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## Trends in Religious Differentials in Fertility, Kerala, India: An Analysis of Birth Intervals

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## Abstract

In spite of overall below replacement level fertility in the state of Kerala, India, fertility differentials by religion persist. The paper examines fertility differentials among the three religion groups, Hindu, Muslim and Christian, and trends in these based on data from the National Family Health Survey (NFHS-1). The results show that the mean closed birth intervals do not differ much across religion. The life table indicators of the second birth interval also do not vary by religion, but for the third and fourth birth intervals, the medians are shorter for Muslims than Hindus and Christians for all the birth cohorts. Probabilities of progressions to third and fourth birth are also higher for Muslims than for Hindus and Christians. Application of the proportional hazards model (Cox regression) shows that, for intervals after the second birth, the risk of the next birth is significantly higher among Muslims than Hindus and Christians even after controlling for other socio-economic and demographic variables. Moreover, the religion effect has become stronger over time in spite of an overall fertility decline.



JEL Classification : *J 11, J13, Z12*

Keywords : *Birth intervals; Proportional hazard; Fertility; Religion; Kerala*



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# Trends in Religious Differentials in Fertility, Kerala, India: An Analysis of Birth Intervals

**Manoj Alagarajan**
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## 1. Introduction

Fertility differentials by religion and other cultural factors have been observed in developing as well as in developed countries (Freedman and Whelpton, 1961; Westoff *et al*., 1963; Jones and Nortman, 1968; Ryder and Westoff, 1971; Goldstein, 1973; Chamie, 1977). In India, the estimates of fertility from various sources indicate that among major religions Muslims have experienced the highest fertility and Sikhs the lowest. Between these extremes are Hindus and Christians. The National Family Health Survey-1 (NFHS-1) of India conducted during 1992-93 estimated the Total Fertility Rate (TFR) at 4.41 for Muslims, 3.30 for Hindus, 2.87 for Christians and 2.43 for Sikhs (IIPS, 1995). Estimates from the second National Family Health Survey (NFHS-2, conducted during 1998-99) also show a similar pattern, TFR of 3.59 for Muslims, 2.78 for Hindus, 2.44 for Christians and 2.26 for Sikhs (IIPS and ORC Macro, 2000). However, in India, populations of various religions are not uniformly distributed across states and since there are large regional variations in fertility some of the observed religious differentials in fertility may be on this account. For example, the Sikh population is concentrated in the state of Punjab that has low fertility. Similarly, the Christian population is relatively high in the southern state of Kerala characterised by nearly universal literacy and very low fertility. Hence, instead of comparing fertility of various religions at the national level, it is desirable to examine religious differentials within a state or a region. The state of Kerala has large populations of three religion groups, Hindu, Muslim, and Christian; according to the 1991 census, of the total state population of 29.1 million, 57.3 percent was Hindu, 23.3 percent Muslim, and 19.3 percent Christian (India, Registrar General, 1995). As a consequence of the fairly large shares of each of the three religions, in state level surveys the number of cases belonging to each of these religions is large enough to provide estimates of fertility and to permit analysis of fertility behaviour by religion. Kerala also presents an interesting case, though the state has reached replacement level low fertility, large differentials are seen among the religious

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groups. According to the NFHS-1, the TFR in Kerala was 2.00 during 1989-92, (PRC, Thiruvanthapuram and IIPS, 1995). Within the state, Hindus and Christians (TFR of 1.66 and 1.78 respectively) had below replacement level fertility, however for Muslims the fertility was relatively higher (TFR of 2.97).

Demographic theory recognises that fertility differentials by religion may, at least in part, be caused by variations in socio-economic factors such as education, occupation, and urbanisation, across religions rather than by religion *per se,* the well known characteristics hypothesis (for discussion of theories explaining religious fertility differentials, see Jones and Nortman, 1968; Goldscheider and Uhlenberg, 1969; Chamie, 1977). Therefore, to assess the net effect of religion, it is necessary to control for the effects of other factors. Further, often the differentials widen or narrow down during the process of fertility transition; it is known that in North America, the Catholic-Protestant fertility gap narrowed down during the post-baby boom period (Westoff and Jones, 1979; Mosher and Hendershot, 1984). In the case of Kerala, which has recently experienced a transition to replacement level fertility, it would be of interest to see how the religion effect has changed through the transition. But in view of the characteristics hypothesis, it is essential that any analysis of the religion effect on fertility must be carried out after controlling for the effects of other socio-economic variables.

Fertility changes and variations can be meaningfully studied through an analysis of the family building process. One way of doing this is to examine parity progression ratios (PPRs). Such an analysis was carried out for Kerala and presented in an earlier work (Alagarajan and Kulkarni, 1998). However, the socio-economic variables could not be incorporated in this analysis because computation of PPRs for various religions in categories of socio-economic factors was not possible on account of small number of births in each cell (religion x socio-economic factor category). However, an analysis of birth intervals, that includes both closed and open intervals, can overcome this problem. Here, the approach of survival analysis is adopted and the influence of various factors on the risk of occurrence of the next birth is assessed. The proportional hazards model (Cox regression) that combines the features of life table and regression is well equipped to estimate the net effect of religion on the hazard of occurrence of the next birth, controlled for the effects of other variables (Cox, 1972). When applied to birth cohorts, the technique can also provide trends in the effects of religion and other variables.

