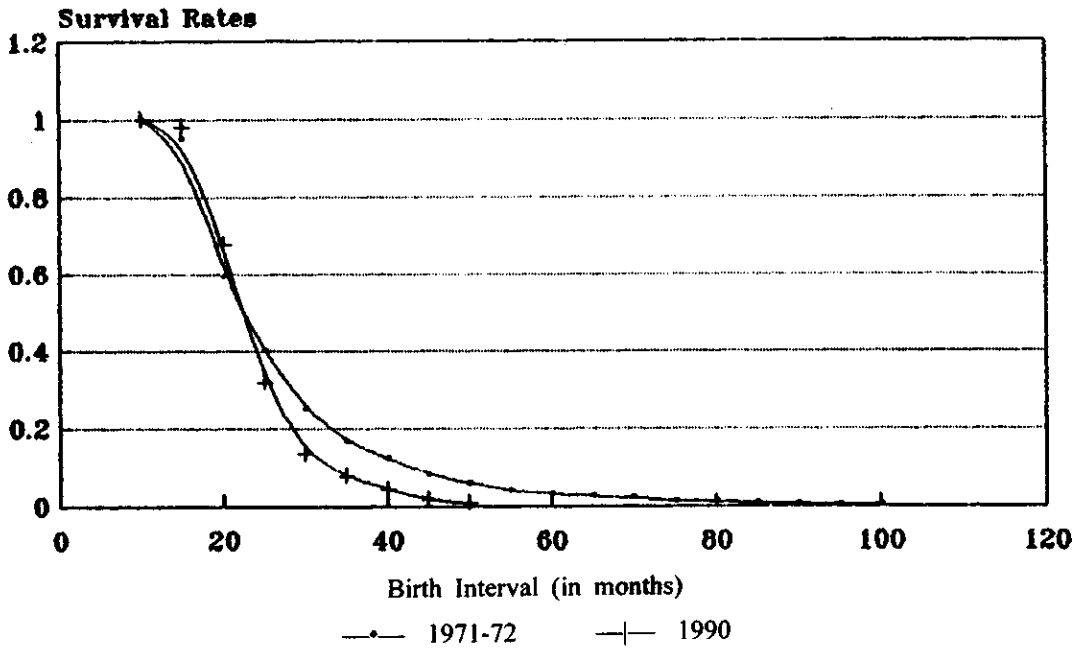


Fig. 1. Survival Rates (First Birth)

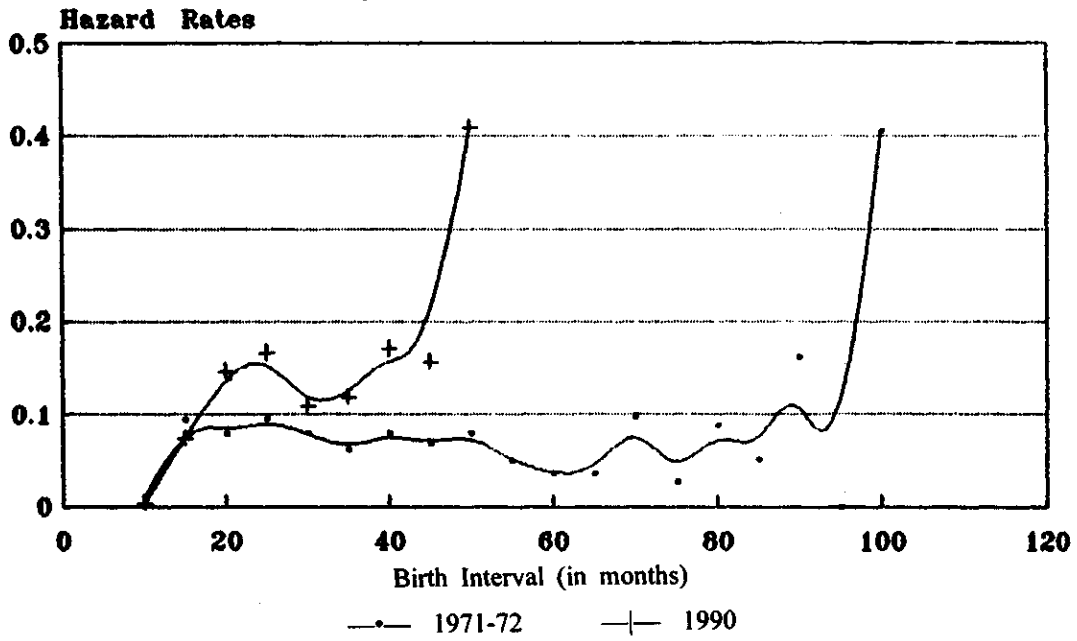


Fig. 2. Hazard Rates (First Birth)

