

S. Rajaram*

Secular Changes in the Patterns of Reproduction in Goa in the 1980's**

Introduction

TERTILITY levels of a population contribute disproportionately more to the growth rate in any population and will be the most crucial variable in population stabilization in developing countries and their development strategies. Consequently, demographers in India have been interested in studying the differentials and determinants of the reproductive behaviour among women in various regions of the country. In this context, data on birth intervals have been used as one set of indicators to study the reproductive performance, useful in understanding the spacing patterns of populations. Empirical evidence from various female populations suggests that, on an aggregate level, birth spacing influences the societal level of reproduction and the intrinsic growth rate of any population (Srinivasan, 1980). Thus timing of birth can be viewed as a major determinant of over all fertility levels and population change.

It is also obvious that change in fertility represents a systematic compositional shift in female populations described by parity and birth interval. Infact, the initial stages of fertility transition occur mainly as a result of earlier cessation of child bearing (limitation of family size) followed by changes in the spacing between births. For example, it has been suggested that the transition from a natural fertility regime to a controlled fertility is marked by an increasing proportion of sub cohorts adopting distinctive inter birth spacing pattern distributed across all parities and by parity

* Research Associate, Population Foundation of India, New Delhi - 110 016.

**The views expressed in the article are the author's own and do not necessarily reflect the views of the organisation

dependent truncation, with the impact on last and, in some cases next to last closed birth intervals (Anderson and Bean, 1985). An increase of the last closed birth interval indicates not only the truncation of child bearing but also earlier failed attempts in stopping child bearing. It has been empirically shown that the smaller the completed family size; the longer is the ultimate birth interval.

The purpose of the present paper is to study the trends and differentials in the timing of births at two points of time in the state of Goa. The paper attempts to integrate whether fertility transition between the two points of time is characterized by truncation of ages of child bearing and /or by elongation of the last closed birth interval. The relevant measures are derived from two surveys conducted, at two points of time 1984 and 1993 in the state of Goa, where the fertility control through conventional contraceptives seems to be very poor compared to some of the other low fertility states (for example, Roy *et al.*, 1986 and PRC, Dharwad and UPS, 1995). The use of contraceptives has increased substantially in the study population during the period under consideration. No attempt is made in the analysis to study the measures by parity and thus provide only an over all picture of the changing pattern of reproduction or the transition of fertility through the measures. The study uses measures such as age at marriage, age at first birth, open birth interval and parity progression ratios, which are also considered to be major indicators of fertility change (Srinivasan, 1967; 1980).

Data and Methodology

The paper uses data collected from two sample surveys conducted at two points of time. In 1984, the International Institute for Population Sciences, carried out a survey in the state of Goa to study the levels and differentials of fertility and mortality. The survey was undertaken with the specific objective of providing independent set of estimates of fertility and mortality rates for the region and identifying the factors associated with low level of fertility in the state. The sampling design adopted for the survey is a two stage stratified sampling and fieldwork began on February 10,1984 and continued till May 5,1984. More details about the survey can be obtained from Roy *et al.* (1986). In all, 3483 households were interviewed from the 3500 households sampled in the survey. A total of 2756 ever married women in the age group 15-49 were interviewed and detailed information about their marriage; pregnancy history; the use of contraception was collected through interviews by trained female investigators.

The second data set comes from the large-scale sample survey carried out in the same state under the National Family Health Survey (NFHS) during 1992-93.

The same Institute (UPS) was the nodal agency for collection of data and providing technical guidance to this survey. The fieldwork for data collection in this round was carried out between 1 December 1992 and 28 February 1993. Relevant information about marriage, birth history and use of family planning methods were gathered from a representative sample of 3141 ever married women aged 13-49 from 3741 sampled households. The sample design adopted for the state in the NFHS is a systematic, multi-stage stratified sample. The details of the sample design and implementation of the survey in the state can be obtained from the detailed NFHS reports for the state (PRC, Dharwad and UPS, 1995). It has to be pointed out that the two surveys cover two independent samples of households of Goa state drawn in 1984 and 1993.

The two data set available for the state, 9 years apart, have the unique advantage of allowing us to examine the trends in the timing of births for a series of cohorts of women who were aged 30 and above at the two points of time. The average of the different measures of fertility pattern mentioned in the introductory section have been used for studying the trends and differentials in the timing of births. Separate analysis is carried out for currently married women in the age group 30-39 and 40-49. To understand the extent of decline in fertility among these two groups of women, average children ever born to them by selected variables are first considered. In a population where reproduction occurs as legitimate births within the institution of marriage, the age at marriage is considered to be the starting point of reproduction. In order to examine the secular changes in reproduction, we first studied the mean age at marriage in Goa during the time under observation as an indicator of reproduction. Subsequently, mean age at first birth and last birth for these two points of time is also computed to study the trends in the timing of births among these women. These two measures can be considered as indicators of change in the patterns of reproduction. The mean age at first birth is mainly affected by pattern of marriage and first birth interval and an increase in it can be attributed to an increase in age at first marriage or an increase in first birth interval. Similarly, a decline in age at last birth over the period may indicate an increasing attempt of couples to limit family size at an earlier age. These two measures can tell, roughly the average active reproductive span in the study population.

