

## **CHAPTER FOUR**

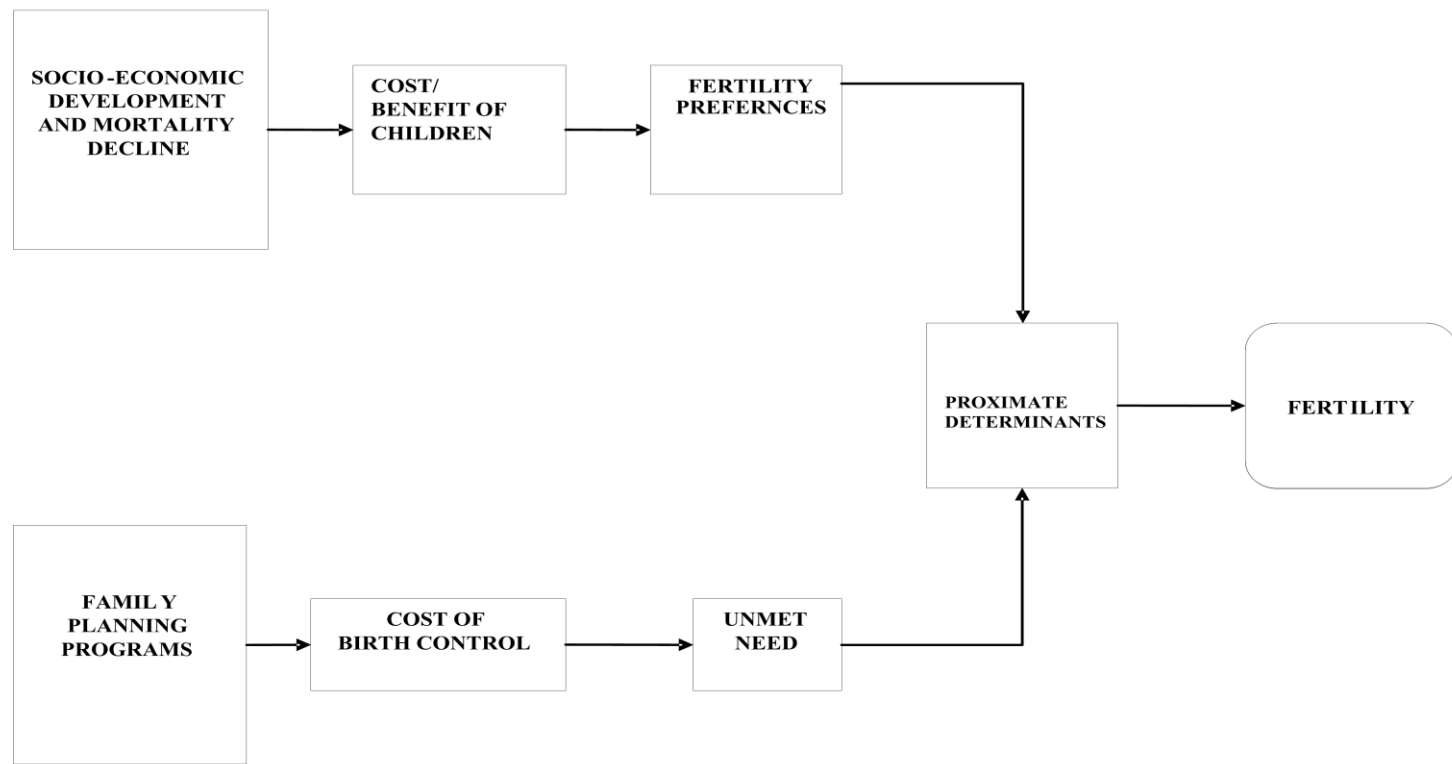
### **THE PROXIMATE DETERMINANTS AND CORRELATES OF FERTILITY CHANGE AMONG THE NORTH- EASTERN STATES OF INDIA, 1990 to 2005**

#### **4.1 Introduction**

In this chapter, we carry out a detailed investigation of the proximate determinants of fertility among the North-eastern states using Bongaarts Aggregate Fertility Model, and thereby examine the effects of nuptiality, induced abortion, contraception and postpartum infecundability on fertility. As pointed out in the previous chapter, many of the North-eastern states witnessed a stall in fertility decline during the 1990s. In this context, a parallel objective of this analysis is to find out whether and to what extent, the stall in fertility has been captured within the proximate determinants model. A priori, we expect to observe very little change in the total effect of the proximate determinants towards reducing fertility for any state that evinced fertility stall during the concerned period.