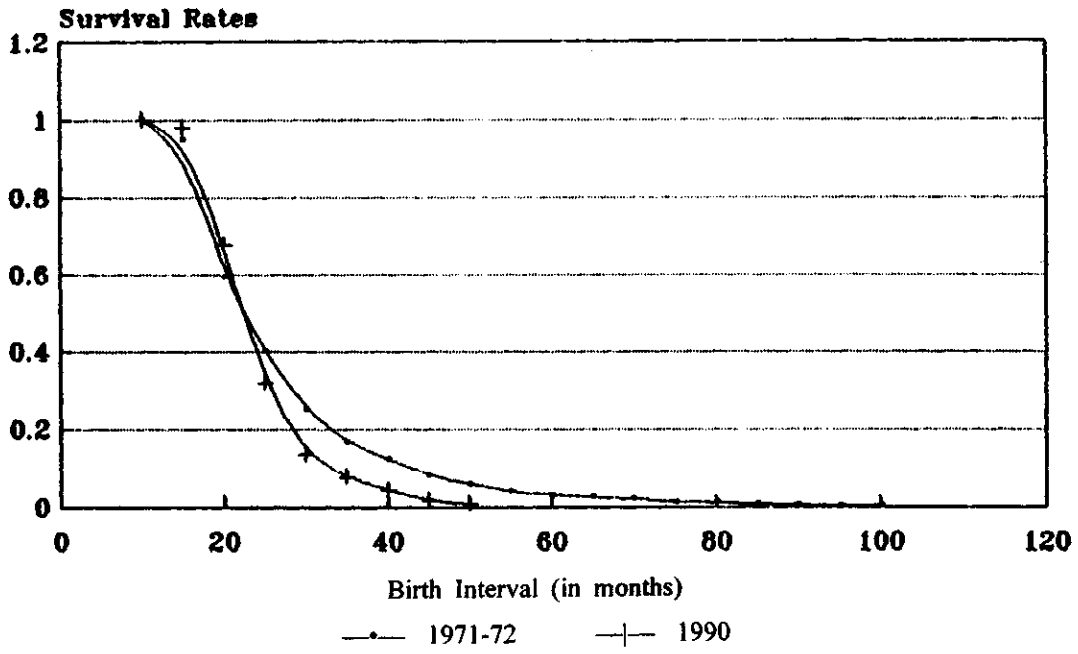


Fig. 1. Survival Rates (First Birth)

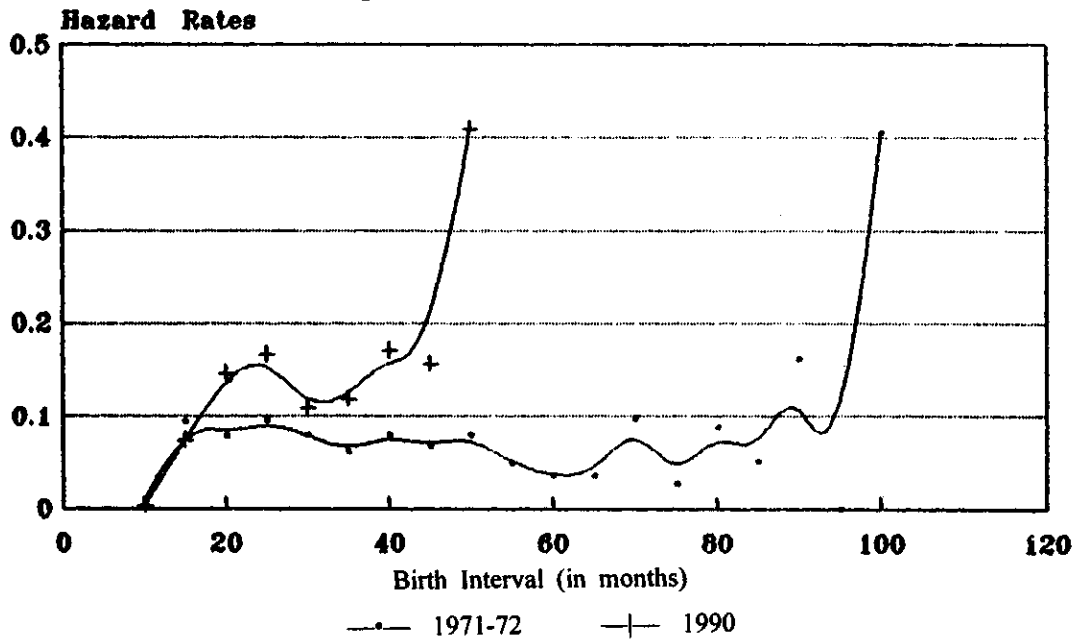


Fig. 2. Hazard Rates (First Birth)

The cumulative percentage of women having a birth by the end of 19 months is 41 for the 1971-72 survey, while for the recent data, it is only 32. But the pace of fertility appears faster after 19 months for the women of the latter survey and 96 percent of the first birth occurred before 35 months since marriage for these women. The corresponding figure for the former data set is 88 percent. A study conducted in Shaanxi, China (Ping Tu, 1991) indicates that most of the women had their first birth as soon as possible (the estimated median length of first birth interval was only 14.2 months).