To understand the nature of changes in fertility overtime, the patterns of spacing and limiting of births must be studied. A number of studies on birth intervals reveal that the last closed birth intervals for married women in reproductive ages surveyed at a point of time can be used to measure changes in spacing in the recent past. It has been documented that fertility limitation is indexed by truncation of child bearing experience and traditionally indicated by an increase of last closed birth

interval, reflecting failed attempts to stop child bearing. Hence, trends in it between two points of time are also an important indicator of changes in the reproductive patterns.

The interval between last birth and the survey date, i.e. the open birth interval, can be used to measure parity progression ratios (Srinivasan, 1967; Srinivasan, 1980; Srinivasan et al., 1985). Also, open birth interval has a direct influence on fertility level of any population, longer the interval, the lower will be the levels of fertility. Studies have also shown that the percentage increase of the birth interval in any population over period is a good approximation for studying changes in marital fertility rates of the same population (Srinivasan, 1980). Thus it is worthwhile to notice the changes in open birth interval during the two points of time under consideration.

Results

As discussed earlier, the data set analysed for the present paper comes from two independent samples collected around nine years apart. Before using them for detailed analysis of changes during this period, a preliminary analysis to check on their validity was carried out. For this purpose, selected indicators used for study of changes in reproductive patterns are computed cohort wise. The selected measures for age group 30-39 in 1984 are compared with the same measures for age group 40-49 in 1993. To be precise, the comparisons should be made with the age group of 39-48. However, since it is a well-known fact that there may exist some digit preference for digit 0 in the reporting of age, we have selected the age group 40-49. The computed values of the indicators are given in the Table 1. One should expect almost same levels in some of the selected indicators, such as age at marriage and age at first birth from the two data sources. An examination of the values indicates

TABLE 1: COMPARISON OF COHORT MEASURES OF SELECTED INDICATORS IN GOA

<i>Indicator</i>	<i>IIPS (1984)</i> <i>Aged 30-39</i>	<i>NFHS (1993)</i> <i>Aged 40-49</i>
Mean children ever born	3.76	3.91
Mean age at first marriage	19.84	20.13
Mean age at first birth	22.03	21.97
Mean age at last birth	29.48	30.15
Last closed birth interval	38.54	41.15
Open birth interval	73.49	169.14

a clear similarity and indeed that the two data sets can be used for studying changes in reproductive patterns during the period under observation. The levels of the selected indicators by cohort are in the expected direction.

In our first attempt to study the changes, mean children ever born to currently married woman at the two points of time by their background characteristics is computed. The detailed analysis was restricted to the child bearing experiences of currently married women aged 30 and above and married on or before age 30. Table 2 provides the result from the analysis. The table indicates a definitive decline in fertility in the state irrespective of background characteristics of women. Altogether, there is a reduction of around one child per woman among those aged 30 and above during the period, the decline in the number of children is almost same by place of residence. However, the rural woman's fertility is higher than that of their urban counterparts in both the time points. Differentials in the average parity appear to have narrowed over the period under consideration. In case of women aged between 40 and 49, the difference in it between rural and urban areas appears to remain constant during the period. This indicates that for women aged 30 and 39 the rural-urban differentials in the fertility have narrowed down.

The table also provides the trends and differentials in children ever born by mother's educational level. A decline in fertility levels over the period is observed irrespective of educational level of mothers. The maximum reduction is among women who have studied more than primary and below high school. Illiterate women have highest average parity irrespective of age and period. By religious affiliation of women, the table indicates that decline in the mean number of children is highest for Roman Catholics. The women belonging to the non-Hindu and non-Roman Catholic religions have highest fertility. Differentials in the same measure by work status are negligible over time. For both working and non-working women it has declined during the period between 1984 and 1993, though there are fluctuations in their levels. The mean children are always highest for women who were married below age of 18. The differences in it between women were married below 18 and married in the age group 24-30 is about 2 children per woman. The decline in it during the period is highest for those who were married between ages 18 and 20.