Following this, we make an attempt to explain the causes behind the particular changes observed in the proximate determinants for the states of NER, in terms of the background or the contextual factors. The analysis of the effect of the contextual factors as they affect the proximate determinants has been conducted at the state-level (district-level analysis of contextual factors affecting fertility, being the subject of the following and final analytical chapter). Specifically, we look into changes in fertility preferences and the improvement/deterioration in the family planning program of the

Fig. 6: Schematic Representation of Analytical Framework of Determinants of Fertility



Source: Modified from Bongaarts (2006)

State, using a modification of the analytical framework developed by Bongaarts (2006) (Fig. 6).

The framework presented in Fig 6, basically spells out the channels through which socio-economic factors and family planning measures affect fertility, working through the various proximate determinants. At the heart of this model is the idea that the ultimate determinants of fertility are the socio-economic factors facing individuals and households, echoing the proposition of the classical demand theories of fertility (the latter is discussed more fully in the next chapter). Therefore, improvements in the socio-economic condition, bringing about such changes in the family calculus that renders children relatively expensive than before, leads to lower demand for children, and the fertility rate will tend to decline.

Similarly, an improvement in the family planning programme (FPP) can also lead to a reduction in the fertility rate, through meeting the existing demand for family planning methods. Even though, FPP can also reduce fertility through affecting the desire for children, along with meeting the demand for family planning methods, the former effect has been found to be relatively small as compared to the latter. Hence, in a sense, socio-economic determinants remain central to fertility transition in this model.

It would be also be useful to mention here that within the general analytical framework to analyze the correlates of fertility stall, we have adopted a comparative approach, comparing the states that have witnessed fertility stall with those that have experienced a decline in fertility. This exercise, we believe, will shed useful

light on the primary correlates of fertility decline (and equally, those of fertility stall) among the states of NER.

#### **4.2. Changes in the Proximate Determinants of Fertility in the North-eastern states: 1990-92 to 2003-05**

The biological and behavioral determinants of fertility that are most closely associated with it are called its proximate determinants; any change in fertility could be immediately traced to changes in one or more of these proximate factors. The proximate determinant framework as expounded by Bongaarts (1983) provides an analytical tool to examine the relative impact of the immediate or proximate determinants on fertility. As such, any change in fertility over a period, is necessarily brought about by the interplay of these factors. Hence, as pointed out earlier, we hypothesize that a stalling of fertility decline would also be reflected in the proximate determinants in that the net effect of the proximate determinants on fertility would remain unchanged in those states that have witnessed no change in fertility and decrease in states have witnessed a rise in fertility. Hence, in the present section we look into the levels and trends of the proximate determinants of fertility in the North-eastern states during the 1990s and thereafter in an attempt to discover the proximate routes through which pattern of changes in the fertility level and trend have been shaped among the North-eastern states during the period 1990-92 to 2003-05.

#### ***4.2.1 Bongaarts Proximate Determinants Model: Theory and Facts from North-eastern States***

Davis and Blake (1956) suggested eleven proximate or intermediate variables through which economic, social, cultural and environmental and other factors influence fertility.<sup>29</sup> The commonly encountered proximate determinants in fertility models ever since have been the proportion married among females, use and effectiveness of contraception, induced abortion, duration of postpartum infecundability, frequency of intercourse, spontaneous intrauterine mortality and permanent sterility. Bongaarts (1983), on the basis of the analysis of fertility differentials and variation in the proximate determinants among 41 developed and developing countries, found that around ninety-six per cent of the variation in fertility among populations is explained by four proximate determinants- nuptiality, the prevalence of contraception, the duration of post-partum infecundability and induced abortion. This however, does not mean that the other proximate determinants are unimportant. For instance, a large part of fertility level can be explained by permanent sterility in a population with high prevalence of venereal diseases.