The hazard rate can be defined here as the probability of occurrence of birth per woman per month and the rates for the latter data are higher than those of the former data beyond 15 months. The largest hazard rates are for 45-50 months for the 1990 data and for 85-90 months interval for the 1971-72 data. Figure 2 shows a clear picture of the experience of the two data sets. The graph shows higher hazard rates for the recent data in the timing of first birth.

Table 3 presents the results of MCA of first birth interval. Interestingly, there is not much variation in the first birth intervals among the three religious groups for both the data sets. The difference is less than 0.5 month in 1971-72 and negligible in 1990. Looking at the difference between the two time periods, first birth interval decreases by more than 2 months among all the three religious groups of the women of the 1990 survey compared to those of 1971-72 survey. After controlling the effects of education of couples and age at marriage, the difference is reduced to 0.2 month for 1971-72 data and 0.003 month for 1990. But the difference between the two time periods is still more than 2 months. The so called 'minority' effect is not at all visible in the fertility behaviour in Kerala. This state, historically, is well known for communal amity and the absence of a significant religious differential may be a special feature of the social milieu of Kerala.

Table 3 also shows that there is no marked dissimilarity in first birth interval between different educational groups. For the 1971-72 data, the low educated husbands had the highest first birth interval, while the medium educated lowest, a difference of 0.58 month. A negligible increase in the interval could be seen as the level of education increases. However, for the 1990 data, the highly educated husbands have the highest first birth interval and medium educated the shortest; a difference of only 0.18 month on the average. However, the mean intervals of first birth show a substantial variation by educational levels between the two time periods.

When the differences in religion, educational level of wife and age at marriage are controlled, the effects of the variation between the levels of education of husbands got reduced further in both the time periods. Also, the difference between the three educational groups of the two time periods was reduced. The 1971-72 data set have longer birth intervals, a difference of slightly more than three months from the 1990 data.

The illiterate and primary educated women have the longest first birth interval for both the data sets. The mean age at marriage among these women is low and therefore the societal pressure for early conception may be less. The difference between the largest and shortest first birth interval of the three educational groups of wives in 1971-72 data is marginal compared to other factors. But, for the 1990 data, a small increase in the

difference between the effects of educational levels of wives can be seen when the effects of other factors and covariates are controlled. The highly educated women have the longest first birth interval for both the data.

TABLE 3: RESULTS OF MULTIPLE CLASSIFICATION ANALYSIS (MCA)  
FIRST BIRTH INTERVAL 1971-72, 1990

<i>Variable</i>	<i>1971-72</i>		<i>1990</i>	
	<i>Unadjusted</i>	<i>Adjusted factors and covariate</i>	<i>Unadjusted</i>	<i>adjusted factor and covariate</i>
<b>Religion</b>				
Hindu	20.347	20.694	18.271	18.301
Christian	20.468	20.620	18.286	18.299
Muslim	20.844 (0.108)*	20.853 (0.083)*	18.286 (0.010)	18.302 (0.001)
<b>Education (Husbands)</b>				
Low	22.033	21.815	18.351	18.185
Medium	21.458	21.331	18.233	18.210
High	21.540 (0.066)*	21.450 (0.048)	18.414 (0.034)	18.275 (0.007)
<b>Education (Wives)</b>				
Low	21.736	21.007	18.663	18.594
Medium	21.312	20.822	18.351	18.273
High	21.289 (0.052)	21.152 (0.031)	18.614 (0.078)	18.623 (0.078)
Multiple <i>R</i>		0.187*		0.102*
$R^2$		0.035		0.010

\*Significant at 5% level.

Figures in parentheses are eta values (gross effects) and beta values (net effects) respectively.

The multiple *R*; i.e., the overall relationship between first birth interval and the independent variables has decreased from 0.187 to 0.102 overtime. *R*, the proportion of variation in the first birth interval explained by the additive effects of factors and covariates is only 0.04 in 1971-72 and 0.01 in 1990.

The preceding results show that there are no substantial differences in the first birth interval between religious groups and levels of education. In fact, on average, women of different categories have their first birth at similar durations for both the data sets. Very low differentials in the unadjusted and adjusted means for the two time periods are observed. Restriction of the sample to young women, age 34 years or less, reduces the bias in the data, but the variations in birth intervals are reduced and extraneous variations are removed. Wineberg (1988) suggests "as fertility continues to remain at low levels, social factors may have less influence on the timing of fertility". This appears true for

the recent data, since the first birth for most of the women occurred at a time of accelerated fertility transition. For the two sets of data, social factors seem to have very little influence on first birth interval. Bloom and Russell (1984) had concluded that, in coming years fertility patterns are likely to be differentiated on the basis of education and race.

### *Second Birth Interval*

For the analysis of second birth interval, closed as well as open intervals are considered. Table 4 presents the survival rates and hazard rates for the two sets of data for different groups and Figs. 3 and 4 are their graphic representations. The survival rates of the 1971-72 data at each month is smaller than the rates of 1990 data. This shows that at each interval, a smaller proportion of the women of the latter data set have a birth. However, the difference between these two data sets is not substantial.

