

## **“Has Modernization Increased Fertility in Karnataka, India?”\***

### **Introduction**

**T**HE article on the topic by Chandrasekaran *et al.* calls for further consideration and debate, namely :

- (i) whether modernization really did increase fertility in Karnataka State in India, and,
- (ii) if so, what are the aspects of modernization that contributed to the increase?

Though not explicitly stated the authors seem to question the findings reported in an earlier paper by Srinivasan, Reddy and Raju in 1978. Srinivasan *et al.*, had argued therein that natural fertility level did increase in some areas of Karnataka State between 1951 and 1975 and that the reasons thereof could be attributed to certain aspects of modernization experienced in the State. This conclusion rested on a comparison of the cumulative and current fertility patterns of largely overlapping and comparable areas covered by the 1951-52 Mysore Population Study (MPS) and the 1975 Bangalore Population Study (BPS). The comparison revealed that cumulative fertility rates of ever-married women did not record any decline in any age group in the reproductive span over this long period despite a substantial increase in contraceptive use in every age group during that period. Similarly, the current fertility rates of married women in 1975 revealed a change in the age pattern from the 1951

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\*This article offers comments on the article by C. Chandrasekaran, P. H. Reddy, V. S. Badri, and K. N. M. Raju, published in *Demography India*, Vol XIV, No. 2, 1985.

rates that cannot be fully accounted for by the phenomena of a rising age at marriage and higher contraceptive use at older ages. The natural fertility rates<sup>o</sup> of married women did record a substantial increase among women aged 20-29.

Chandrasekaran *et al.* admit the possibility that, in early stages of modernization, the fertility of the Indian population could increase, a view advanced by Chandrasekaran himself as early as 1954. However, they doubt whether fertility levels actually increased in Karnataka State between 1951 and 1975 and whether there is any justification at all for using the Karnataka experience as an illustration of the fertility-increasing effects of the early phases of modernization in India. Seven years elapsed between the two papers in question. During this period a number of research articles on this topic of modernization in its early stages leading to fertility increase have been published based on the recent experience of India and other developing countries (particularly Columbia, Sri Lanka and Taiwan; see Easterlin *et al.*, 1985 and the historical experiences of European populations. See Caldwell *et al.* 1984, Nag 1982, Srinivasan and Jejeebhoy 1981, Easterlin and Crimmins 1985, Srinivasan *et al.* 1984). Without going into this literature, I will confine myself to certain specific issues raised by Chandrasekaran *et al.* in their paper.

### (1) Did Natural Fertility Levels Increase During the Period 1951-1975?

(a) The answer is "Yes", on the basis of cohort fertility levels. For example, consider the average numbers of children ever born firstly to ever-married women and secondly to currently-married women and also note the proportion who had ever used contraception in Bangalore City as obtained by the MPS in 1951 and BPS in 1975 for different age groups (Table 1). The two articles are in agreement with regard to these figures.

In Table 1, consider the age group 25-34 : the average number of children ever born for ever-married women in this age-group in 1951, according to the MPS, was 3.2 and in 1975, according to the BPS, was 3.4; while the figures are corrected to 3.4 and 3.4 if we consider only currently-married women

<sup>o</sup>The terms "natural fertility" and "potential fertility" are used synonymously in this article as in the paper by Chandrasekaran *et al.* However, they have been used with different meanings in the works of Easterlin, especially in his "synthetic framework" and the various applications of this framework illustrated in the volume "Fertility Revolution" by Easterlin and Crimmins (1985). In those works, potential fertility is defined as the product of natural fertility ( $N$ ) and the child survivorship ratio ( $s$ )—the proportion of children born surviving to the age of the mother—up to which the potential fertility is computed. In the literature on estimation of births averted because of contraception, the two terms have been used rather interchangeably, with the modification that "potential fertility" indicates the fertility among contraceptive acceptors that would have prevailed had they not accepted the method.