The twin criteria that Bongaarts applied to select the most important proximate determinants were the sensitivity of fertility to variations in the different intermediate variables and its variability among populations. Table 4.1 presents the

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<sup>29</sup> Davis and Blake (1956) proposed the following set of intermediate fertility variables: I. *Factors affecting exposure to intercourse* (age at entry into sexual union, permanent celibacy, amount of reproductive period spent after of between unions, voluntary abstinence, involuntary abstinence, coital frequency) II. *Factors affecting exposure to conception* (fecundity or infecundity; as affected by involuntary causes, use or nonuse of contraception, fecundity or infecundity as affected by voluntary causes) III. *Factors affecting gestation and successful parturition* (fetal mortality from involuntary causes, fetal mortality from voluntary causes).

seven proximate determinants and their rankings based on these criteria. Fertility is found to be least sensitive to levels of intrauterine mortality and most sensitive to changes in proportions married and prevalence of contraception. The proportion married, contraceptive use, prevalence of abortion and postpartum infecundability has the highest variability among populations. Spontaneous intrauterine abortion and permanent sterility have the

**TABLE 4.1: RATING OF INTERMEDIATE FERTILITY VARIABLES**

Intermediate Fertility Variables	Sensitivity of Fertility to intermediate variable	Variability among populations	Overall Rating
Proportions married	+++	+++	+++
Contraceptive use	+++	+++	+++
Prevalence of induced abortion	++	+++	+++
Postpartum infecundability	++	+++	+++
Fecundability	++	++	++
Spontaneous intrauterine mortality	+	+	+
Permanent sterility	++	+	+

++++= high +++= medium ++=low or absent  
 Source: Table taken from Bongaarts (1982)

least influence on fertility and can explain very little variation of fertility among populations. Fecundability (or the frequency of intercourse) was found to have moderate influence on fertility levels and moderate variability among populations. Overall, nuptiality, the prevalence of contraception, the duration of post-partum

infecundability and induced of abortion were found to be the most significant determinants in explaining fertility differentials.

The remaining proximate determinants viz., the waiting time to conception, the risk of intrauterine mortality and the onset of permanent sterility are generally found to be less important causes of variation in fertility. In Bongaarts Aggregate Fertility Model, the four proximate determinants together determine the extent to which fecundity is reduced from its biological maximum. Four different fertility levels are produced by the impact of the proximate determinants:

i) Total Marital Fertility (TM): If the effect of delayed marriage and marital disruption were removed without changes in the other proximate determinants, i.e. in other words, marriage was universal and marital dissolution absent so that women spent their entire reproductive period in conjugal union, fertility would rise from the observed level (measured as the total fertility rate) to TM.

ii) Total Natural Marital Fertility Rate (TN): In addition to the effect of delayed marriage and marital disruption, if the effect of contraception and induced abortion were to be removed, fertility would increase and would be as high as TN.

iii) Total Fecundity Rate (TF): Additionally, if women were not to breastfeed their infants and couples did not practice postpartum abstinence, fertility would rise to the level of total fecundity.<sup>30</sup> Thus total fecundity rate is the fertility that results in the absence the fertility inhibiting effect of the four proximate

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<sup>30</sup> The total fecundity rate is the *biologically* maximum fertility that could be achieved in a population given the fertility inhibiting influence of the waiting time to conception, the risk of intrauterine mortality and the onset of permanent sterility, which usually cause modest changes in fertility. TF has been found to vary from 13 to 17 among populations, with the average being around 15 children per woman.

determinants- non-marriage, contraception, induced abortion and lactational amenorrhea.

iv) Total Fertility Rate (TFR): The observed fertility in a population reduced from the level of TF upon the fertility inhibiting influence of the four proximate determinants mentioned above.