TABLE 4: SECOND BIRTH SURVIVAL RATES AND HAZARD RATES: 1971-72, 1990

<i>Second Birth Interval</i> (in months)	<i>Survival Rate</i>		<i>Hazard Rate</i>	
	<i>1971-72</i>	<i>1990</i>	<i>1971-72</i>	<i>1990</i>
05-10	1.0000	1.0000	0.0000	0.0000
10-15	1.0000	1.0000	0.0164	0.0146
15-20	0.9219	0.9302	0.0319	0.0246
20-25	0.7868	0.8233	0.0523	0.0383
25-30	0.6064	0.6808	0.0575	0.0512
30-35	0.4553	0.5275	0.0758	0.0590
35-40	0.3114	0.3931	0.0653	0.0457
40-45	0.2248	0.3133	0.0742	0.0395
45-50	0.1550	0.2575	0.0643	0.0240
50-55	0.1125	0.2286	0.0518	0.0485
55-60	0.0869	0.1796	0.0479	0.0839
60-65	0.0685	0.1179	0.0250	0.0332
65-70	0.0605	0.1000	0.0195	0.0070
70-75	0.0549	0.0966	0.0357	0.0000
75-80	0.0460	0.0966	0.0299	0.0289
80-85	0.0397	0.0837	0.0299	0.0505
85-90	0.0347	0.0651	0.0213	0.0000
90-95	0.0312	0.0651	0.0216	0.0000
95-100	0.0293	0.0651	0.1347	0.0622

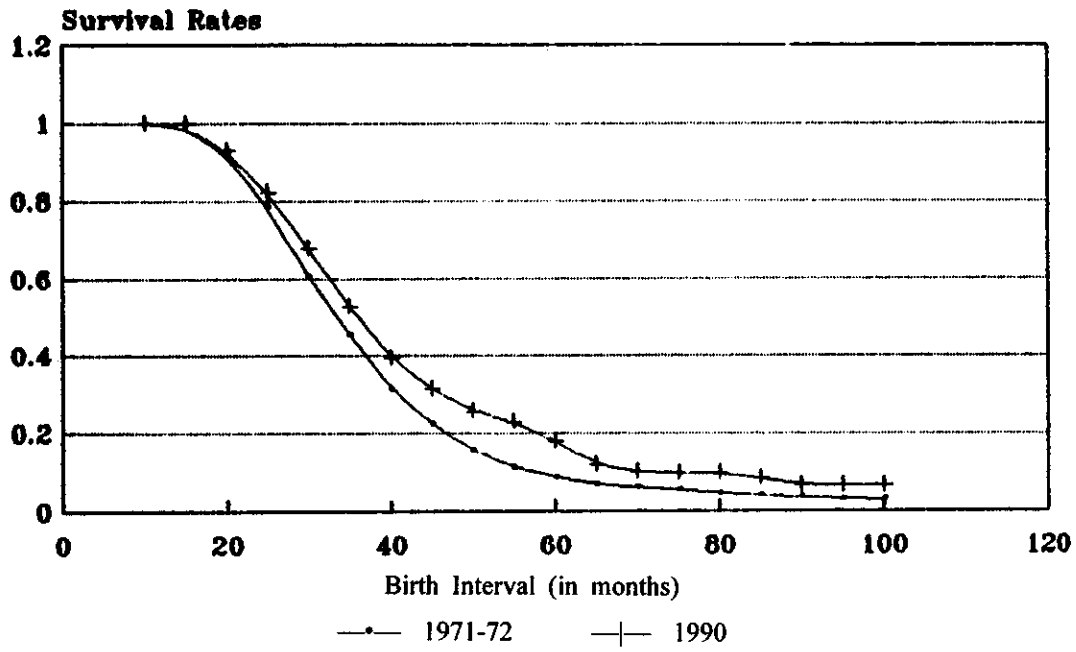


Fig. 3. Survival Rates (Second Birth)