In an earlier work, a birth interval analysis of the data from the Kerala Fertility Survey of 1980 found higher hazards for Muslims and Christians compared to Hindus for the first, second, and third births after other socio-economic factors were controlled (Singh *et al*., 1993). However, no trends were examined and the survey covered only three districts of the state. Analysis of data from two surveys conducted in 1971-72 and 1990 did not show any clear religion effect (Nair, 1996; Nair and Nair, 1996). But these surveys covered a very small area, in fact, only one village near Trivandrum City, and the sample size was quite small. On the other hand, the data from the NFHS-1, that covered sample from the entire state, makes it possible to carry out a systematic assessment of the religion effect on fertility in Kerala. This paper has two principal objectives: first, to examine the magnitude of the religion effect net of the effects of other socio-economic factors in the Kerala state of India, and, second, to assess trends in this effect, that is, whether the religion effect has changed in the recent years.

## 2. Data and Methodology

The data used in this paper are from the National Family Health Survey-1, a large survey that covered various aspects of health, fertility and family planning in all the states of India. The survey for Kerala, carried out during October 1992 to February 1993, included 4332 ever married women in the age group of 13-49 years from 4387 households. The detailed fertility histories collected in the survey are used for the analysis in this paper. The sample covered a fairly large number of ever-married women belonging to each of the three major religions, 2346 Hindu, 1147 Muslim, and 824 Christian.

First, mean closed birth intervals (a closed birth interval is the interval between the two consecutive live births, also called an inter-live birth interval) are presented by religion. However, it is recognised that an analysis of closed birth intervals, though useful to examine the tempo of childbearing, does not reveal the termination effect. Open birth intervals (an open birth interval is the interval between the last birth and the date of survey) are useful in this context (Srinivasan, 1980) and a life table analysis can combine information from both closed and open intervals (Rodriguez and Hobcraft, 1980; Hobcraft and McDonald, 1984). A closed birth interval of length `t' is equivalent to the occurrence of the event (the next birth) at time `t' since the previous birth, and is a complete observation. On the other hand, an open interval of length `s' is

equivalent to the non-occurrence of the next birth at least until time `s', and is thus a censored observation since it is only known that the next birth has not taken place by the survey date. A life table can be constructed by pooling closed and open birth intervals of a specific order (for methodology, see, Lee, 1993). Using this approach, life tables have been constructed for the second, third, and fourth intervals for the three religions. Three indicators are computed from the constructed life tables: the median, i.e., the date by which half of the women had the next birth; proportion who had the next birth within 60 months (5 years), called the Quintum (Rodriguez and Hobcraft, 1980); and the proportion who had the next birth within 120 months (10 years).

In order to see changes over time the analysis has been carried out by birth cohorts, that is time period in which the interval begins. The second birth interval begins on the date of the first birth, and so on. Three birth cohorts are considered: 1972-76, 77-81, and 82-86. Since the data are from the fertility histories of women interviewed in the survey, who were of age 13-49 during 1992-93, the number of births prior to 1972 is not large. Further, intervals beginning in the five year period just before survey, that is 1987-92, are also not considered since truncation seriously affects these. Intervals of width 0, caused due to twin births, are ignored.

It is well accepted in demographic literature that education, economic status, female work participation, and rural-urban residence have a bearing on fertility. If these characteristics vary by religion, it is possible that some of the observed religious differentials are caused by such factors rather than be effects of religion as such. In order to see if this is indeed the case, distributions of women of the three religions from the NFHS sample were obtained by education, standard of living index (proxy for household economic status), work status of woman, and residence. These are categorised variables as listed below:

1. Education of Woman: four categories, Illiterate, Literate without schooling or up to Primary School, Middle School completed but not High School, and High School completed

2. Standard of Living: three categories, Low, Medium, and High, on the basis of an index computed by Roy and Jayachandran (1996) from housing condition and ownership of consumer durables (details provided in Table 1).

3. Work Status of Woman: dichotomous, Working and Non-Working;

4. Residence: dichotomous, Rural and Urban.

**Table 1: Percentage Distribution of Women in Each Religion by Socio-economic Characteristics, NFHS-1, Kerala**

| Characteristic | Hindu | Muslim | Christian | All[1] |
|---|---|---|---|---|
| **Education of the Woman[2]** | | | | |
| Illiterate | 15.2 | 20.7 | 11.4 | 16.0 |
| Literate/Primary | 34.6 | 50.3 | 29.2 | 37.7 |
| Middle School | 26.1 | 23.0 | 24.3 | 25.0 |
| High School | 24.0 | 6.0 | 35.1 | 21.3 |
| **Standard of Living Index[3]** | | | | |
| Low | 41.5 | 35.6 | 38.0 | 53.3 |
| Medium | 42.8 | 49.7 | 38.2 | 33.3 |
| High | 15.8 | 14.7 | 23.8 | 13.3 |
| **Work Status of the Woman** | | | | |
| Non-working | 65.5 | 92.6 | 71.2 | 73.8 |
| Working | 34.5 | 7.4 | 28.8 | 26.2 |
| **Residence** | | | | |
| Rural | 69.3 | 75.5 | 73.8 | 71.9 |
| Urban | 30.7 | 24.5 | 26.2 | 28.1 |
| ***Number of Women*** | ***2346*** | ***1147*** | ***824*** | ***4332*** |

Note: 1. The column 'All' includes 15 women other than Hindu, Muslim, and Christian.