The above observations are based on gross mean values that are not adjusted for correlates and other factors of fertility. The adjusted means of children ever born are also provided in Table 2. The differentials in number of children by place of residence become negligible after controlling for the effects of independent factors considered for the analysis. However, after control, the urban values have increased, while for rural areas it is reduced. Educational differentials persist even after the

TABLE 2. MEAN CHILDREN EVER BORN TO CURRENTLY MARRIED WOMEN IN THE AGE 30 AND ABOVE IN GOA

Factors	IIPS Survey (1984)			NFHS (1993)		
	Aged 30-39	Aged 40-49	Aged 30+	Aged 30-39	Aged 40-49	Aged 30+
Place of Residence						
Rural	4.06 (3.81)	5.02 (4.79)	4.45 (4.17)	3.04 (2.89)	4.16 (3.94)	3.53 (3.33)
Urban	3.47 (3.72)	4.54 (4.80)	3.86 (4.14)	2.60 (2.75)	3.67 (3.88)	3.09 (3.29)
Educational Level						
Illiterate	4.49 (4.23)	5.32 (5.15)	4.86 (4.63)	• 3.69 (3.24)	4.60 (4.33)	4.20 (3.81)
Primary	4.01 (3.88)	4.70 (4.76)	4.29 (4.22)	3.08 (2.96)	3.99 (4.01)	3.50 (3.45)
Middle Complete	3.51 (3.46)	4.30 (4.59)	3.76 (3.81)	2.50 (2.53)	3.17 (3.53)	2.72 (2.88)
High School +	2.40 (2.99)	3.06 (3.57)	2.58 (3.13)	1.96 (2.43)	2.51 (2.97)	2.15 (2.65)
Religion						
Hindus	3.80 (3.74)	4.94 (4.81)	4.23 (4.13)	2.93 (2.84)	4.05 (3.95)	3.42 (3.32)
Roman Catholics	3.47 (3.70)	4.32 (4.67)	3.82 (4.09)	2.37 (2.70)	3.41 (3.68)	2.86 (3.21)
Others	4.62 (4.43)	5.95 (5.82)	5.00 (4.81)	3.75 (3.18)	5.31 (5.07)	4.27 (3.78)
Work Status						
Working	3.84 (3.70)	4.88 (4.90)	3.82 (4.09)	2.80 (2.70)	3.83 (3.88)	3.24 (3.19)
Not Working	3.34 (3.77)	4.79 (4.78)	4.21 (4.16)	2.84 (2.87)	3.94 (3.92)	3.34 (3.36)
Age at Marriage						
<18	4.70 (4.41)	5.63 (5.41)	5.09 (4.80)	4.19 (3.89)	4.91 (4.56)	4.60 (4.24)
18-20	4.09 (3.99)	4.89 (4.86)	4.39 (4.29)	3.27 (3.16)	4.03 (3.90)	3.63 (3.50)
21-23	3.24 (3.38)	4.23 (4.45)	3.61 (3.78)	2.55 (2.63)	3.51 (3.68)	2.94 (3.08)
24-30	2.29 (2.76)	3.24 (3.63)	2.60 (3.10)	1.78 (2.00)	2.67 (3.20)	2.08 (2.45)
Total	3.76	4.80	4.15	2.82	3.91	3.31
Number of Cases	1025	637	1662	1097	890	1987

Note : Figures in the parenthesis are the adjusted mean for the effects of factors considered here.

adjustment. The adjusted values are higher than the unadjusted values, as the education of the mother increases. There is not much change in the adjusted and unadjusted values for Hindu women, as well as by work status of the women. However, there is a large difference before and after adjustment in case of women who were married between ages 24 and 30.

Variations in the timing of marriage during the period under consideration are presented in Table 3. The mean age at marriage for women aged 30 and above

TABLE 3. MEAN AGE AT FIRST MARRIAGE FOR CURRENTLY MARRIED WOMEN IN THE AGE 30 AND ABOVE IN GOA

<i>Factors</i>	<i>UPS Survey (1984)</i>			<i>NFHS (1993)</i>		
	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>
Place of Residence						
Rural	18.87 (19.55)	18.64 (19.44)	18.78 (19.48)	20.83 (21.32)	19.32 (20.17)	20.18 (20.81)
Urban	20.72 (20.10)	20.14 (19.30)	20.51 (19.83)	22.09 (21.60)	20.86 (20.10)	21.53 (20.90)
Educational Level						
Illiterate	17.87 (17.89)	17.75 (17.78)	17.82 (17.89)	18.61 (18.70)	17.60 (17.70)	18.04 (18.12)
Primary	19.09 (19.22)	20.06 (20.17)	19.49 (19.58)	20.98 (21.19)	20.54 (20.48)	20.78 (20.88)
Middle Complete	19.85 (19.85)	21.72 (21.59)	20.47 (20.42)	21.59 (21.55)	22.38 (21.97)	21.84 (21.69)
High School +	23.62 (23.37)	23.22 (23.02)	23.51 (23.28) ~	34.17 (23.93)	23.98 (23.97)	24.10 (23.93)
Religion						
Hindus	19.46 (19.52)	18.66 (18.79)	19.15 (19.24)	21.14 (21.30)	19.55 (19.71)	20.43 (20.59)
Roman Catholics	21.05 (20.82)	21.08 (20.75)	21.06 (20.79)	21.89 (22.35)	21.70 (21.32)	22.33 (21.86)
Others	18.70 (19.03)	19.24 (19.35)	18.86 (19.08)	18.51 (19.24)	18.06 (18.11)	18.36 (18.86)
Work Status						
Working	21.14 (20.11)	19.33 (19.50)	20.58 (19.90)	21.43 (20.97)	20.10 (19.89)	20.86 (20.97)
Not Working	19.57 (19.78)	19.39 (19.36)	19.50 (19.62)	21.47 (21.33)	20.15 (20.23)	20.86 (20.81)
Total	19.84	19.38	19.66	21.46	20.13	20.86
Number of Cases	1039	656	1695	1125	910	2035