TABLE 1—MEAN NUMBER OF CHILDREN EVER BORN AND LEVEL OF CONTRACEPTIVE PRACTICE IN BANGALORE CITY IN 1951 (MPS) AND 1975 (BPS) (FOR EVER MARRIED WOMEN AND CURRENTLY MARRIED WOMEN)

Age group of women	Mean No. of children ever born				Percentage who practised contraception and currently married (aged 15-34) <sup>a</sup> only			
	Ever married		Currently married		All methods		Modern methods	
	MPS	BPS	MPS	BPS	MPS	BPS	MPS	BPS
15-24	1.3	1.4	1.3	1.4	8.5	18.5	2.8	18.5
25-34	3.2	3.4	3.4	3.4	18.7	36.1	6.0	36.1
35-54	4.9	5.2	5.4	5.2	—	—	—	—
45+	5.3	5.7	5.9	5.8	—	—	—	—
Combined	3.6	3.7	3.6	3.6	12.4	31.7	4.0	31.4

SOURCE : United Nations (1961), Table 10.1, p. 112; Srinivasan, Reddy and Raju (1977), Table 12, p. 45 and Table 5 of Chandrasekaran *et al.* (1985).

(<sup>a</sup>)Data on contraceptive practice were collected only for currently-married women in the age-group 18-33 in the MPS and hence comparison is restricted to the age-group 15-34.

on these two dates. On the other hand, the percentage who had reported use of any modern method of family planning was 36.1 in 1975 compared to only 6 percent in 1951. Thus 30 percent more couples were using contraception at the end of this 24-year period than at the beginning. Actually the real increase was almost certainly greater; for, the percentage using contraception was based on enquiries made from the husbands in the Bangalore Population Study in 1975, whereas in the Mysore Population Study in 1951/52 information was sought from both husbands and wives, and the estimates were based on whether usage was reported either by the husband or by the wife. Since we know that enquiries based only on husbands or wives with regard to contraceptive use provide an underestimate of the actual contraceptive use of the couple (as reported by either), the increase in contraceptive use during the period 1951-1975 can be expected to be more than sixfold. Estimates of births averted among couples because of increased use of contraception, taking into account the period of use and the effectiveness of use, indicate that there should be at least a 12 percent decline in the number of children ever born to currently-married women in this age group. Such an expected decline did not occur. On the other hand, when we consider the average number of children born to ever-married women, there was a marginal increase between 1951/52 and 1975 from 3.2 to 3.4, although the number remained the same (at 3.4) for both these years if we consider only currently-married women. The question posed in 1975, therefore,

was : "Where, then, have the presumed effects of family planning gone"? This phenomenon of the absence of any decline in the fertility levels of the population commensurate with the increase in contraceptive practice was observed in most of the areas taken for comparison in Karnataka State. Such a phenomenon cannot happen unless the natural fertility levels of the population increased to the extent of counteracting the effects of contraceptive use. The phenomenon was observed in rural hills, rural plains, towns and Bangalore City as a pervasive feature of the population. The 1978 paper was an attempt to raise this fundamental empirical issue and postulate some reasons that could underlie the increase in natural fertility.

Chandrasekaran *et al.* (1985) have attempted to refine the comparability of data at the two points of time by controlling the marital status of women and considering the fertility only of continuously-married women on both the dates. In the Mysore Population Study, the currently-married woman was defined as a woman currently and continuously-married at the time of the survey, while in the Bangalore Population Study the currently-married woman was considered on the basis of marital status at the time of the survey irrespective of the number of times she had married. The currently-married women category in the Bangalore Population Study included the women who have been married more than once, including widows or separated women. Chandrasekaran *et al.* agree that the fertility of remarried women in any age duration is less than the fertility of 'continuously-married' women of the same duration. Accordingly, the fertility of the currently and continuously-married women in the study area in 1975 can be expected to be higher than is reported in BPS on the basis of the differing definitions. As such the average number of children ever born to currently and continuously-married women in the age group 25-34, in 1975 could be expected to be greater than 3.4. Thus the real increase in the average number of children ever born between the years 1951/52 and 1975 will be greater than that indicated by Table 1, strengthening the contention of Srinivasan *et al.* that the natural fertility level had increased substantially over the period.

In the process of adjusting the fertility levels to take account of remarriage by estimating the remarriage rate of widows or separated women in 1975, for data from the BPS, Chandrasekaran *et al.* used the procedure developed by Bhat and Kanbargi (1984), and obtained the results for the percentage of widowed/separated women remarried in different age groups shown in Table 2. The rates of widow remarriage obtained in this way for 1975 from BPS data appear to be questionable. Those familiar with the cultural conditions of Karnataka would question the validity of a widow remarriage rate of 77.1 percent in the age group 25-34 and 67.1 percent in the age group 35-44 in 1975 compared to 7.8 and 8.0 percent in these two groups in 1951. The authors have claimed that, even with such remarriage rates, "the increase in total fertility in rural areas, towns and Bangalore City for women aged 35-44 years is estimated at no more than 0.1 child" (p. 187). When widow remarriage increases from 7.8 percent