2. The categories of education are: Illiterate; Literate/Primary (Literate without schooling or primary school but not Middle School); Middle (Middle school completed but not High School); High School (At least High School completed).
3. The standard of living index, computed on the basis of housing conditions and ownership of consumer durables, as proposed by Roy and Jayachandran (1996), has been used in the analysis as a proxy for economic status. This is computed by assigning weights to various items: Separate room for cooking, Type of house, Source of lighting, Fuel for cooking, Source of drinking water, Toilet facility, and Ownership of Sewing Machine, Clock/Watch, Sofa set, Fan, Radio/Transistor, Refrigerator, Television, VCR/VCP, Bicycle, Motorcycle/Scooter, Car. The index as computed here ranges from 0 to 39. This has been categorised into Low Standard of Living (score 0-9), Medium Standard of Living (score 10-19), and High Standard of Living (score 20-39).

Source: Computed from NFHS-1 data files of Kerala.

The distributions presented in Table 1 show that the level of education is higher among Hindus and Christians compared to Muslims. In particular, the proportion with at least high school education is higher among Hindus and Christians than Muslims. The standard of living is better for Christians than others. Work participation is much lower among Muslim women compared to Hindu and

Christian women. A slightly greater proportion of Hindu women live in urban areas than in rural.

Clearly, there are notable variations in the socio-economic characteristics by religion bringing in the possibility that some of the observed religious differentials may have been caused by such variations. This makes it necessary to examine the effect of religion after controlling the influences of other socio-economic factors. But constructing life tables for the religions, controlled for other variables, becomes difficult since the number of births in various sub-classes becomes small. Instead, the proportional hazards approach (Cox regression) can be used to estimate the net effect of a factor on the risk of occurrence of an event, controlled for the effects of other variables (Cox, 1972). The proportional hazards model combines the features of regression and life table. The hazard of the occurrence of an event, in this case the next birth, at time t since the previous birth, is a function of time and is by other variables. Let $\lambda$ (t; $\underline{x}$) be the hazard at time t for a woman with characteristics (explanatory variables) $X_1$, $X_2$, $X_3$,… given by the vector $\underline{x}$, then

$$\lambda (t; \underline{x}) = \lambda_0 (t) \exp (\underline{x}' \underline{\beta})$$

where $\lambda_0$ (t) is the baseline hazard for which no specific function is assumed and represents the hazards for individuals for whom all the variables are set at 0, and $\underline{\beta}$ = ($\beta_1$, $\beta_2$, $\beta_3$, …) a vector of regression coefficients. In proportional hazards, the effects of explanatory do not vary over time, hence the name 'proportional hazards'. Estimates of the coefficients $\beta_1$, $\beta_2$, $\beta_{3,\ldots}$ can be used to assess the effects of the explanatory variables $X_1$, $X_2$, $X_3$,…. Though formulated in terms of variables measured on a ratio scale, the technique of proportional can be applied in case of categorised explanatory variables, with a category specified as 'reference category'.

In the analysis in this paper, religion is the primary factor and this has three categories: Hindu, Muslim and Christian. The four socio-economic variables listed above, education of woman, standard of living index, work status of woman, and residence are used as controls; these are categorised as noted above. There is also a need to control the effects of some demographic variables. Given the high preference for a son the tendency to go for an additional child may depend on the sex of the last child born. Death of an infant can influence further childbearing due to biological and replacement effects. Besides, it is known as the age of the woman increases the tempo of child

bearing becomes slower and the probability of terminating childbearing rises, both due to biological and social reasons. Therefore, the following three variables are also used in the proportional hazards analysis of birth intervals:

1. Sex of the previous child: dichotomous: Male, Female

2. Survival of the previous child: dichotomous: Survived infancy, Died during infancy

3. Age of the woman at the birth of the previous child: four categories: less than 20 years, 20-24, 25-29, and above 30

The analysis has been carried out for three birth intervals, second, third, and fourth, and three time periods, 1972-76, 77-81, and 82-86 (that is, for the intervals beginning in these three quinquennial periods).