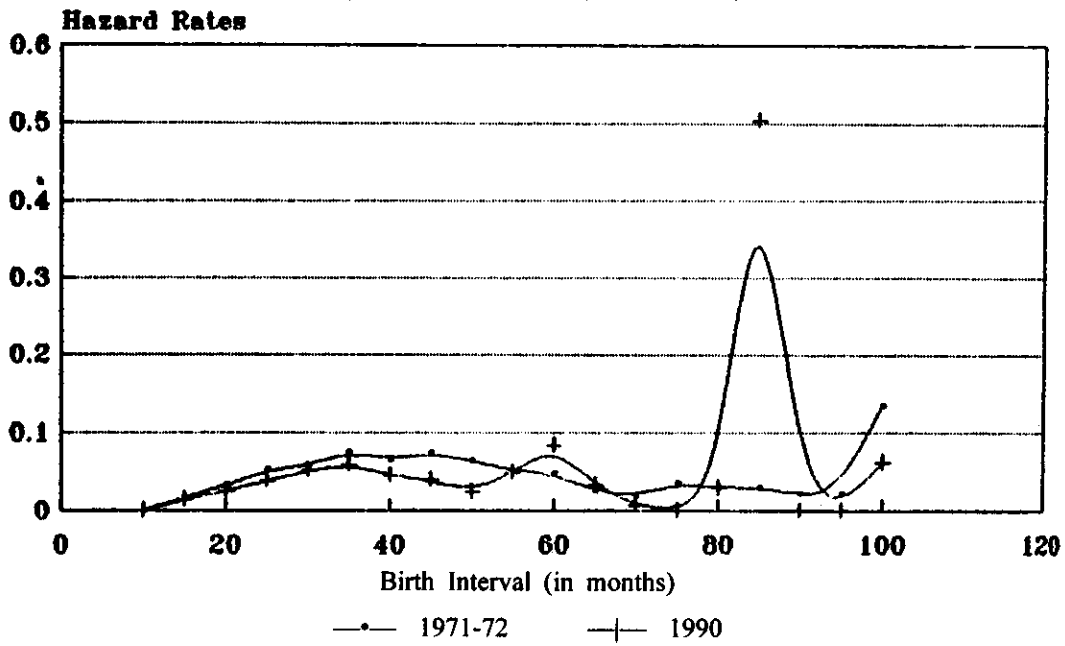


Fig. 4. Hazard Rates (Second Birth)

The Z value, to test whether the probability of progressing from first to second birth within two years after first birth differs significantly for the two sets of data, is only 1.71 which is not significant at 5 per cent level. Similarly, the Z value for a period within three years and four years after first birth are 2.97 and 4.25 respectively and both the values are significant. The test statistics of the probabilities of transition from first to second birth for the two data-sets within 72 months (6 years) and 99 months (8.25 years) are 2.45 and 3.06 respectively and both the values are greater than 1.96, the theoretical value. So it can be concluded that the probabilities of having a second birth immediately after first birth among the two data sets do not differ significantly from each other, but afterwards, they differ significantly (at 5 per cent level).

One third of the women of the 1971-72 survey had their second birth after completing 2 years since first birth, while nearly 30 percent of the women of the second data-set had their second birth during this period. Cumulative percentages of women having a second birth before three years are 58 per cent and 55 per cent for the former and latter data respectively. About 75 per cent of the women had a second birth before 5 years for 1990 data, while the women of 1971-72 data-set took nearly 70 months to have a second birth for the same proportion. Nearly same proportion of the women (77.8 per cent and 78.6 per cent) had a second birth by 99 months after the first birth. The Z value is 4.143 which is significant statistically. So we may conclude that the women of the time periods differ significantly in progressing to second birth.

For the MCA of second birth interval, one more covariate—the duration of breast feeding is included for the 1990 data set. Table 5 shows that the religious differential in the second birth interval is negligible during 1971-72, since the maximum difference is only 0.09 month and during 1990, the difference is 0.72 month. When controlled for the effects of factors and covariates, the means of the three religious categories have increased for the former data. However, except for the Muslims, the means have declined for the other two groups recently. The difference between the maximum and minimum values of birth intervals of the three categories of religion is 0.28 month in 1971-72 and it is 0.38 month in 1990. Before and after the introduction of control variables, the two time periods show a difference of two months of second birth interval, while an increase in the difference of the intervals for Muslims is also observed.

Among the three categories of educational levels of husband also, very small differentials are observed for both the data sets. The maximum difference between pairs of educational levels are 0.81 month for the former data and 0.71 month for the recent data. This shows that effect of the husband's education on second birth interval is very small in both generations. When the effects of factors and covariates are controlled, the mean values declined for all the three categories of education in 1971-72 and also in the low and high educated groups in 1990.

A cursory look at the unadjusted means show that the difference within the levels of education of wives are much greater than the difference in the other two variables for both the data sets. The highest difference for the 1971-72 data and 1990 data are 1.46 months and 1.57 months respectively. Introducing controls reduces the effects of

TABLE 5: RESULTS OF MULTIPLE CLASSIFICATION ANALYSIS (MCA):  
SECOND BIRTH INTERVAL 1971-72, 1990

	1971-72		1990	
	<i>Adjusted</i>	<i>Unadjusted factors and covariate</i>	<i>Adjusted</i>	<i>Unadjusted factors and covariate</i>
<b>Religion</b>				
Hindu	29.234	29.453	31.449	31.428
Christian	29.181	29.404	31.961	31.757
Muslim	29.148 (0.030)	29.174 (0.053)	31.244 (0.114)	31.373 (0.108)*
<b>Education (Husbands)</b>				
Low	30.574	30.319	32.632	32.298
Medium	29.763	29.517	31.921	32.339
High	29.905 (0.092)*	29.897 (0.109)*	32.417 (0.063)	31.665 (0.078)
<b>Education (Wives)</b>				
Low	29.782	28.996	32.776	30.899
Medium	29.557	28.998	31.782	30.684
High	28.318 (0.056)	29.092 (0.020)	32.700 (0.102)*	32.249 (0.102)*
Multiple/?		0.223*		0.702
$R^2$		0.050		0.493

\* Significant at 5% level.