TABLE 2—PERCENTAGE REMARRIED AMONG WIDOWED OR SEPARATED WOMEN IN BANGALORE CITY IN 1951 AND 1975 ESTIMATED BY CHANDRASEKARAN *et al.*

Age group of widowed or separated women	Percent remarried	
	MPS (1951)	BPS (1975)
15-24	5.0	39.1
25-34	7.8	77.1
35-44	8.0	67.1

SOURCE : Tables 7 and 8 of Chandrasekaran *et al.* (1985).

to 77 percent in the age group 25-34, it is hard to believe that the increase in the total fertility rate would be only 0.1, unless the incidence of widowhood/separation was extremely low in the earlier period, which could not have been the case. However, even ignoring the probable overestimation of remarriage rates for 1975, it is clear that the average number of children born to currently and continuously-married women between the years 1951/52 and 1975 actually increased, and the expected impact of a substantial rise in contraceptive practice on fertility during this period was not observed.

(b) Current marital fertility rates also increased during the period in younger ages. Consider the age-specific marital fertility rates based on births in the year prior to the survey for different age groups in the Bangalore Population Study and the Mysore Population Study and the percentage of women who had ever used contraception (Table 3). Take the age-group 20-24 and 25-29; They show a sharp increase in the age-specific marital fertility rates between

TABLE 3—AGE-SPECIFIC MARITAL FERTILITY RATES AND CONTRACEPTIVE USE IN BANGALORE CITY IN 1951 (MPS) AND 1975 (BPS)

Age group of married women	Marital Fertility Rates		Percent who ever used contraception			
	MPS (1951)	BPS (1975)	All methods		Modern Methods	
			MPS	BPS	MPS	BPS
15-19	297	290	5.1	—	1.5	—
20-24	253	351	10.8	21.3	3.7	21.3
25-29	201	229	15.9	36.2	4.9	36.2
30-34	174	134	22.2	36.0	7.4	36.0
35-39	88	61	NA	NA	NA	NA
40-44	36	16	NA	NA	NA	NA

NA—Not available or published.

1951 and 1975, despite the substantial increase in the percentage who had ever used contraception. Particularly intriguing is the increase in the age-group 25-29, where the proportion who had practised contraception increased from 15.9 percent in 1951 to 36.2 percent in 1975. If we consider only modern methods of contraception, the increase was from 4.9 percent in 1951 to 36.2 per cent in 1975. Since the methods used in 1975 were quite efficient (mostly sterilization and IUDs), one should have expected at least a 20 percent reduction in the 25-29 age-specific marital fertility rates between 1951 and 1975 on the assumption that the potential fertility of the acceptors was the same as that of all women in the age-group. On the other hand, the increase in the marital fertility rates of the 25-29 age-group suggests that the natural fertility rates, or the potential fertility rates of married women in the absence of contraception, should have increased during the period 1951 to 1975.

The increase in the marital fertility rate for 25-29 cannot be explained by any increase in the age at marriage of women during this period. For example, in a study carried out by the Sample Registration Scheme (Sample Registration Bulletin, 1976), it was found that the median age of married women in the urban areas of Karnataka State in 1972 was 17.0, compared to 16.7 in the rural areas. Again, on the basis of a study of age at marriage of synthetic cohorts from census age distribution of 1971, Goyal (1975) estimated the singulate mean age at marriage for urban areas of Karnataka as 19.4. The Mysore Population Study estimated the age at marriage of Bangalore City as between 16 and 17. The increase in age at marriage from 16 or 17 in 1951 to 19.4 in 1971 could not have significantly affected the marital fertility levels of the age-group 25-29.

Thus, it is clear, on the basis of the cohort as well as the current fertility levels, that the natural fertility of women in the younger age-groups, particularly 20-24 and 25-29, must have increased during the 24-year period 1951 to 1975, since the fertility levels on those two dates fail to reflect the effect of increase in contraceptive use during the same period.

## **2. Further Empirical Support for Increase in Natural Fertility Levels in India During the 1950s and 1960s**

There is a substantial body of empirical data on the age patterns of marital fertility rates compiled at different points of time during the past three decades from different states in India, and these data support the hypothesis that natural fertility levels have systematically increased in a number of states.