In the Bongaarts model, the effect of these four proximate determinants are measured by four indices; the index of marriage ( $C_m$ ), the index of noncontraception ( $C_c$ ), the index of induced abortion ( $C_a$ ) and the index of postpartum infecundability ( $C_i$ ). The indexes can assume values between 0 and 1. When there is no fertility inhibiting effect of a particular proximate determinant it assumes the value of 1 and when the fertility inhibiting effect is complete it assumes the value of 0. Each index by definition equals the ratio of the fertility levels in the presence and absence of the inhibition caused by the particular proximate determinant of fertility. The following equations summarize the basic structure of the model and show how the fertility measures are related to the proximate determinants:

$$C_m = TFR/TM$$

$$C_c \times C_a = TM/TN$$

$$C_i = TN/TF$$

Rearranging the above,

$$TFR = C_m \times TM$$

$$TM = C_c \times C_a \times TN$$

$$TN = C_i \times TF$$

Thus,

$$TFR = C_m \times C_c \times C_a \times C_i \times TF$$



Estimation of the indexes of the proximate determinants require data preferably from a single source as pooling data from different sources can lead to errors due to differences in sampling design, reference period and geographical coverage of the surveys<sup>31</sup>. The NFHS collects information on the proximate determinants and thus makes it possible to estimate the indexes from a single source. However, although we have estimated the index of noncontraception and postpartum amenorrhea from NFHS data pertaining to the periods 1990-92 and 1996-98, the calculation of the index of marriage for the same period is based on SRS data, as marital fertility rates are not available from NFHS. The index of abortion could not be calculated due to lack of data. For the purpose of our present analysis, following Bongaarts we have assumed that this index does not change over the period and hence has no effect on change in fertility during this period.

In addition, while data for the calculation of the various proximate determinants are available for the period 1990-92 to 1996-98 for most of the North-eastern states, information for the period 1996-98 to 2003-05 permits the calculation of the index of contraception alone. Hence, the application of Bongaarts proximate determinants model is limited to the period 1990-92 to 1996-98. Nevertheless, though not for a strictly comparable period, information on the mean age at marriage and induced abortion are available from the District Level Household Survey (DLHS) for 2000-2002 to 2005-07 and have been utilized for analyzing the

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<sup>31</sup> In the subsequent discussion on the proximate determinants in the Northeastern states, we have not included Mizoram and Sikkim due to the unavailability of data for these states.

trends in the proximate determinants of fertility during the period 1996-98 to 2003-05.

#### ***4.2.1.1 NUPTIALITY***

Nuptiality or the pattern of marriage (proportion married and timing of entry into marital union) has been recognized as a crucial proximate factor influencing fertility. “Age at marriage identifies the onset of exposure to the risk of socially sanctioned childbearing, and as such, it is a principal determinant of the number of births a woman will have.” (Bongaarts and Potter, 1983: 57). The time spent by women in marital unions determines the length of the period for which they are at the risk of pregnancy and childbirth. Thus, greater the proportion of women in marital unions in a population and lower the age at first marriage, higher would be the fertility of that population, other things remaining the same. Cultures that ensure nearly universal and early marriage of females, as in India, predispose its population towards higher fertility. That the practice of remarriage of widows is not socially allowed in many societies including India may partly mitigate the effect of early entry into marital union. However, historical evidence points out that the early entry into union and the universality of marriage (features that generally concur), are perhaps relatively more important factors as against the dissolution of unions. For instance, data on the fertility of European and Indian population in the past suggest that whereas the former had higher rate of permanent celibacy as well as remarriage than the latter, the natural fertility rate in the former was much lower compared to the latter (see for instance Weir, 1984; Watkins, 1987).