Note: Figures in the parenthesis are the adjusted mean for the effects of factors considered here.

has increased by 1.2 years during 1984-93. The increase is largest for women aged between 30-39 years; is more in the rural areas than in the urban area. For older women the increase in the age at marriage is not very large. The age at marriage has increased during the period irrespective of educational level and work status of women; so also for Hindus and Roman Catholics.

The changes observed in the aggregate level of fertility could be attributed to a change in the timing of births or the proportion of women progressing to higher parities. We considered mean age at first birth as an indicator of the timing of birth and the results from the two surveys is given in Table 4. Interestingly there is not much change in it between the two points of time in spite of a one in age at marriage. Little change can be observed in the same measure by place of residence. The age at first birth is higher for the urban women. Surprisingly, there is a reduction in it among the illiterate and women who have studied up to primary level of education. As expected, the women with higher education have the highest mean age at first birth. The non-Hindu and non-Roman Catholic groups have also revealed a decline in the age at first birth. There is a decline in the age at first birth irrespective of age at marriage. The spacing of first birth after marriage seems to have narrowed in the study population during the period under observation. In reality, one would expect that when the fertility is reducing the age at first birth would increase. However, in the study population there is not much increment in the age at first birth. The adjusted values also show the same trend as discussed above. In the next attempt mean age at last birth in the population during the two points of time for currently married women aged 30 and above is computed and the results are discussed below.

The result of age at last birth is presented in Table 5. The data from the year 1984 shows that age at last birth in the study population is around 31 years. The NFHS data conducted during the period 1992-93 indicates an age at last birth of 29 years. Thus there is a reduction of about 2 years in it between the two points of time. The decline in age at last birth is higher for the rural women as compared to their urban counterparts. Rural women had higher age at last birth in 1984 while reverse is true in 1993. However, differentials in age at last birth have narrowed over the period according to place of residence. The mean age at last birth by educational level suggests that decline in it is higher among illiterate women. The differentials in it among different educational categories of women have also marginalised between the two time points. The religious category of women reveals that there is not much difference in age at last birth between Roman Catholic and Hindu women. The reduction in age at last birth is highest for the 'other religious group'. The work status of women does not show any

TABLE 4. MEAN AGE AT FIRST BIRTH FOR CURRENTLY MARRIED WOMEN IN THE AGE 30 AND ABOVE IN GOA

<i>Factors</i>	<i>IIPS Survey (1984)</i>			<i>NFHS (1993)</i>		
	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>
Place of Residence						
Rural	21.32 (22.03)	22.01 (22.38)	21.60 (22.15)	22.15 (22.64)	21.40 (22.04)	21.83 (22.35)
Urban	22.68 (22.03)	22.47 (22.09)	22.61 (22.07)	23.05 (22.54)	22.50 (21.90)	22.79 (22.27)
Educational Level						
Illiterate	20.71 (22.16)	21.43 (22.40)	21.03 (22.30)	20.27 (22.38)	20.10 (21.80)	20.18 (22.18)
Primary	21.31 (21.92)	22.57 (22.30)	21.81 (22.06)	21.85 (22.40)	22.02 (21.90)	21.93 (22.16)
Middle Complete	21.47 (21.78)	23.46 (21.95)	22.13 (21.80)	22.66 (22.63)	24.00 (22.17)	23.08 (22.32)
High School +	25.04 (21.99)	24.28 (21.70)	24.84 (21.84)	25.23 (22.94)	25.37 (22.39)	25.28 (22.65)
Religion						
Hindus	21.79 (22.10)	21.71 (22.24)	21.76 (22.16)	22.28 (22.56)	21.55 (22.03)	21.95 (22.32)
Roman Catholics	22.83 (21.88)	23.61 (22.31)	23.15 (22.45)	24.00 (22.45)	23.29 (21.96)	23.66 (22.41)
Others	21.06 (21.80)	20.85 (21.58)	21.00 (21.68)	19.81 (22.30)	19.28 (20.90)	19.63 (21.64)
Work Status						
Working	22.95 (22.12)	22.51 (22.41)	22.80 (22.18)	22.37 (22.62)	22.15 (22.08)	22.28 (22.36)
Not Working	21.85 (22.01)	22.20 (22.22)	21.98 (22.10)	22.69 (22.58)	21.90 (21.92)	22.33 (22.29)
Age at Marriage						
<18	18.16 (18.08)	19.15 (19.02)	18.58 (18.45)	17.32 (17.52)	18.09 (18.19)	17.76 (17.89)
18-20	21.31 (21.32)	21.62 (21.62)	21.42 (21.42)	20.47 (20.55)	20.94 (21.01)	20.70 (20.77)
21-23	23.93 (23.96)	24.51 (24.57)	24.15 (24.22)	23.42 (23.36)	23.77 (23.71)	23.56 (23.51)
24-30	27.68 (27.74)	28.33 (28.54)	27.90 (28.07)	27.63 (27.46)	27.68 (27.46)	27.65 (27.47)
Total	22.03	22.23	22.11	22.59	21.97	22.31
Number of Cases	991	622	1613	1040	870	1910