From a detailed analysis of the data on age-specific marital fertility rates compiled from two large-scale sample surveys conducted about 13 years apart, 1959 and 1972, in the rural areas of eleven major states in India, Srinivasan and Jejeebhoy (1981) had observed : "The results consistently indicate an increase in the total marital fertility rates in eight of the eleven states (the excep-

tions being Kerala, Orissa and Punjab) between 1959 and 1972. The most striking increase in total marital fertility have been observed in those States where there has been practically no prevalence of contraception as indicated by "m" values in 1959 and 1972. The increase is 28 percent in Uttar Pradesh, 26 percent in Rajasthan, 13 percent in Madhya Pradesh—and all these states were practically under natural fertility conditions. . ."

In rural Karnataka the total marital fertility rate increased by 2.3 percent in spite of a substantial increase in contraceptive practice during the 13-year period. In this study the model developed by Coale and Trussel (1974) was used to estimate the scale parameter  $M$  and the contraceptive use parameter  $m$ , and it was found that the natural fertility levels indicated by the scale parameter  $M$  increased in a number of states when the level of contraceptive use, also increased during the early stages of modernization. It was concluded, therefore, that : (i) the levels of natural fertility may vary widely among populations at a given time; and (ii) in general, during the early stage of modernization, natural fertility levels tend to increase.

Another study analysed the 1970 ORG data for a sample of households from ten states in India to test the "synthetic framework" developed by Easterlin (1978) for explaining the transition from natural to controlled fertility. This analysis carried out by Srinivasan *et al.* (1984) revealed that, in the process of modernization, natural fertility levels tend to increase; the authors had developed a procedure for estimating natural fertility in terms of the number of children born to 'continuously-married' women aged 35-44 who had at least two living children (at the time of the survey in 1970).

The estimates of natural fertility ( $N$ ), the average number of children ever born ( $B$ ), the proportion of children surviving ( $s$ ), and the percentage practising contraception ( $P$ ), estimated from the household data for the women 35-44 with at least two living children are given in Table 4.

The natural fertility levels among the states vary even for fertile women in the same age-group (35-39) from 6.4 in Punjab to 5.5 in Madhya Pradesh, and that it is generally the highest in states which are relatively more advanced in terms of various developmental criteria (Punjab, Tamil Nadu, Karnataka and Gujarat all having high 's' values). The correlation coefficient between the observed fertility levels ( $B$ ) and the percentage using contraception ( $P$ ) is found to be as low, as 0.02. Higher contraceptive use should theoretically imply lower fertility, but since states with greater use also tend to have higher natural fertility, the relation of use and actual marital fertility is not empirically observable. On the other hand, the correlation coefficient between natural fertility ( $N$ ) and observed fertility ( $B$ ) is as high as 0.80. Observed fertility levels seem to have been influenced more by changes in natural fertility levels than by changes in contraceptive use until 1970, supporting the view that marital fertility may not decrease, or may even increase during the early phase of fertility

TABLE 4—ESTIMATES OF NATURAL FERTILITY (*N*), CHILD SURVIVAL (*s*), AND NO. OF CHILDREN EVER BORN (*B*) AND PROPORTION EVER PRACTISING CONTRACEPTION IN 10 STATES OF INDIA—FOR CURRENTLY MARRIED WOMEN, MARRIED ONLY ONCE, AGED 35-44 WITH TWO OR MORE LIVING CHILDREN AT THE TIME OF THE SURVEY

State	<i>N</i>	<i>s</i>	<i>B</i>	<i>P</i>
Punjab	6.40	0.797	5.94	42.4
Maharashtra	5.86	0.817	5.57	41.1
Tamil Nadu	6.18	0.777	5.89	39.1
Gujarat	6.19	0.800	6.04	34.1
Kerala	5.96	0.864	5.85	35.7
Andhra Pradesh	5.86	0.763	5.87	23.8
Karnataka	6.05	0.813	5.99	17.5
Rajasthan	6.06	0.746	5.91	19.0
Madhya Pradesh	5.47	0.779	5.49	15.4
Uttar Pradesh	6.01	0.720	5.94	12.8

SOURCE : Easterlin, R. A. and Crimmins, E. M. (1985), *The Fertility Revolution*, University of Chicago Press, pp. 154-160.

transition because increases in contraceptive use do little more than offset increases in natural marital fertility.