In theory, marriage refers to all stable sexual unions, including both formal marriages and consensual unions, but in practice, the latter are numerically insignificant in the context of India. Women who adopt permanent celibacy are atypical and rare in India and this is true of diverse regions as well, notwithstanding regional differences along other dimensions of socio-cultural features. However, there have been considerable differences in the age at first marriage among the various regions and social groups. It is notable that in the historical past, the age at marriage of the tribal population had been higher than that of the non-tribals (Maharatna 2005). For instance, the singulate mean age at marriage of females (SMAM) in Assam, for the entire period 1901-1931, had been higher than the national average, and this was particularly so for its tribal population.<sup>32</sup> The female SMAM of tribals for the year 1931 was 18 years in Assam as against 14.3 years for the Hindu population of the Province, much higher compared to the 15.8 and 13.6 years for the tribal and Hindu female population at the all-India level respectively (see Maharatna, 2005). Indeed, Gopinath (2005) observed that “[T]his proximate determinant of fertility is, (however), closely linked to long-term cultural practices embedded in demographic conditions, material life and ideology. Marriage postponement can be forced through legislative fiat but past practices will largely determine the pace and intensity of these changes” (Gopinath, 2005: 84).

There has been a secular-albeit gradual- rise in the female age at marriage at the all-India level as captured by the singulate mean age at marriage during the post-

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<sup>32</sup> Hajnal (1953) devised a method to estimate the age at marriage of males and females in the absence of direct record of marriages for the population concerned, called the singulate mean age at marriage (SMAM). It is defined as the average length of single life expressed in years among those who marry before age 50.

Independence period at least up to 1991 (Table 4.2). This has been generally true of the North-eastern states as well. Not surprisingly, the regional differentials, as noted earlier, in the age at marriage have persisted. The SMAM for the North-eastern states according to the Census data has been higher than that at the all-India level since 1961. The NFHS estimates of age at marriage confirm the upward trend in the age at marriage among the North-eastern states.

**TABLE 4.2: SINGULATE MEAN AGE AT MARRIAGE OF FEMALES: NORTH-EASTERN STATES, 1961-2001**

State	Census					NFHS			
						SMAM		Median age at first marriage	
	1961	1971	1981	1991	2001	1990-92	1996-98	1990-92	1996-98
Arunachal Pradesh	-	19.6	-	20.1	19.6	20.0	21.6	18.2	18.7
Assam	18.6	18.7	-	20.9	19.7	21.6	21.7	16.9	18.3
Manipur	19.9	22.2	23.4	24.7	21.5	25	25.4	20.8	21.7
Meghalaya	-	20.2	21.0	21.5	20.5	21.2	23.0	19.0	19.1
Mizoram	-	-	-	22.4	21.8	22.9	24.1	21.0	22.0
Nagaland	22.2	24.0	24.8	25.0	21.6	22.7	23.0	20.1	20.1
Tripura	16.3	18.4	20.3	20.8	19.3	21.2	22.0	17.2	18.3
India	15.9	17.2	18.4	19.3	18.3	21.5	19.7	16.1	16.7

Source: IIPS, 2002, National Family Health Survey Northeastern states, 1998-99, RGI, 2008

However, the decline in the female age at marriage after 1991 in the North-eastern states of India as well as at the national level, as revealed by census data is rather striking (Table 4.2). It is remarkable that after nearly nine decades of secular

rise since 1901, the female age at marriage at the all-India level showed a decline by nearly a year in 2001.<sup>33</sup> There has been commensurate decline in the SMAM among the North-eastern states as well. In fact, the decrease in the female age at marriage during the period 1991 to 2001 had been sharper in four states in NER, viz., Assam, Manipur, Nagaland and Tripura than that at the all-India level. There has been marginal decline in the female SMAM in Arunachal Pradesh and Mizoram during the same time. The decline in the female mean age at marriage would tend to increase fertility by increasing the duration of exposure to the risk of pregnancy, unless offset by commensurate increase in contraceptive prevalence.

However, the female age at first marriage in all the North-eastern states in 2001 remained higher than the all-India level. As can be seen from Table 4.2, this trend is not captured in the NFHS data, which show an increase in female SMAM both in the North-eastern states and India. However, data on the median age at marriage from the NFHS for the period 1990-92 to 1996-98 suggest that the increase had been marginal and perhaps insignificant in Arunachal Pradesh, Meghalaya and Nagaland; in fact, there was practically no change in the median age at marriage in the latter states during the period 1990-92 to 1996-98.