Figures in parentheses are eta values (gross effects) and beta values (net effects) respectively.

education in both the data sets except for the high education category of 1971-72 survey. There is no discernible effect of education of wife on second birth interval for 1971-72 data after controlling for the other predictors. Focusing on the difference in the effects of wife's education on second birth interval in the two samples, one can see that there is an increase in the second birth interval of each category for both the raw and adjusted means compared to the other predictor variables. For the unadjusted means, the differences lie between 2.225 months and 4.382 months and for adjusted means the corresponding values are 1.686 months and 3.157 months. When we introduce the controls, the effect of the level of education of wife increases for the 1971-72 data, while for the medium education category of the 1990 data, the effect of education gets reduced. But the effect of higher education is increased. The regression coefficients are significant for both data-sets. The overall relationship between the criterion variable and independent variables increases over time. The proportion of variance explained by the additive models increases from 0.05 to 0.49 during a period of nearly 20 years.

The multiple classification analysis shows that very slight differentials in the second birth interval exist by religion and education of couples, even after the effects of other

independent variables are controlled. From the present analysis, it appears that women, irrespective of any social, economic or demographic differentials, wish to have their first two births within a short time. We can see a behavioural homogeneity among the women of two generations.

#### *Third Birth Interval*

The proportion of women not opting a third birth in each time duration is obviously high for the recent data. The survival rates clearly show that very few women have a third birth during recent times (see Table 6 and Fig. 5). Also a very sharp decline in survival rates is observed between 20 and 40 months among the women of the former group. The decline in the survival rates of 1990 data is, perhaps, facilitated by the increased use of contraceptives. The Z values to test the probabilities of transition from second to third birth within 2 years, 3 years and 5 years are 5.58, 10.68 and 19.4 respectively and all the values are highly significant, implying a very high difference in the probabilities of progressing to the next birth among the women of the two generations.

TABLE 6: THIRD BIRTH SURVIVAL RATES AND HAZARD RATES: 1971-72, 1990

Third Birth Interval (in months)	Survival Rate		Hazard Rate	
	1971-72	1990	1971-72	1990
05-10	1.0000	1.0000	0.0000	0.0000
10-15	1.0000	1.0000	0.0109	0.0016
15-20	0.9473	0.9921	0.0200	0.0082
20-25	0.8580	0.9529	0.0409	0.0150
25-30	0.7003	0.8846	0.0572	0.0140
30-35	0.5266	0.8255	0.0660	0.0082
35-40	0.3788	0.7928	0.0717	0.0018
40-45	0.2647	0.7858	0.0523	0.0049
45-50	0.2040	0.7671	0.0410	0.0109
50-55	0.1664	0.7266	0.0472	0.0037
55-60	0.1316	0.7135	0.0066	0.0082
60-65	0.1273	0.6851	0.0151	0.0015
65-70	0.1181	0.6800	0.0182	0.0103
70-75	0.1080	0.6463	0.0106	0.0058
75-80	0.1024	0.6279	0.0449	0.0043
80-85	0.0820	0.6148	0.0109	0.0023
85-90	0.0820	0.6078	0.0282	0.0000
90-95	0.0713	0.6078	0.0109	0.0026
95-100	0.0675	0.6078	0.0449	0.0215

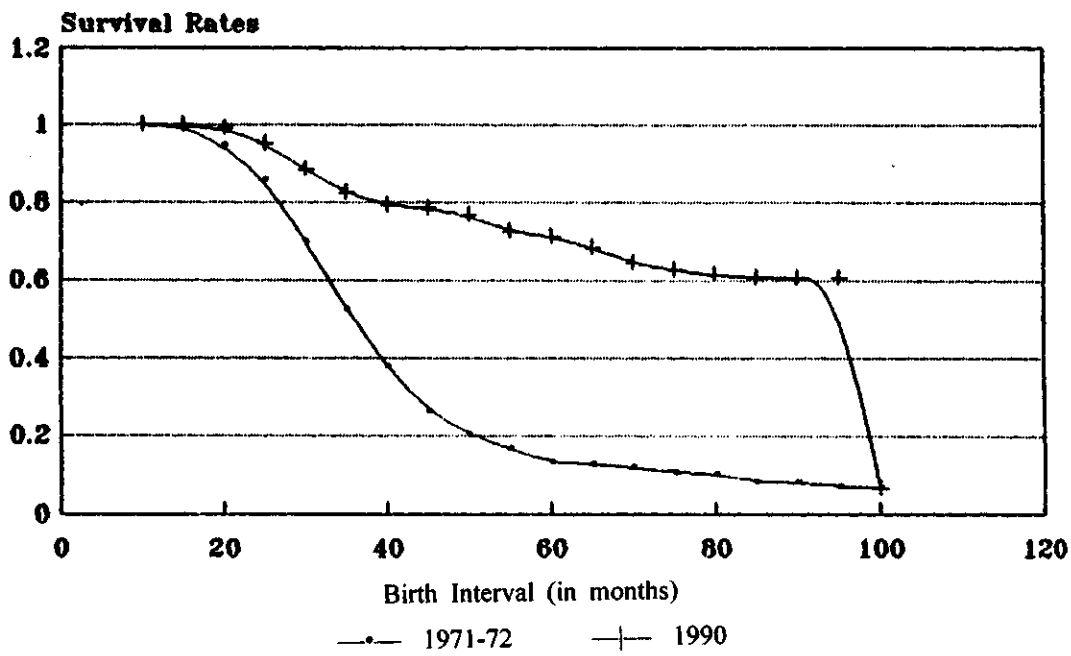


Fig. 5. Survival Rates (Third Birth)