In societies where fertility outside marriage is negligible, it is customary to analyse data for the first birth interval that is from marriage to first birth and for subsequent birth intervals. This ought to be done for Kerala as well. However, the NFHS provides data only for *age at marriage* instead of *calendar year and month of marriage*. The imputed dates of marriage from woman's date of birth and age at marriage were found to be inconsistent with the date of the first birth in a non-negligible proportion of cases. Therefore, it has not been possible to analyse the first birth interval. Since the number of fourth and higher order births in Kerala is not large in the recent period, the numbers of fifth and higher order intervals are too small for an analysis of differentials. Hence, the analysis is focussed only on the second, third, and fourth birth intervals. The analysis has been restricted to *currently married women who have been married only once* in order to avoid complications introduced by marriage dissolution and remarriage. Thus, the intervals and risks examined are strictly for women in the married state. Finally, only a very small proportion of population in Kerala belongs to religions other than Hinduism, Islam, and Christianity. In the NFHS-1 sample, only 15 women did not belong to these three religions. Hence, the analysis is restricted only to women from the three religions, Hinduism, Islam, and Christianity.

## 3. Results

### *3.1 Mean Closed Birth Intervals*

The mean closed birth intervals for the three religions are given in Table 2 for the three birth cohorts, 1972-76, 77-81 and 82-86. The results show a steady decline in the mean second birth interval for Christians but an irregular trend for Hindus and Muslims.

Table 2: Mean Closed Birth Intervals by Religion, 1972-86, NFHS-1, Kerala

| **Religion/ Period** | Birth Interval | | | | | |
|---|---|---|---|---|---|---|
| | Second | | **Third** | | **Fourth** | |
| | N | **Mean (in months)** | N | **Mean (in months)** | N | **Mean (in months)** |
| **Hindu** | | | | | | |
| 1972-76 | 286 | 34.33 | 165 | 38.87 | 70 | 32.26 |
| 1977-81 | 358 | 31.03 | 201 | 33.97 | 86 | 36.06 |
| 1982-86 | 336 | 35.48 | 152 | 32.55 | 36 | 30.47 |
| **Muslim** | | | | | | |
| 1972-76 | 112 | 35.21 | 90 | 36.16 | 90 | 30.60 |
| 1977-81 | 128 | 39.27 | 107 | 37.08 | 78 | 33.63 |
| 1982-86 | 176 | 36.27 | 96 | 36.42 | 62 | 35.77 |
| **Christian** | | | | | | |
| 1972-76 | 100 | 39.23 | 57 | 39.91 | 41 | 32.12 |
| 1977-81 | 121 | 37.08 | 71 | 34.45 | 26 | 30.73 |
| 1982-86 | 137 | 35.62 | 54 | 35.93 | 14 | 28.00 |
| **All Religions** | | | | | | |
| 1972-76 | 500 | 35.52 | 314 | 38.32 | 202 | 31.82 |
| 1977-81 | 609 | 33.95 | 318 | 34.86 | 192 | 34.27 |
| 1982-86 | 649 | 35.72 | 303 | 34.35 | 112 | 33.10 |
| ***Total*** | 2154 | 34.08 | 1159 | 35.01 | 549 | 32.72 |

Note : For currently married women who have been married only once
N: Number of closed birth intervals.

Source: Computed from NFHS-1 data files of Kerala.

The mean third birth interval declines for Hindus and Christians, but was stable for Muslims for the period between 1972-76 and 1982-86. The mean closed fourth birth interval shows a steady increase for Muslims while it decreased for Christians and shows an irregular trend for Hindus. The second and third intervals for Christians are generally (but not always) longer than the corresponding intervals for Hindus and Muslims, and the fourth intervals shorter. Broadly, there are no clear differentials and trends in mean closed intervals.

## 3.2 Life Table Analysis

The life tables have been constructed for the second, third, and fourth intervals from the NFHS-I data for each of the three birth cohorts for the three religions. The three indicators, the median, i.e., the date by which half of the women had the next birth; the Quintum, i.e., proportion who had the next birth within 60 months (5 years); and the proportion who had the next birth within 120 months (10 years) are presented in Table 3. In some categories, the median could not be computed since the majority did not have the next birth.

Life table analysis of birth intervals clearly indicates that the median second birth interval fluctuated mildly over 1972-76 to 1982-86. The differences by religion are also very small. The median third birth interval declined marginally (for intervals beginning) during 1977-81 but increased substantially during 1982-86. For Hindus and Christians, less than half of the 1982-86 cohort progressed to the fourth parity. The median among Muslims has been shorter than Hindus and Christians in all the periods clearly showing a greater tendency to have higher order births early among Muslims.

The proportions of women progressing to the second birth by the end of 60 and 120 months have declined only marginally over time, and are similar for all the religion groups. But the proportions of women progressing to the third birth have declined impressively during 1982-86 for all the religions. The level of progression was higher among Muslims in the past and the gap has widened further especially in 1982-86. The chances of progression to the fourth birth were low among Hindus even in 1972-76 and have fallen further. A large decline is also seen among Christians. In the past, over 90 percent of Muslim women progressed to the fourth birth within five years of the third, though this percentage has also fallen, the Hindu/Christian-Muslim gap has widened. A majority of Muslim women did have the fourth child within five years of the third birth even

during 1982-86, compared to only about a fifth of Hindu and Christian women. Thus, while the closed birth intervals do not show any discernible differentials by religion, the life table analysis clearly shows that Muslims have a much greater tendency than Hindus and Christians of continuing childbearing after the second and the third birth.