Early marriage of females is still not a prominent feature of the tribal majority region of the North-east. The percentage of married female adolescents was higher at the all-India level compared to any State in the region. The percentage of married female adolescents is, on the average, found to be lower in the tribal majority states

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<sup>33</sup> A fuller discussion on the trends in the mean age at marriage at the all-India level and in the major states in the pre-Independence period is contained in Agarwala, 1957.

**TABLE 4.3: PERCENTAGE OF WOMEN 15-19 YEARS MARRIED IN NORTH-EASTERN STATES AND INDIA: 1991-2001**

State	Percentage married (15-19) 1991	Percentage married (15-19) 2001
Arunachal Pradesh	25.8	17.6
Assam	23.8	20.6
Manipur	9.3	8.8
Meghalaya	18.0	15.6
Mizoram	10.5	10.9
Nagaland	7.9	8.4
Sikkim	18.2	16.6
Tripura	25.0	20.7
India	31.3	24.9

Source: RGI 1991, 2001

of NER than the states of the region with comparatively lower proportion of tribals. Consequently, we find that Nagaland and Mizoram had distinctly lower adolescent marriages compared to other states within NER during 1991 to 2001. Manipur too evinced lower adolescent marriages during the same period. Notably, the percentage of adolescent girls (15-19) married declined between 1991 to 2001 among all the North-eastern states except Mizoram and Nagaland, which experienced a marginal increase during this period (Table 4.3).

#### The Index of Proportion Married

The index of proportion married is calculated as:

$$C(m) = \frac{\sum m(a)g(a)}{\sum g(a)}, \text{ where}$$

$m(a)$  = Age specific proportions of married females and

$g(a)$  = Age specific marital fertility rates

This formulation takes into account the fact that the fertility impact of marriage in addition to the proportion married also depends on the age-distribution

of women. Married women in the prime childbearing years contribute more to fertility than those at extremes. Hence,  $C_m$  is calculated as a weighted average of the proportion of age-specific females married, with the weights being the age-specific marital fertility rate.

We have calculated  $C_m$  as the ratio of the TFR and the total marital fertility rate (as the numerator of the equation equals TFR and the denominator equals TMFR). As pointed out earlier, the data on TFR and TFMR have been taken from the SRS. The value of the index of marriage for the early 1990s (1990-92) ranged from 0.88 (in Tripura) to 0.27 (in Nagaland) (Table 4.4). This suggests that a significant reduction in fertility in Nagaland from the biologically feasible maximum can be attributed to the fact that a substantial proportion of women in the reproductive ages had not entered conjugal union. On the contrary, since a large proportion of women in the reproductive age bracket had been married in Tripura, fertility would depart to a lesser extent from biological maximum due to this factor. For the subsequent period (1996-98),  $C_m$  ranged from 0.36 in Nagaland to 0.65 in Arunachal Pradesh, indicating that non-marriage had the highest fertility inhibiting effect again in Nagaland, while it had the least fertility inhibiting effect in Arunachal Pradesh.

During the period 1990-92 to 1996-98, the index of marriage increased in two states within NER- Arunachal Pradesh and Nagaland, and decreased in the remaining states. Thus, in Arunachal and Nagaland, the proportion of women remaining unmarried declined during this period, encouraging higher fertility. However, in the remaining states, the fertility inhibiting effect of nuptiality was

strengthened. Nevertheless, the change in the index was marginal in most states of NER.