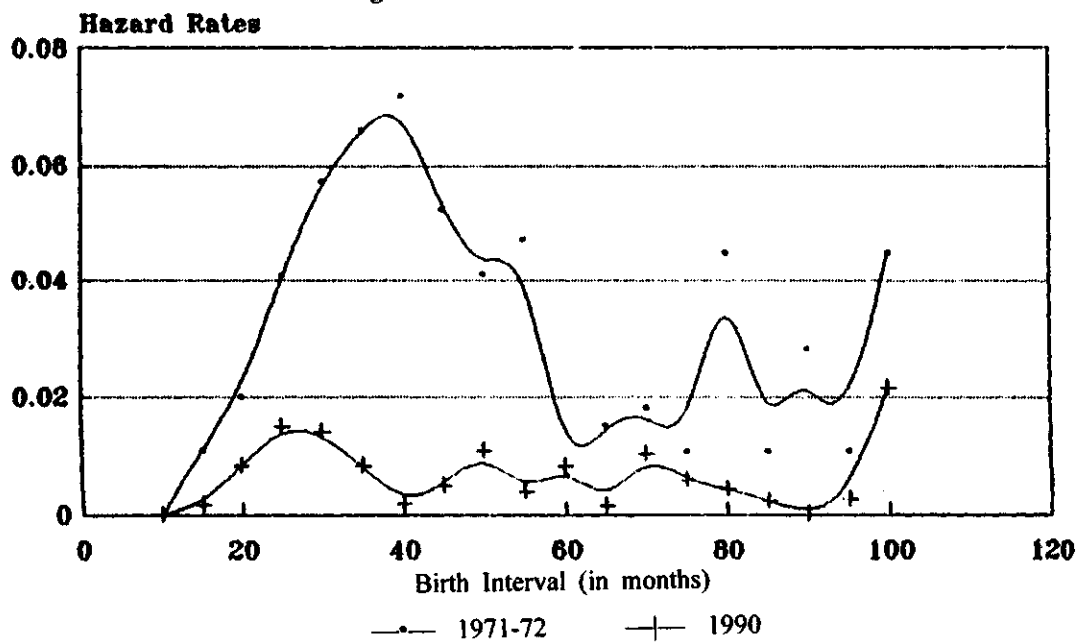


Fig. 6. Hazard Rates (Third Birth)

Nearly 10 percent of the women of the recent period have third births after two years while 25 percent of the women of the former data-set have a third child. Moreover, 23 percent of the women of 1990 survey have another birth five years after second birth, the corresponding proportion for 1971-72 data is nearly 66 percent. More than two third of the women who had borne two children go for another birth in 1971-72, but only 28 percent of the women of the recent data have a third birth by the end of 99 or more months. The absolute Z value computed to examine the difference between the two survival functions is 16.84 and this implies a large difference between the two time periods in progressing to the third birth.

The hazard rates for 1990 data are lower for each time interval than those of the 1971-72 data except at the intervals of 55-60 and 80-85 months (see Table 6 and Fig. 6). These two higher rates may be due to some error in one or both the surveys. The hazard rates for the third birth show very high difference between the two data-sets. Table 6 shows that family size has actually been declining substantially overtime and it would appear that in future the proportion of women having three live births will be extremely low.

TABLE 7: RESULTS OF MULTIPLE CLASSIFICATION ANALYSIS (MCA): THIRD BIRTH INTERVAL  
1971-1972, 1990

Variable	1977-72		1990	
	Adjusted	Unadjusted factors and covariate	Adjusted	Unadjusted factors and covariate
<b>Religion</b>				
Hindu	29.963	30.030	38.153	36.427
Cristian	29.874	29.942	36.865	37.347
Muslim	30.300 (0.086)*	30.865 (0.068)	32.171 (0.237)	32.256 (0.318)
<b>Education (Husbands)</b>				
Low	31.416	31.294	28.393	29.195
Medium	30.741	30.639	32.459	33.267
High	30.886 (0.086)*	30.865 (0.068)	32.171 (0.237)*	32.250 (0.318)*
<b>Education (Wives)</b>				
Low	30.691	30.060	31.136	35.855
Medium	30.609	30.293	33.730	36.494
High	30.293 (0.062)	29.977 (0.320)	33.733 (0.142)	35.689 (0.095)
Multiple R		0.155*		0.690*
R <sup>2</sup>		0.024		0.476

\* Significant at 5 per cent level.