Note: Figures in the parenthesis are the adjusted mean for the effects of factors considered here.

TABLE 5. MEAN AGE AT LAST BIRTH FOR CURRENTLY MARRIED WOMEN IN THE AGE 30 AND ABOVE IN GOA

<i>Factors</i>	<i>IIPS Survey (1984)</i>			<i>NFHS (1993)</i>		
	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>
Place of Residence						
Rural	29.72 (29.72)	33.34 (33.01)	31.17 (30.96)	28.07 (28.21)	30.05 (30.07)	28.94 (28.95)
Urban	29.27 (29.27)	31.89 (32.25)	30.24 (30.45)	27.94 (27.78)	30.25 (30.22)	29.03 (29.02)
Educational Level						
Illiterate	30.14 (30.72)	33.60 (33.96)	31.69 (32.21)	27.92 (28.88)	30.11 (31.10)	29.16 (30.16)
Primary	28.92 (29.21)	32.02 (31.97)	30.15 (30.30)	27.50 (27.76)	29.87 (29.82)	28.61 (28.73)
Middle Complete	28.40 (28.54)	31.89 (31.22)	29.54 (29.40)	27.57 (27.5.7)	30.58 (29.61)	28.53 (28.16)
High School +	29.19 (27.91)	30.09 (29.11)	29.43 (28.15)	28.69 (27.61)	30.58 (28.79)	29.33 (27.99)
Religion						
Hindus	29.39 (29.52)	32.39 (32.66)	30.60 (30.72)	27.85 (27.94)	30.05 (30.24)	28.85 (28.95)
Roman Catholics	29.65 (29.29)	32.65 (32.38)	30.87 (30.55)	28.50 (28.03)	30.36 (29.77)	29.39 (29.00)
Others	29.87 (30.16)	34.05 (34.63)	31.10 (31.41)	27.53 (28.62)	30.43 (31.42)	28.52 (29.32)
Work Status						
Working	29.70 (29.56)	32.91 (32.87)	30.70 (30.66)	27.89 (27.78)	30.34 (30.34)	28.97 (28.85)
Not Working	29.44 (29.47)	32.59 (32.61)	30.72 (30.71)	28.06 (28.10)	30.07 (30.07)	28.99 (29.04)
Age at Marriage						
<18	28.48 (27.79)	31.99 (31.19)	29.99 (29.12)	26.29 (28.53)	28.84 (28.20)	27.73 (27.07)
18-20	29.19 (29.06)	32.22 (32.16)	30.30 (30.12)	26.81 (26.73)	29.53 (29.35)	28.10 (27.96)
21-23	29.92 (30.27)	33.15 (33.81)	31.17 (31.67)	28.02 - (28.13)	30.56 (30.91)	29.06 (29.31)
24-30	31.15 (32.18)	34.33 (35.68)	32.21 (33.61)	30.39 (30.66)	32.75 (33.62)	31.25 (31.83)
Total	29.48	32.63	30.70	28.00	30.15	28.98
Number of Cases	991	622	1613	1040	870	1910

Note: Figures in the parenthesis are the adjusted mean for the effects of factors considered here.

differentials in the mean age at last birth. The decline in the measure also seems to be almost same for working and non-working mothers. The reduction is larger for women who were married before age 18. Invariably, women who were married before age 18 have lowest age at last birth and women married between ages 24 and 30 have highest age at last birth.