The point brought out by the analysis of Srinivasan and Easterlin *et al.* is that the relative level of observed marital fertility, by itself, is not a good indicator of the stage of demographic transition. Some Indian states are considerably more advanced with regard to motivation for fertility control, and these states show more response in the actual use of contraception, even though their comparative levels of marital fertility may differ little from the average. Studying the association between state-level differences in the use of contraception and the actual fertility, the authors concluded: "This conforms to our expectation that, in the early stages of transition from natural to controlled fertility, observed marital fertility may be constant, or even rising, as the positive effect of higher natural fertility offsets the negative effects of greater control. In some states, unregulated fertility may result in greater than average numbers of surviving children because of increase in natural fertility\*."

\*For further elaborations on this argument see chapter 6, pages 169, 170 of Easterlin and Crimmins (1985).

In making a comparative analysis of the trends in proximate determinants of fertility for a number of countries in Africa, Bongaarts *et al.* (1984) observe, "Future trends in fertility are entirely determined by trends in the proximate determinants. The proximate determinants can be divided into two general classes : (i) fertility-enhancing trends : shortening of breastfeeding and post partum abstinence; decline in pathological sterility; and (ii) fertility reducing trends : rise in the age at first union, higher prevalence and effectiveness of contraception.

### 3. Decline in the Duration of Breastfeeding in Developing Countries (including India)

Chandrasekaran *et al.* state (page 190) that : "There is not much evidence that either the length of breastfeeding or the length of lactation amenorrhoea, is being reduced substantially in the population as a whole." This statement does not appear to be consistent with the large volume of empirical data available from different parts of India (and other developing countries). There is a growing body of evidence that in Karnataka State, in many other parts of the country (and in other developing countries), the period of lactation is declining quite rapidly. This decline in the period of lactation, especially in the rural areas where there is a considerable degree of malnutrition, is a matter of serious concern not only for nutritionists and public health specialists but also for family planning programmes, and there is at present a global campaign started by the WHO and UNICEF to promote breastfeeding in developing countries.

We will provide only a few of the many examples to support the statement. In a carefully conducted microdemographic study in nine villages a hundred kilometres from Bangalore, in the area covered both by the Mysore Population Study and the Bangalore Population Study, Caldwell, Reddy and Caldwell (1984) observed, "Breastfeeding (in the previous generation) was of even longer duration and was controlled not by the concept of a proper duration but of a proper time association, namely when the women had reached a certain stage of the next pregnancy (three months was most commonly quoted). Thus in the 1940s the great majority of women breastfed for over two years, and many for three to five. Those doing so for less than 24 months were usually the victims of sickness, problems with their supply of milk, or the death of the infant. The majority of women in the smaller villages still wean later than 24 months, but in the large villages (as in poorer Bangalore) the period now averages around 18 months."

Reviewing major studies carried out with regard to breastfeeding practices, Nag (1982) concludes, "Breastfeeding is less prevalent in urban areas than in rural areas, less among educated women than among uneducated women, less among women in non-agricultural sectors than those in agricultural sectors, and less among women from higher income households than from lower income

households. There is a general tendency to view breast-feeding as an old-fashioned custom and bottle-feeding as a status symbol. In a 1970 WHO survey of economically advantaged women in an urban area of India, it was found that only 63 percent of secondary educated, and 39 percent of college educated women were breast-feeding their children at six to eight months. In the rural areas of India, most mothers still breastfeed their children up to two years or so. There is, however, a strong tendency even in rural areas to supplement breast-milk with other liquid or solid food, thereby reducing the frequency of breastfeeding. Hence it is likely that modernization has caused some increase in natural fertility in both the urban and rural areas of India through a decline in the practice of breastfeeding."

Many socio-economic factors are linked with breastfeeding, so that the analysis of breastfeeding is complicated and obscure. However, it is found that the more urban the area in which a woman lives, the shorter her period of breastfeeding, it being the shortest in the metropolitan areas. Education, which is not independent of type of residence and other socio-economic variables, also plays an important part in reducing the length of breastfeeding. An analysis of the data for 28 developing countries, covered by the World Fertility Survey, confirmed the findings of many earlier studies that the duration of breastfeeding is shortest among more educated women living in urban areas, with their husbands or themselves employed in non-agricultural activities and that modernization with regard to any of these three variables systematically reduces the duration of breastfeeding (Ferry and Smith, 1983).