*Table 3: Life Table Analysis of Birth Intervals by Religion 1972-86, NFHS-1, Kerala*

| **Religion/ Period** | Second Birth Interval | | | Third Birth Interval | | | Fourth Birth Interval | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Median (in months)** | **Proportion had next birth by** | | Median **(in months)** | **Proportion had next birth by** | | Median **(in months)** | **Proportion had next birth by** | |
| | | **60 m** | **120 m** | | **60 m** | **120 m** | | **60 m** | **120 m** |
| **Hindu** | | | | | | | | | |
| 1972-76 | 30.50 | 0.874 | 0.966 | 46.21 | 0.595 | 0.684 | * | 0.433 | 0.460 |
| | (294) | | | (237) | | | (150) | | |
| 1977-81 | 28.33 | 0.884 | 0.947 | 41.50 | 0.585 | 0.640 | * | 0.394 | 0.440 |
| | (378) | | | (311) | | | (193) | | |
| 1982-86 | 34.00 | 0.797 | - | * | 0.406 | - | * | 0.182 | - |
| | (374) | | | (347) | | | (198) | | |
| **Muslim** | | | | | | | | | |
| 1972-76 | 31.83 | 0.880 | 0.957 | 32.50 | 0.760 | 0.890 | 29.00 | 0.915 | 0.957 |
| | (117) | | | (100) | | | (94) | | |
| 1977-81 | 30.08 | 0.798 | 0.969 | 30.00 | 0.754 | 0.890 | 35.25 | 0.742 | 0.794 |
| | (129) | | | (118) | | | (97) | | |
| 1982-86 | 33.42 | 0.806 | - | 44.37 | 0.637 | - | * | 0.609 | - |
| | (187) | | | (135) | | | (92) | | |
| **Christian** | | | | | | | | | |
| 1972-76 | 32.00 | 0.814 | 0.951 | 43.00 | 0.632 | 0.750 | 40.00 | 0.629 | 0.661 |
| | (102) | | | (76) | | | (62) | | |
| 1977-81 | 32.67 | 0.820 | 0.922 | 39.50 | 0.636 | 0.717 | * | 0.369 | 0.400 |
| | (128) | | | (99) | | | (65) | | |
| 1982-86 | 33.75 | 0.804 | - | * | 0.344 | - | * | 0.203 | - |
| | (148) | | | (131) | | | (69) | | |
| **All Religions** | | | | | | | | | |
| 1972-76 | 31.32 | 0.862 | 0.961 | 40.75 | 0.641 | 0.747 | 38.25 | 0.622 | 0.655 |
| | (515) | | | (415) | | | (307) | | |
| 1977-81 | 29.21 | 0.854 | 0.947 | 38.00 | 0.634 | 0.711 | 67.00 | 0.486 | 0.531 |
| | (637) | | | (467) | | | (357) | | |
| 1982-86 | 33.72 | 0.801 | - | 96.59 | 0.445 | - | * | 0.294 | - |
| | (709) | | | (614) | | | (359) | | |

Note: For Currently married women who have been married only once.
The figures in parentheses are the number of intervals.
* Median can not be computed; since the proportion completing the intervals does not reach 0.5.

`-' can not be obtained.

Source: Computed from NFHS-1 data files of Kerala.

### 3.3 Proportional Hazards Analysis

As noted earlier, women belonging to the three religions differ in one or more socio-economic characteristics such as education, standard of living, work status, and residence. It is possible that the differentials by religion observed in the analysis of birth intervals may, in part, be attributable to this fact rather than to religion as such. In order to estimate the religion effect net of other important socio-economic variables, the proportional hazards model (Cox regression) is adopted. The results of the Cox regression for the second birth interval are given in Table 4. The variables used have been listed earlier. Since all the variables are in categorised form, the beta coefficient for a category gives the effect for the category compared to the reference category for the characteristic. In addition to the regression coefficients, the table also gives exp (beta), called relative risk, which is the risk of the next birth for the category relative to the risk for the reference category. In the case of religion, the reference category is 'Hindu'. For the second birth interval, that is, for the risk of the second birth, the religion effect is not significant for intervals beginning during 1972-76 and 1977-81 when other socio-economic and demographic variables are controlled.

For intervals beginning during 1982-86, the risk is lower for Muslims and higher for Christians. Thus, as far as the second birth is concerned, the Muslims do not have higher propensity than others, in fact, in the last period the chances for Muslims to have second birth are lower than for Hindus and Christians. Some effects of other variables are seen; a significantly lower risk at higher education (as compared to illiterate), at high standard of living (as compared to low standard of living) for intervals beginning during 1977-81 and 1982-86 and at ages below 25-29 (as compared to the 20-24 age group) in 1982-86. The risk of having the second birth was higher for “literate+primary” and “middle school” educated women in the 1972-76 and 1982-86, at medium standard of living (as compared to low standard of living) in 1977-81 and 1982-86 periods and for ages (at first birth) below 20 (as compared to the 20-24 age groups) in the 1982-86 period. The risk of having the second birth was higher in urban areas (as compared to rural) during 1977-81 and 1982-86, working women had higher risk (as compared to non-working) in 1982-86 period and in all the three periods the risk was higher in the case of the death of the first child during infancy. Sex of the first child does not seem to influence the chances of having the second birth.