The next indicator used to examine the change in the patterns of child bearing is the last closed birth interval. The adjusted and unadjusted means of last closed birth interval by background characteristics of women are given in Table 6. This measure is computed only for women with at least two children. As indicated earlier, an increase in last closed birth interval is not only an indication of truncation in child bearing but also of failed attempts to stop child bearing. The table indicates that there is very little change in it over the period. Surprisingly, both adjusted and unadjusted means reveal a decline in it for rural women during the period. In the first survey, rural women have longer last closed birth interval, whereas in the second period, urban women have longer birth interval. In 1984, illiterate women have highest mean, while in 1992-93, women who have educated above middle school have highest mean. However, there is an increase in the birth interval among the women who have studied middle complete and high school and above. The average birth interval for Hindu women remains almost same over the period. For working and non-working women it has increased marginally. The unadjusted values for women who were married before age 18 suggest that there is a reduction in the measure interval over the period. However, the adjusted values suggest that it remains almost same for the same group of women.

The indicator that has been examined next is open birth interval. The mean of this measure is provided in Table 7. It is a good approximation for change in the general marital fertility overtime and space. Interestingly this measure has shown a large change in the study population than the measure—last closed birth interval. Similarly, the adjusted means of open birth interval varies considerably as compared to the unadjusted means. On an average there is an increment of about 15 months in open birth interval over the period. The adjusted as well as the unadjusted values of mean open birth interval by place of residence suggest that urban women have longer birth interval than their rural counterparts. The unadjusted value reveals that differential in it by place of residence is reduced over time. However, the adjusted values indicate a large rural-urban variation in the open birth interval. The adjusted value of open birth interval is lower than the unadjusted value for illiterate women. The adjusted value is higher than the unadjusted value for women who have studied high school and above. The open birth interval of most of the religious groups has also increased substantially during the period under observation. The mean open

TABLE 6: MEAN LAST CLOSED BIRTH INTERVAL FOR CURRENTLY MARRIED WOMEN IN THE AGE 30 AND ABOVE IN GOA

<i>Factors</i>	<i>IIPS Survey (1984)</i>			<i>NFHS (1993)</i>		
	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>
Place of Residence						
Rural	39.48 (39.20)	42.08 (41.61)	40.54 (40.22)	38.23 (38.88)	39.08 (39.73)	38.61 (39.12)
Urban	37.66 (37.92)	40.79 (41.30)	38.84 (39.15)	40.22 (39.47)	43.05 (42.46)	41.66 (41.12)
Educational Level						
Illiterate	39.30 (37.91)	43.16 (43.28)	41.03 (40.28)	37.91 (37.21)	39.35 (39.37)	38.73 (38.30)
Primary	36.55 (36.12)	38.53 (38.43)	37.34 (37.32)	36.69 (36.38)	39.86 (39.62)	38.21 (38.00)
Middle Complete	39.80 (39.36)	38.80 (38.61)	39.46 (39.51)	40.02 (39.65)	46.08 (45.60)	42.04 (41.83)
High School +	38.22 (41.39)	40.13 (39.15)	38.74 (40.60)	42.76 (43.46)	45.98 (44.46)	43.98 (44.95)
Religion						
Hindus	37.63 (37.36)	40.92 (40.87)	38.89 (38.67)	37.98 (38.15)	40.10 (40.16)	38.99 (39.05)
Roman Catholics	41.01 (41.69)	42.29 (42.33)	41.55 (42.08)	41.77 (41.40)	43.35 (42.34)	42.56 (41.06)
Others	38.30 (38.53)	45.26 (45.79)	40.30 (40.48)	40.90 (40.65)	43.43 (43.34)	41.77 (42.54)
Work Status						
Working	37.95 (37.52)	40.79 (40.47)	38.87 (38.59)	38.31 (38.12)	41.75 (41.86)	39.90 (39.93)
Not Working	38.66 (38.74)	41.55 (41.60)	39.82 (39.87)	39.53 (39.61)	40.90 (40.85)	40.19 (40.17)
Age at Marriage						
<18	40.96 (41.90)	41.42 (40.89)	41.16 (41.40)	39.44 (41.69)	39.69 (41.87)	39.58 (41.74)
18-20	39.22 (39.36)	41.58 (41.55)	40.09 (40.13)	39.93 (40.74)	42.22 (42.73)	41.03 (41.67)
21-23	37.14 (36.79)	42.43 (42.82)	39.19 (39.05)	40.92 (39.77)	41.35 (40.42)	41.10 (40.04)
24-30	34.26 (32.60)	40.07 (41.13)	36.23 (35.79)	35.97 (33.92)	41.39 (37.88)	38.25 (35.69)
Total	38.54	41.46	39.68	39.15	41.15	40.10
Number of Cases	921	589	1510	915	831	1746

Note: Figures in the parenthesis-are the adjusted mean for the effects of factors considered here.