Analyses of data on breastfeeding collected from the 1973 National Demographic Survey in the Philippines (Mejia-Raymundo, 1985) strongly suggest the adverse effects of modernization on both the initiation and duration of breastfeeding. In this study a higher level of education of women and working outside the house are found to be the modernization variables that are most effective in lowering the level and duration of breastfeeding practice, independently of the influences of other socio-economic factors.

At a major international conference on lactation held in New York in 1977, concern over the rapidly-declining period of lactation in developing countries from the demographic, public health and psychological points of view, was expressed. The WHO has started an international movement for restoring breastfeeding as the most hygienic, nutritious and safe way of improving the nutritional status of infants during the first year of life. As a contraceptive method, it is estimated (Bongaarts 1978) that breastfeeding has contributed more than any other means in preventing of births and keeping down fertility at levels significantly lower than the biologically optimal. It has been estimated that, at least up to 1974, the aggregate contraceptive protection provided by breastfeeding in developing countries has probably been greater than that achieved through family planning programs.

The decision to wean a child is essentially that of the mother. Her attitudes

on the adequacy and nutrition of breast milk for the child, competing demands on her time of work or other activities outside home, the impact of sales promotion of baby-foods and her own ideas about the impact of breastfeeding on her physical appearance largely determine the initiation and duration of breastfeeding. Breastfeeding as a natural contraceptive is likely to have a minimal influence, compared to other factors, in determining the duration of breastfeeding. Modernization by changing the relevant traditional attitudes of the mother can be expected to depress the duration of breastfeeding.

#### 4. Taboos on Sexual Intercourse

Many anthropological studies have indicated that the taboos on sexual intercourse imposed by culture, for either religious or social reasons, are weakened in the early stages of modernization. The taboos on sexual intercourse can be of two types : (i) the taboos relating to the post-partum period, often called as post-partum abstinence, and (ii) other taboos, religious or social, leading to abstinence on specified auspicious days and on other days to protect the health of the mother or the husband, as well as terminal abstinence on the couple reaching a certain age or stage in their life-cycle, especially when they are likely to become grandparents themselves.

In rural Karnataka, post-natal sexual abstinence of sufficient duration to affect fertility has been practised extensively and is believed to have been a universal cultural phenomenon. Anthropological type of inquiry conducted by Caldwell, Reddy and Caldwell (1984) reported that abstinence is "practised for the same reasons as it was in other parts of the world : to achieve a spacing that will maximise the chance of the child's survival, to allow the mother to regain her health, and so as not to endanger the quality of the milk (reported to be the greater danger in the earlier period of breastfeeding than subsequently). The primacy of the first reason is shown by a considerable proportion of women who abstain far longer after a male than after a female birth. The period of post-natal abstinence has been shortening for so long that there are no longer even folk memories of what the ideal period once was, but it was certainly at least two years. Amongst women who married during the 1940s, 15 percent of those living in small villages, but only 5 percent of those in the large villages, abstained for that period or longer, while the substantial majority did so for more than a year. Among women who were married since 1960, abstention for longer than 18 months has almost disappeared in the large villages, and is around 20 percent in the smaller villages. Even in middle-class Bangalore it has not fallen substantially below six months".

Since the contraceptive effect of post-partum abstinence is linked to the duration of lactation, which in turn affects the return of ovulation or the fecund period, any reduction in the duration of post-partum abstinence to less than six months may not have any contraceptive effect since, for this period,

the woman will be protected by post-partum infecundability due to lactation. However, if the period of post-partum abstinence was of the order of two years or more before 1940 in rural areas, as Caldwell *et al.* report from their study, and if this has been reduced to six months during the period of modernization, the reduction in the period of post-partum abstinence must have contributed to an increase in natural fertility among the couples.

On this topic, Chandrasekaran *et al.* have pointed out (page 100) that the proportion of women going to their mothers' homes for delivery, both in Bangalore city and in the rural areas, had remained almost the same between the period of the Mysore Population Study and the Bangalore Population Study. They based their finding on a survey that was carried out by Badari *et al.* in 1978 which studied the extent of visits of pregnant women to their mothers' homes for delivery by the order of pregnancy. The fact that almost the same proportion of women went to their mothers' homes for delivery in 1951 as in 1975 does not indicate the extent to which post-partum abstinence was practised by the couples at these two points of time. It is not the percentage who go to their mothers' home for delivery that is the important factor, but the extent to which post-partum abstinence is practised. The period of stay of women in their mothers' home after delivery has declined sharply and many anthropological studies reveal that the period of post-partum abstinence has been coming down significantly. The process of modernization, such as education and urbanization, has caused considerable decline in the practice of post-partum abstinence, mainly through changes in family structure, social customs and attitudes towards sex.