**Table 4: Regression Coefficients from Cox Proportional Hazards Model, Second Birth, NFHS-1, Kerala**

| Explanatory Variable | Intervals Beginning During | | |
|---|---|---|---|
| | 1972-76 | 1977-81 | 1982-86 |
| ***Religion*** | | | |
| Hindu (Ref.) | 0.0 | 0.0 | 0.0 |
| Muslim | -0.0468 (0.954) | -0.1202 (0.887) | -0.1343 (0.874)* |
| Christian | 0.0003 (1.001) | 0.0580 (1.060) | 0.1477 (1.159)** |
| ***Residence*** | | | |
| Rural (Ref.) | 0.00 | 0.0 | 0.0 |
| Urban | 0.0543 (1.056) | 0.0943 (1.099)** | 0.1101 (1.116)** |
| ***Education of the Woman*** | | | |
| Illiterate (Ref.) | 0.0 | 0.0 | 0.0 |
| Liter.+Primary | 0.1525 (1.165)** | 0.0790 (1.082) | 0.1353 (1.145)* |
| Middle Complete | -0.0321 (0.968) | -0.0734 (0.929) | 0.1247 (1.133)* |
| High School+ | -0.1375 (0.872) | -0.3359 (0.715)** | -0.3005 (0.740)*** |
| ***Work Status of the Woman*** | | | |
| Non-Working (Ref.) | 0.0 | 0.0 | 0.0 |
| Working | 0.0659(1.068) | -0.0492 (0.952) | 0.1289 (1.138)*** |
| ***Standard of Living Index*** | | | |
| Low (Ref.) | 0.0 | 0.0 | 0.0 |
| Medium | 0.1444 (1.155)** | 0.0732 (1.076) | 0.0496 (1.051) |
| High | -0.0932 (0.911) | -0.2093 (0.811)** | -0.1696 (0.844)** |
| ***Age of the Woman at First Birth*** @ | | | |
| 20-24 (Ref.) | 0.0 | 0.0 | 0.0 |
| Below 20 | -0.0103 (0.990) | -0.0129 (0.987) | 0.3000 (1.350)*** |
| 25-29 | -0.0629 (0.939) | -0.0762 (0.927) | -0.2851 (0.752)*** |
| ***Sex of the First Child*** | | | |
| Male (Ref.) | 0.0 | 0.0 | 0.0 |
| Female | 0.0252 (1.026) | -0.0313 (0.969) | 0.0309 (1.031) |
| ***Infant Death (First Child)*** | | | |
| Survival (Ref.) | 0.0 | 0.0 | 0.0 |
| Death | 0.4283 (1.535)*** | 0.3240 (1.383)*** | 0.4340 (1.543)*** |
| **Chi-Square Value** | 31.49 | 64.64 | 80.92 |
| **Number of Intervals** | 503 | 608 | 677 |

Level of Significance: *** p<0.01, ** p<0.05, *p<0.10.

Note: For currently married women who have been married only once.

The figures in parentheses are "exp (beta)" values.

@ : The number of intervals with age of woman at first birth above 30 years was very small and hence this category is excluded from this analysis.

Source : Computed from NFHS-1 data files of Kerala.

The regressions for the third birth interval (Table 5) indicate that for intervals beginning in the last two periods (1977-81 and 1982-86) the chances of having the third birth were higher for Muslims than Hindus. Further, the relative risk for Muslims increased over time. The chances of having the third birth were lower for

Christians than Hindus during 1982-86 but did not differ significantly in the earlier periods. As expected, at higher level of education the risk of the third birth is lower, the effect is quite clear at the high school level. The relative risk is also lower for older women, for women at ages above 25, especially during 1972-76 and 1977-81, and at ages above 30 for the recent period, 1982-86. Rural or urban residence does not have a significant effect. Death of the second child during infancy increases the chance for the third birth. Sex of the child shows some significant effect during the 1972-76 and 1982-86, that is, the relative risk of having the third birth is higher if the second birth was a female, than if it was a male during 1972-76, however the chance of having the third birth was lower during 1982-86. Risk of having the third birth is higher for women with primary education (as compared to illiterate women) during 1972-76. Working women had lower risk of having the third birth in the recent period (1982-86).

The religion effect on the risk of the fourth birth is significant in all the periods (Table 6). Muslim women have a much greater chance than Hindu and Christian women of having a birth after the third, even after socio-economic and demographic factors are controlled. Moreover, the coefficient for Muslims has increased over time indicating that the relative risk has increased further. For intervals beginning during 1977-81, Christians have lower risk of having fourth birth than the Hindus. The risk of having the fourth birth does not differ between rural and urban areas and also between working and non-working women. Again, as education, standard of living and age of the women at (the third) birth increase, the chances of having the fourth birth decrease. For all the cohorts the risk of having the fourth birth is higher in case of the death of the third child during infancy. The preference for a particular sex does not show any significance.