TABLE 7: MEAN OPEN BIRTH INTERVAL FOR CURRENTLY MARRIED WOMEN IN THE AGE 30 AND ABOVE IN GOA

<i>Factors</i>	<i>IIPS Survey (1984)</i>			<i>NFHS (1993)</i>		
	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>	<i>Aged 30-39</i>	<i>Aged 40-49</i>	<i>Aged 30+</i>
Place of Residence						
Rural	71.07 (68.41)	145.50 (148.70)	100.95 (98.12)	77.33 (75.28)	169.33 (168.30)	117.67 (113.10)
Urban	75.71 (78.15)	162.07 (158.76)	107.69 (110.43)	76.89 (79.06)	168.97 (169.91)	120.38 (124.91)
Educational Level						
Illiterate	72.35 (65.24)	144.07 (140.25)	104.38 (98.90)	78.89 (65.92)	170.59 (160.66)	130.78 (118.90)
Primary	80.13 (76.68)	157.17 (157.18)	110.56 (108.34)	84.97 (81.69)	172.05 (171.61)	125.60 (124.11)
Middle Complete	80.62 (78.46)	162.19 (170.33)	107.43 (107.95)	80.90 (80.52)	163.68 (172.28)	107.27 (109.83)
High School +	67.74 (83.31)	181.45 (192.44)	97.39 (111.78)	67.09 (81.38)	163.03 (182.60)	99.89 (116.21)
Religion						
Hindus	73.96 (72.24)	153.98 (153.05)	104.51 (102.40)	79.33 (77.86)	169.82 (167.29)	120.42 (117.58)
Roman Catholics	73.32 (78.83)	153.88 (156.75)	106.27 (112.80)	71.05 (76.17)	154.78 (176.85)	118.19 (128.56)
Others	67.77 (61.00)	143.10 (136.54)	89.92 (18.34)	79.14 (64.19)	169.40 (141.45)	104.89 (84.94)
Work Status						
Working	69.68 (72.33)	144.65 (145.36)	93.43 (94.95)	77.91 (79.10)	161.96 (161.97)	115.06 (115.15)
Not Working	74.26 (73.72)	154.87 (154.76)	106.33 (106.05)	76.75 (76.22)	172.26 (172.18)	120.83 (120.74)
Age at Marriage						
<18	89.96 (95.95)	161.34 (170.15)	120.68 (125.89)	100.45 (106.66)	184.01 (191.37)	147.56 (150.99)
18-20	78.05 (78.68)	155.52 (156.73)	106.49 (106.17)	95.06 (95.79)	175.58 ; 177.21)	133.28 (133.70)
21-23	66.70 (63.89)	154.52 (147.46)	100.54 (97.19)	70.49 (68.83)	165.91 (162.00)	109.74 (108.01)
24-30	46.07 (37.93)	129.05 (114.35)	73.54 (67.49)	48.14 (44.63)	139.64 (129.88)	81.60 (79.25)
Total	73.49	153.60	104.38	77.12	169.14	119.03
Number of Cases	991	622	1613	1040	870	1910

Note: Figures in the parenthesis are the adjusted mean for the effects of factors considered here

birth interval for Hindu and Roman Catholic women seems to be almost equal. The work status of women, however, suggests that the non-working women have longer open birth interval. There is no difference in the adjusted and unadjusted values of open birth interval by work status. However, the differential in the open birth interval is very large by women's age at marriage. The women who were married before age 18 have longer open birth interval compared to other group of women.

The indicator that we have considered in our last attempt is the parity progression ratios for the currently married women aged 30 and above. The estimated value of parity progression ratios during the period is provided in Table 8. The values in table clearly indicate a reduction in the transition rates of higher parities irrespective of age between the two points of time. However, for older women there is a negligible increase in progression ratios of first two parities and there after it indicates a declining trend over the period. For women aged 30-39, reduction in the parity progression ratios is enormous as compared to the women aged 40-49.

TABLE 8: PARITY PROGRESSION RATIOS FOR THE CURRENTLY MARRIED WOMEN IN THE AGE 30 AND ABOVE IN GOA

Parity	IIPS Survey (1984)			NFHS (1993)		
	Aged 30-39	Aged 40-49	Aged 30+	Aged 30-39	Aged 40-49	Aged 30+
1	0.9653	0.9772	0.9699	0.9404	0.9780	0.9567
2	0.9252	0.9393	0.9307	0.8677	0.9472	0.9040
3	0.8006	0.9071	0.8426	0.6209	0.8102	0.7114
4	0.7416	0.8227	0.7760	0.5772	0.7072	0.6478
5	0.6134	0.7666	0.6823	0.4468	0.6066	0.5413
6	0.5148	0.6841	0.6003	0.4286	0.5836	0.5371
7+	0.4598	0.5805	0.5293	0.3492	0.5439	0.4893