Modernization has also caused a considerable decline in the observance of sexual abstinence in connection with ritual occasions and on specific days related to phases of the moon. Traditionally, abstinence was considered a great virtue since semen is believed to be a vital fluid not to be wasted.

Based on an anthropological inquiry of couples in three villages in West Bengal, Nag (1972) reported that the average weekly frequency of coitus for Hindu women, as reported, was 1.8 for ages 25-29, 1.1 at ages 30-34, and 0.7 at ages 35-39. Comparing these data with a weekly coital rate of 2.3 reported for American women aged 30-34 in the sample studied by Kinsey, Nag pointed out, "there is a widespread belief that semen is a great source of strength for men and so men are very much concerned about loss of their strength through coitus." Modernization, through the spread of education, can be expected to reduce this undue and irrational concern of men for the loss of semen and so increase coital frequency.

In the Mysore Population Study (MPS) in 1951, abstinence was reported as the most widely used method of family limitation, with about 12.7 percent of married women in the age group 25-34 practising it in Bangalore city. The percentage of married women of the same age-group in Bangalore city reporting the practice of abstinence in 1975 in the BPS was zero. With moderniza-

tion, the emphasis on abstinence as a method of family limitation has just disappeared.

Nag (1972) reported that women living in extended households had lower average coital frequency than those living in nuclear families for all age-groups. The factor responsible for the difference is the greater adherence to traditional rules of sexual abstinence by women living with their in-laws in extended families. The breakdown of the extended family system is considered to have led to a decline in adherence to traditional rules of abstinence.

Fecundability, defined as the monthly probability of conception for a woman in a susceptible state, can be considered to increase in direct proportion with coital frequency (until a limit), assuming that days of abstinence based on ritualistic and religious reasons are unrelated to the period of ovulation. The religious or ritualistic abstinence that was followed in Hindu culture was more related to the astrological almanac, to the position of the stars or phases of the moon or the days of the week, than to the ovulatory cycle of individual women, excepting abstinence during and a few days following menstruation. It can be expected that reduction in the period of abstinence or increase in coital frequency that is expected as a natural sequel of modernization, better health and changing family structure will increase the fecundability, or the potential fertility of the woman, in the absence of any contraceptive practice.

#### **5. Effect of Improved Health Conditions in Increasing Natural Fertility**

Srinivasan *et al.* (1978) indicated that the eradication of malaria during the period 1951-1975 in the State of Karnataka might have contributed to the increase in fecundability of women. This was based on studies by public health specialists that exposure to malaria, especially in its serious form, could cause secondary sterility. In commenting on this hypothesis, Chandrasekaran *et al.* pointed out: "If malaria did affect fecundity, the situation in the BPS area was worse around 1975 when the survey was undertaken than at the time of the MPS." This conclusion was based on the fact that the reported incidence of malaria in 1975 was quite high, and the success of the malaria eradication campaign achieved in the 1950s and early 1960s was short-lived and that there was a resurgence of malaria in this area.

Malaria had been a major cause of death in India until 1960 (refer Table 5). The nationwide Malaria Control Program was launched in 1953, in the first Five-Year Plan. It was converted into a Malaria Eradication Programme (NMEP) in 1958 during the second Five-Year Plan with massive inputs of personnel and other resources into the program. As a result of this intensive campaign, the incidence of malaria steadily declined in the country from 1959, reaching its lowest figure in 1965 when only 100,000 cases were reported and none of them was fatal. Presuming that the disease has been controlled, if not

**TABLE 5—THE PERCENTAGE OF DEATHS ATTRIBUTED TO MALARIA AND OTHER CAUSES AMONG THE REGISTERED DEATHS, AS FURNISHED IN THE VARIOUS REPORTS OF THE DIRECTORATE GENERAL OF HEALTH SERVICES**

<i>Cause</i>	<i>1921-31</i>	<i>1931-41</i>	<i>1941-51</i>	<i>1960</i>	<i>1961</i>	<i>1964</i>
Malaria	59.1	58.4	58.1	58.1	38.4	37.7
Cholera	3.6	2.4	1.1	1.8	0.3	0.8
Smallpox	1.2	1.1	4.0	0.9	1.0	0.9
Plague	2.6	—	0.3	—	—	—
Dysentery and diarrhoea	3.6	4.2	4.4	0.5	5.1	4.8
Respiratory diseases	N.A.	8.3	8.2	4.1	8.8	8.9
Others	N.A.	25.8	23.9	34.6	46.4	46.9
All Causes	100.0	100.0	100.0	100.0	100.0	100.0