It was observed earlier from the life table indicators that a greater proportion of Muslim women had an additional birth after the second and the third births, as compared to Hindu and Christian women. The proportional hazards analysis further shows that this disparity persists even when other socio-economic and demographic variables are controlled. Moreover, the relative risk for Muslims has increased over the period 1972 to 1986. On the other hand, no significant difference is found between Hindus and Christians.

**Table 5: Regression Coefficients from Cox Proportional Hazards Model, Third Birth, NFHS-1, Kerala**

| Explanatory Variable | Intervals Beginning During | | |
|---|---|---|---|
| | 1972-76 | 1977-81 | 1982-86 |
| ***Religion*** | | | |
| Hindu (Ref.) | 0.0 | 0.0 | 0.0 |
| Muslim | 0.1464 (1.158) | 0.2221 (1.249)** | 0.3525 (1.423)*** |
| Christian | 0.0059 (1.006) | -0.0336 (0.967) | -0.1905 (0.827)* |
| ***Residence*** | | | |
| Rural (Ref.) | 0.0 | 0.0 | 0.0 |
| Urban | -0.0273 (0.973) | 0.0119 (1.012) | -0.0438 (0.957) |
| ***Education of the Woman*** | | | |
| Illiterate (Ref.) | 0.0 | 0.0 | 0.0 |
| Liter.+Primary | 0.2297 (1.258)** | 0.1038 (1.109) | 0.0711 (1.074) |
| Middle Complete | 0.0400 (1.041) | -0.0992 (0.906) | -0.1864 (0.830) |
| High School+ | -0.3381 (0.713)** | -0.3044 (0.738)* | -0.3120 (0.732)* |
| ***Work Status of the Woman*** | | | |
| Non-Working (Ref.) | 0.0 | 0.0 | 0.0 |
| Working | -0.1148 (0.892) | 0.0391 (1.040) | -0.1305 (0.878)* |
| ***Standard of Living Index*** | | | |
| Low (Ref.) | 0.0 | 0.0 | 0.0 |
| Medium | -0.1075 (0.898) | 0.0455 (1.047) | 0.0406 (1.041) |
| High | -0.1126 (0.894) | -0.2446 (0.783)** | -0.3469 (0.707)** |
| ***Age of the Woman at Second Birth*** | | | |
| 20-24 (Ref.) | 0.0 | 0.0 | 0.0 |
| Below 20 | 0.2402 (1.272)** | 0.1940 (1.214)** | 0.2796 (1.323)** |
| 25-29 | -0.3718 (0.690)*** | -0.3123 (0.732)*** | 0.1526 (1.165) |
| 30 + | - | - | -0.6837 (0.505)*** |
| ***Sex of the Second Child*** | | | |
| Male (Ref.) | 0.0 | 0.0 | 0.0 |
| Female | 0.1060 (1.112)* | 0.0185 (1.019) | -0.1104 (0.896)* |
| ***Infant Death (Second Child)*** | | | |
| Survival (Ref.) | 0.0 | 0.0 | 0.0 |
| Death | 0.2832 (1.327)** | 0.7635 (2.146)*** | 0.5888 (1.802)*** |
| **Chi-Square Value** | 64.92 | 102.92 | 110.31 |
| **Number of Intervals** | 410 | 499 | 601 |

Level of Significance: *** p<0.01, ** p<0.05, *p<0.10.

Note : For currently married women who have been married only once.
The figures in parentheses are “exp (beta)” values.

Source : Computed from NFHS-1 data files of Kerala.

**Table 6: Regression Coefficients from Cox Proportional Hazards Model, Fourth Birth, NFHS-1, Kerala**

| Explanatory Variable | Intervals Beginning During | | |
|---|---|---|---|
| | 1972-76 | 1977-81 | 1982-86 |
| ***Religion*** | | | |
| Hindu (Ref.) | 0.0 | 0.0 | 0.0 |
| Muslim | 0.5283 (1.696)*** | 0.5927 (1.809)*** | 0.7785 (2.178)*** |
| Christian | 0.0716 (1.074) | -0.3268 (0.721)** | -0.2995 (0.741) |
| ***Residence*** | | | |
| Rural (Ref.) | 0.0 | 0.0 | 0.0 |
| Urban | 0.337 (1.034) | -0.0450 (0.956) | -0.0341 (0.966) |
| ***Education of the Woman*** | | | |
| Illiterate (Ref.) | 0.0 | 0.0 | 0.0 |
| Liter.+Primary | 0.4442 (1.559)** | 0.2125 (1.237) | 0.7199 (2.054)** |
| Middle Complete | -0.1362 (0.873) | 0.1657 (1.180) | 0.3559 (1.427) |
| High School+ | -0.9296 (0.395)** | -0.7197 (0.487) | -1.5223 (0.218)** |
| ***Work Status of the Woman*** | | | |
| Non-Working (Ref.) | 0.0 | 0.0 | 0.0 |
| Working | 0.0741 (1.077) | 0.0526 (1.054) | -0.0848 (0.919) |
| ***Standard of Living Index*** | | | |
| Low (Ref.) | 0.0 | 0.0 | 0.0 |
| Medium | 0.0609 (1.063) | 0.1310 (1.140) | -0.1130 (0.893) |
| High | -0.0424 (0.959) | -0.4411 (0.643)*** | 0.1363 (1.146) |
| ***Age of the Woman at Third Birth*** @ | | | |
| 20-24 (Ref.) | 0.0 | 0.0 | 0.0 |
| 25-29 | -0.1291 (0.879) | -0.1313 (0.877) | 0.2353 (1.265) |
| 30 + | - | - | -0.6042 (0.547)** |
| ***Sex of the Third Child*** | | | |
| Male (Ref.) | 0.0 | 0.0 | 0.0 |
| Female | -0.0207 (0.980) | 0.0288 (1.029) | 0.2584 (1.295) |
| ***Infant Death (Third Child)*** | | | |
| Survival (Ref.) | 0.0 | 0.0 | 0.0 |
| Death | 0.3932 (1.482)** | 0.4243 (1.529)** | 1.2888 (3.628)*** |
| **Chi-Square Value** | 76.03 | 55.17 | 113.36 |
| **Number of Intervals** | 272 | 302 | 341 |