Figures in parentheses are eta values (gross effects) and beta values (net effects) respectively.

For the present analysis, the duration of breast feeding is included as a covariate. We have already seen that there is no substantial shift in the means of first birth interval and second birth interval across the two generations.

It is notable that the women of recent period show an increasing tendency to delay their third birth. Moreover, the differentials are also greater for the recent data (Table 7). For 1971-72 data, the difference between the means of the three religious groups lies between 0.089 months to 0.426 months and the corresponding figures are 0.5337 months and 1.228 months for 1990 data. Very negligible increase in the intervals of the three categories can be seen after the effects of other factors and covariates are controlled. But, for the recent data, the birth interval of all the three groups declined when the factors and covariates are introduced.

The effect of education of wife is seen very low for the 1971-72 data. The three educational categories have on the average, more or less equal duration of third birth interval. But an increase in the educational level of wife increases the third birth interval by more than 2.5 months recently (1990).

The results presented in this section provide strong evidence that increase in educational attainment of couples leads to an increase in third birth interval. This finding underlines the importance of education on higher order births. The differentials by religion, education and age at marriage persist for both the data sets. Very high values of multiple  $R$  are observed overtime. Also, a revealing finding is that the proportions of variance explained by all the independent variables is only 0.02 in 1971-72, but increased to 0.48 in recent times. Further, the mean intervals—adjusted and unadjusted—computed from the two data-sets are closely similar within different categories of each factor for the first three births.

### **Summary and Conclusion**

The research attempt here is addressed to examine two different aspects of birth interval dynamics. First, we investigate whether or not the length of birth intervals is the same for two generations (20 year period). Second, we tried to know whether the effects of a host of predictor variables on the dependent variable (i.e. birth intervals) varies among comparable women of different time periods during a period of accelerated fertility transition in Kerala. It is established that the variables affecting conception are parity dependent. Hence, the changes in the parity specific birth interval patterns and the determinants of each birth interval are studied.

The study was conducted in a suburban village of Trivandrum city in Kerala. The details of marriage and pregnancy history of all the women of the area were collected during 1971-72. From this demographic data pertaining to currently married women (at the time of survey) aged less than 35 years and having at least one live birth were elicited. The details of women of sample segments of the same panchayat area were collected again in 1990. These information from two distinct time points representing a twenty year time span (almost a generation) constitute the data for the present study. There were 1,184 such women for the former survey and 515 for the latter survey.

The technique of Hazard model is employed to compare the survival rates and hazard rates at each time period and they %ve the proportions of women processing, to next birth among all those at risk of having another birth. The results of hazard model analysis clearly indicate that the cumulative proportion of the two data-sets having a birth by the end of one year, two years, three years etc., after marriage or previous birth differ significantly from each other. This points towards the change in the pattern of birth intervals over time. The waiting time for first birth declined recently, while for the second and third births, it increased. It is well known that when the level of fertility declines, the birth intervals do shrink. In Kerala, the mean age at marriage of women has been on the increase. That along with the social pressures, couples may have high motivation for early conceptions. The women of the two generations differ significantly in the timing of second birth. Also, the proportions progressing to third birth show substantial difference between the two sets of data.

The hazard rates of different time durations are not decreasing with, increase in birth intervals. At some points, we can see a sudden jump in hazard rates. It is natural that some variables are responsible for the changes in birth intervals.

Multiple classification analysis also has been performed to understand the dynamics of birth interval. The explanatory variables considered here are : religion, education of couples, age at marriage and duration of breast feeding. A summary of findings is given below.

The MCA results show very little difference in the first and second birth intervals of the three religious groups (Hindus, Christians and Muslims) and the three educational groups (low, medium and high) of both husband and wife. But the education of wives shows significant impact. This reassures the relative importance of female education in social development including fertility transition.

Religion does not show high variations even in the third birth interval for the two time periods. However, education of couples have discernible effect on the third birth interval of the recent data. These findings are confirmed by the National Family Health Survey (Nair *et al.*, 1995) results as well in Kerala. The total fertility rate for Kerala is around 2 and the proportion of women proceeding to higher parities are extremely low. Religious differentials on fertility have narrowed down tremendously during the last 10 years.

The study throws some light on the policy changes required in the ongoing family welfare programme in our country. The target oriented female sterilisation stressed programme in the country has not essentially popularised the need and means for birth spacing. This has led to the creation of a norm of achieving the desired family size, say 2 or 3, as early as possible and then go for sterilisation with out much regard for birth spacing. The relation between birth spacing and the health of the mother and children is well established. Even in Kerala, the maternal and child health are not commendable although it may be relatively better among various states in India. So the policy makers and programme personnel should refocus or reorient the whole strategy of family welfare service delivery for increasing the birth interval, at least the second interval and beyond.

The Information Education Communication (IEC) activities and intra-personal motivational efforts should underline the scope and importance of spacing methods especially in those states where fertility has declined substantially.

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