Extracted from *India's Population Problems* by S. N. Agarwala, second edition 1977, page 134.

eradicated, the inputs into the programme were greatly reduced. The disease reappeared once again, with the incidence of cases rising steadily from 1969. The number of malaria cases during 1974 and 1975 was reported as 3.1 and 4.4 million respectively. However, the severity of the disease, as reflected in the case fatality rate, was insignificant, with only 99 deaths attributed to malaria in 1975 out of 4.4 million attacks. Compared to the conditions prevailing prior to 1950 when over 2 million deaths were attributed annually to malaria, it can be inferred that the resurgent epidemic of malaria is mild form of the disease with a practically insignificant case fatality rate. From number one killer in the country, malaria has become one of the rarely fatal diseases.

In this context, it has to be realized that the nature of malarial epidemics prevailing in Karnataka State during the 1940s was very different from the type of malaria that recurred in the 1970s. Though there has been an increase in the prevalence of malaria since 1970 in the country as a whole, including the state of Karnataka, the case fatality rate is only a tiny fraction of that which existed in the forties and fifties, and the severity of the epidemic reported at present is in no way comparable with that reported prior to 1950. The effect of malaria on the health and nutrition of the persons affected by the disease after 1970 is mild compared with the severe epidemics, with large number of deaths, that prevailed before 1950. The facilities created for diagnosing the

disease at an early stage and treating it are far better now than those available in the 1940s. The resurgence of malaria in the late sixties cannot be considered as creating a situation impairing the fecundity of the couples or affecting the health or nutritional status of the population on a scale similar to the one prevailing before 1950.

## Conclusion

From the foregoing discussion, it is evident that the natural fertility levels in the population of Karnataka State went up during the period 1951-1975. The increase in natural fertility has to be attributed to certain aspects of modernization, such as declining breastfeeding, relaxation of taboos on sexual intercourse for religious or social reasons, and improvement in the health status of the population, particularly the eradication or control of certain epidemics such as malaria which damage the fecundity of the couples. The fertility-increasing effects of modernization can be expected to last for only a limited duration, until such time as the maximum natural fertility levels are realized. Subsequently, fertility can be expected to decline faster, commensurate with the increase in the contraceptive use. In the early stages of a developing country's modernization there appears to be a time-lag between the increase in contraceptive practice and the decline in fertility levels. The duration of this time lag depends on the cultural and socio-economic conditions of the population, especially those influencing the natural fertility levels of the couples. In populations, where severe restrictions on fertility are imposed through a prolonged period of breastfeeding, taboos on sexual intercourse for religious or social reasons, and terminal abstinence by the couple after their children reach a certain age, the early stages of modernization could relax these checks and contribute to an increase in natural fertility. In such populations, the time lag between the initiation of modern contraception and the steady decline in the fertility levels can be expected to be longer than in populations where there have been no such traditional checks on fertility. In the population studied in Karnataka State, the fact that birth rate was only around 40 in 1951, even in the absence of any large-scale contraceptive practice, clearly indicates that there were strong traditional, cultural and institutional checks on fertility. Modernization may weaken the force of such factors, and there can be a phase in the process of development when the increased practice of contraception may even be accompanied by a slight increase in the levels of fertility, or fertility may plateau at a particular stage, before its steady decline commences (Basterlin and Crimmins, 1985). The paper by Chandrasekaran *et al.* has rightly pointed out the need for collection of data on various proximate determinants of fertility, in order to have a better understanding of the forces that contribute to an increase or decrease in the natural fertility levels of the population. However, paucity of additional data should not be made a reason for not making the

best use of available information in obtaining an insight into the processes taking place in a population. A comparative study of the data sets between MPS and BPS did indeed provide answers (though not complete) to the two questions raised by Chandrasekaran *et al.* in this paper, viz (i) whether modernization did increase fertility in Karnataka? and (ii) if so, what aspects of modernization contributed to the increase? The availability of data from the 1951 UN-Government of India sponsored survey conducted in the Mysore State under the direction of C. Chandrasekaran has certainly enriched the Indian demographic community by providing a baseline estimate of various demographic and social conditions in the state before the introduction of planned development.

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