Summary and Conclusions

Numerous studies have been carried out in the state of Goa to assess and explain the differentials in the patterns of reproduction among married women (Roy *et al.*, 1989; Rajaram, 1996; Syamala, 1993). Most of them are based on data from one round retrospective survey. Many studies used data from the survey conducted in the state during 1984. Recently, National Family Health Survey was carried out during 1992-93 in the state. This gives an opportunity to observe the changing patterns

of reproduction in the said state, comparing data from both the surveys. Goa is considered to be one of the low fertility states where the use of conventional contraceptive is very low. The present study indicates a very drastic decline in fertility among currently married women in the state of Goa during a short period of around nine years. Changes in the pattern of reproduction are studied by pertinent indicators such as age at marriage, age at first birth, age at last birth, last closed birth intervals, open birth intervals and parity progression ratios. The analysis reveals a rise in age at marriage during the period under observation. However, the effect of this on fertility has almost been neutralized by a reduction in the age at first birth. Spacing between marriage and first birth might have reduced during the period. The last closed birth interval that is considered to indicate the spacing pattern in the population during the recent periods, indicates that there is not much change in it. On the other hand, the measures such as open birth interval and age at last birth have changed very drastically between the two points of time. The parity progression ratios have also changed very sharply.

To be precise, the results from the analysis indicate that the state of Goa has experienced a decline in fertility irrespective of social and economic characteristics of women. Also, the differentials in fertility across various social and economic stratas of the population have reduced substantially over a period of nine years. Although, age at marriage has increased in the study population, its effect on fertility is not substantial, as the age at first birth in the population remains the same. This is also true for majority of the social and economic categories of the population. However, there is a drastic decline in age at last birth among various social and economic groups of the population during the period. Age at last birth is a function of age at first birth, spacing pattern of births and parity progression ratios (Suchindran and Koo, 1992). Since, the pattern of spacing in the study population seems to be uniform during the period, the quantum aspect of fertility (i.e., parity progression ratios) might have played a larger role in the reduction of fertility as well as of the mean age at last birth. There is also a substantial increase in open birth interval irrespective of background characteristics of women over the period. To conclude, the effect of age at marriage has not contributed much in the reduction of fertility in the study population. It has been documented elsewhere that the two measures, such as open birth interval and mean age at last birth are closely related with parity progression ratios. The only possible reason that can be ascribed for the reduction in fertility in Goa is decline in age at last birth and increase in open birth interval irrespective of social and economic characteristics of the population. In other words, reduction in fertility has been generally due to increasing attempt of couples to limit their family size and not by any change in age at marriage and patterns of spacing

between births. The important point emerging from the study is that differentials in most of the indicators across various socio-economic categories of the population have narrowed down over the period. Further detailed analysis is called for to understand the underlying factors behind such a widespread fertility decline in the state of Goa.

Acknowledgements

The author wishes to acknowledge Dr. K.Srinivasan, Executive Director of Population Foundation of India, for his valuable suggestions and comments during the preparation of the article.

References

- Anderson, D. L. and Bean, L. L., 1985. Birth spacing and fertility limitations: A behavioural analysis of nineteenth century population. *Demography*, 22: 169-183. PRC, Dharwad and UPS, Bombay, 1995, *National Family Health Survey (MCH and Family Planning) Goa 1992-1993*. Rajaram, S, 1996. An Analysis of Reproductive Patterns in India with Special Reference to Goa. *Unpublished Ph.D. Thesis* at International Institute for Population Sciences, Bombay. Roy, T. K., Rama Rao, G. and Prasad Rajiva, 1986, *Report on the Survey on Levels of Fertility and Mortality in Goa*. International Institute for Population Sciences, Deonar, Bombay, (Mimeographed). Roy, T. K., Rama Rao G. and Prasad Rajiva, 1989. Child Bearing in Goa: Age Patterns and Cohort Changes. In: K. Srinivasan and K.B. Pathak (eds.). *Dynamics of Population and Family Welfare*, pp. 71-90. Himalaya Publishing House, Bombay. Syamala, T. S., 1993. Effect of Infant and Child Mortality on Fertility and Family Planning Acceptance in Goa. *Unpublished Ph.D. Thesis* at International Institute for Population Sciences, Bombay. Srinivasan, K., 1967. Analytical Models for Two Types of Birth Intervals with Applications to Indian Population, *Ph.D. Thesis* at University of Kerala, Trivandrum. Srinivasan, K., 1980. Birth interval analysis in fertility surveys, *WFS Scientific Reports*, Number 7, World Fertility Survey, London. Srinivasan, K., Pathak, K. B. and Pandey, A., 1985. On some Techniques for Estimating Parity Progression Ratios from the Survey Data with Illustrative Applications. In: K. Srinivasan and S. Mukherji (eds.). *Dynamics of Population and Family Welfare*, pp. 115-143. Himalaya Publishing House, Bombay. Suchindran, C. M. and Koo, H. P., 1992. Age at last birth and its components. *Demography*, 29: 227-245.