**TABLE 4.4: VALUES OF SELECT FERTILITY INDICES FOR NORTH-EASTERN STATES: 1990-92, 1996-98, 2003-05**

State	1990-92	1996-98	2003-05	1997/1991
Arunachal Pradesh				
C(m)	0.62	0.65	-	1.05
C(c)	0.77	0.64	0.57	0.83
C(i)	0.78	0.69	-	0.88
Assam				
C(m)	0.59	0.56	-	0.95
C(c)	0.62	0.60	0.50	0.97
C(i)	0.68	0.66	-	0.97
Manipur				
C(m)	0.43	0.41	-	0.95
C(c)	0.67	0.63	0.58	0.94
C(i)	0.72	0.71	-	0.99
Meghalaya				
C(m)	0.55	0.52	-	0.95
C(c)	0.80	0.81	0.77	1.01
C(i)	0.76	0.72	-	0.95
Nagaland				
C(m)	0.27	0.36	-	1.33
C(c)	0.87	0.70	0.72	0.81
C(i)	0.74	0.79	-	1.07
Tripura				
C(m)	0.88	0.51	-	0.58
C(c)	0.49	0.46	0.40	0.93
C(i)	0.75	0.64	-	0.85

Source: Author's calculations

During the period 1996-98 to 2003-05, fertility stall occurred in six out of the eight states of NER, viz. Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland and Tripura. Among these states, we find that the female mean age at marriage increased in Arunachal Pradesh and very marginally in Assam and



Mizoram. Hence, nuptiality had a tendency to reduce fertility in these states (due to reasons as discussed earlier), and possibly cannot be responsible for the observed stall. However, the female mean age at marriage declined in Manipur and Tripura and had a fertility enhancing effect in these states during the concerned period.<sup>34</sup> In Meghalaya, where fertility declined during this period, there was a commensurate increase in the female mean age at marriage.

#### ***4.2.1.2 CONTRACEPTION***

We know that historically, populations with lower fertility have been using traditional methods such as rhythm method, withdrawal, abstinence, and various traditional methods of abortions for limiting family size (see for instance Frejka 2008). That said, the introduction of modern contraception and its diffusion among populations has been the biggest innovation in reproductive technology. Since its introduction and spread, couples have found it increasingly easy to translate their desire for fewer children into reality. Unsurprisingly, this proximate determinant has been found to have the highest correlation with fertility levels (see for instance Bongaarts and Potter 1983), and this is true of the North-eastern states as well.<sup>35</sup>

India officially adopted the family planning programme in 1952, and though the use of contraceptives did not spread widely in the following two decades, the couple protection rate increased from a meager 13 percent in 1970 to nearly 45 percent in the mid 1990s according to official statistics (Visaria, 1999). The trend

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<sup>34</sup> Data on nuptiality for the period 2000-02 to 2005-07 are not available for Nagaland.

<sup>35</sup> In fact, our calculations of the simple correlation coefficient between the fertility rate and the use of modern contraceptives reveal that the magnitude of the correlation lies between 0.7 and 0.9 for the period 1990-92 to 2003-05. Interestingly, the correlation between these two variables increased from 0.7 to 0.8 from 1990-92 to 1996-98 and further to 0.9 from 1996-98 to 2003-05.

shown by NFHS is again one of increasing use of contraceptives at the all-India level (and in nearly all the states of India) since the early 1990s (IIPS and ORC Macro, 2007:125). However, the percentage of women using contraceptives has remained unchanged during the 1990s in Assam and Tripura. There was a slight decline in the percentage of women using contraceptives in Meghalaya but it was accompanied by significant reduction in female sterilizations (Appendix 2). The remaining states experienced increase in contraceptive prevalence during this period.

Contraceptive prevalence is found to vary with socio-economic differentials among the North-eastern states (Table 4.5). Interestingly, data on rural-urban differentials show that in the states where there was marginal or no change in the contraceptive prevalence, it was true of both urban and rural areas. In NER, contraceptive use is significantly and invariably higher in the urban areas vis-à-vis the rural areas in all the states. Education remains a deciding factor in the use of contraceptives. The proportion of illiterate women using contraception was lower than that of literate women in all the states of NER. Although in the majority of the states, contraceptive use increased with increasing level of education, there are a few states where women with secondary and higher education were found to be using lesser contraception compared to women with lower educational levels (Mizoram during 1992-93, Manipur during 1998-99). However, in spite of the official family planning programmes providing access to contraceptives, it is found that the extent of contraceptive use has also varied with the difference in the standard of living. Women with higher standard of living adopt contraception in larger numbers as compared to women with a lower standard of living among all the