Level of Significance: *** p<0.01, ** p<0.05, *p<0.10.

Note : For currently married women who have been married only once.
The figures in parentheses are “exp (beta)” values.

@ : There were no intervals with age of woman at third birth below 20 years, and hence this category is not shown.

Source : Computed from NFHS-1 data files of Kerala.

## 4. Discussion

The analysis of the fertility histories in Kerala shows that closed birth intervals do not differ systematically across religion over the time periods studied. However, the life table indicators based on both closed and open birth intervals show that, over the period under study, 1972 to 1986, the tendency to progress to the second, especially the third and fourth births has declined substantially in all the religions. The decline has been greater for Hindus and Christians than for Muslims and as a result, the proportion of Muslims who have the third and subsequent births is higher than the proportions for Hindus and Christians and the gap has widened over time. Moreover, the proportional hazards analysis shows that differentials by religion persist even when controlling for other socio-economic and demographic variables like residence, education of the woman, work status of the woman, standard of living, age of the woman at birth, survival of the child, and sex of the child. The fact that the closed birth intervals do not differ much across religion, but the chances of occurrence of the next birth do, indicate that termination of childbearing rather than spacing has played a major role. In India, sterilisation has been the predominant method used for fertility regulation; the NFHS-I data show that in Kerala, the prevalence of modern contraception was 53.4 percent, of this, 47.5 points was the contribution of sterilisation (PRC, Thiruvanthapuram and IIPS, 1995). An earlier study showed that parity progression ratios for Muslims are higher than Hindus and Christians after the second birth and in spite of an overall decline, the gap has widened (Alagarajan and Kulkarni, 1998). The results of the analysis of birth intervals show that this pattern persists even after controlling for other socio-economic variables.

The results, thus, do not support the characteristics hypothesis. In other words, the observed religious differentials in Kerala are not accounted for by differences in characteristics across religions. Two other explanations of religious differentials, namely particularised theology, and minority status hypothesis have been prominent in demographic literature (Jones and Nortman, 1968: Goldscheider and Uhlenberg, 1969). A single state is not an appropriate universe to examine the minority population hypothesis. In order to address the minority population hypothesis systematically, one must have a large number of regions with the various religions being a minority in some and the majority in some other. However, at least in Kerala, the minority hypothesis does not get much support. Both Christians and Muslims are minorities in Kerala, each with about

20 percent of population, but high (higher than average) fertility is observed only in the case of Muslims. An investigation of the particularised theology hypothesis requires comparative theological stands on fertility, fertility regulation, and contraception. Substantial work in this area has been done, an excellent overview is provided by Fagley (1967). Most major religions are pro-natalist. However, often the stand of a religion may not be clear or clearly understood. People's perception of what their religion says may be important than what the scriptures say. Moreover, followers of a religion may not strictly adhere to specific precepts and injunctions on fertility regulation even if these are clearly spelt out. Data on what couples belonging to a religion perceive the position of their religion to be are rarely available and were not obtained in the NFHS-I. In the absence of this information, it is difficult to support the particularised hypothesis as such. At this stage, it can only be concluded that the religious fertility differentials observed in Kerala are not explained by the characteristic hypothesis but we are not sure if these could be attributed to theological factors.

Finally, the results clearly show that though fertility in Kerala has fallen below the replacement level, the differentials by religion have widened. That there has been a decline in Muslim fertility but not to the extent of Hindus and Christians indicates that transition has already occurred at least among some sections of Muslims. In the process of fertility transition in some sections, generally the elite adopt fertility regulation early and are followed by others with a lag. This suggests that the present wide gap in fertility among religions in Kerala is probably a product of the transition process and that would narrow down as has happened in the case of Catholic and Non-Catholic differences. The convergence in fertility behaviour is probably in progress.

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