**TABLE 4.5: SOCIO-ECONOMIC DIFFERENTIALS IN CURRENT USE OF CONTRACEPTION\*, NER, 1992-2005**

NFHS (1992-93)											
State	Residence		Education				Standard of living index				
	Urban	Rural	Illiterate	<middle school	Middle school complete	High school and above	Low	Medium	High		
Arunachal Pradesh	39.5	20.8	19.9	26.4	27.5	46.9	-	-	-		
Assam	62.3	40.1	32.1	51.7	63.7	69.3	-	-	-		
Manipur	44.3	30.3	30.4	35.3	40.8	41.0	-	-	-		
Meghalaya	31.9	18.0	17.0	20.1	30.8	32.0	-	-	-		
Mizoram	57.1	50.5	35.4	58.5?	49.4	51.5	-	-	-		
Nagaland	20.6	10.9	6.6	16.0	17.8	20.8	-	-	-		
Tripura	71.1	52.4	45.0	61.0	66.9	67.8	-	-	-		
India	51.0	36.9	33.9	50.4	50.8	54.7	-	-	-		
NFHS (1998-99)											
State	Residence		Education				Standard of living index				
	Urban	Rural	Illiterate	<middle school	Middle school complete	High school and above	Low	Medium	High		
Arunachal Pradesh	47.3	33.3	31.5	33.9	43.9	47.9	22.6	33.8	55.9		
Assam	53.4	42.3	39.5	42.0	50.2	55.6	34.8	48.1	56.2		
Manipur	44.9	35.6	38.8	38.3	40.6	37.4	36.9	37.5	48.7		
Meghalaya	45.3	13.8	12.1	20.0	31.6	39.8	8.6	26.1	55.4		
Mizoram	65.1	49.7	33.3	57.9	64.4	63.7	26.3	60.8	69.7		
Nagaland	46.7	26.1	20.0	32.1	40.0	46.0	15.5	32.0	49.5		
Sikkim	-	-	-	-	-	-	-	-	-		
Tripura	70.0	51.8	48.8	54.5	65.0	62.1	48.8	58.3	63.5		
India	58.2	44.7	42.9	55.5	52.2	57.0	39.5	48.4	61.2		
NFHS( 2003-05)											
State	Residence		Education				Standard of living index				
	Urban	Rural	Illiterate	<middle school	Middle school complete	High school and above	Lowest	Second	Middle	Fourth	Highest
Arunachal Pradesh	47.3	41.6	37.5	43.9	46.3	58.8	26.8	31.6	48.0	53.5	60.8
Assam	66.0	54.5	51.2	53.2	59.9	65.2	43.6	49.5	64.8	66.0	67.3
Manipur	54.5	46.0	43.2	48.6	50.8	51.9	16.2	40.2	51.4	51.4	50.7
Meghalaya	43.7	18.4	17.1	18.0	25.6	43.7	9.6	13.3	18.4	35.9	45.9
Mizoram	64.3	54.8	37.0	56.7	62.4	64.6	22.6	38.8	48.6	61.0	70.6
Nagaland	41.9	24.8	17.0	25.5	34.1	43.0	14.7	12.4	26.3	39.7	50.8
Sikkim	63.1	56.4	54.2	53.2	58.0	66.6	-	46.6	50.9	59.4	63.9
Tripura	66.8	65.5	58.1	72.0	66.0	70.8	54.9	62.1	67.4	69.4	72.7
India	-	-	52.1	63.0	58.5	62.3	42.2	51.1	56.8	62.5	67.5

Note: \*Percent distribution among currently married women with reference to use of both traditional as well as modern methods

Source: Compiled from IIPS 1995, 2002

states of the region. One possible reason for it could be the declining share of the public sector in the provision of contraceptives (more on this presently) The demand for contraceptives would thus remain unsatisfied among the poor, who cannot afford the higher costs of procuring it from the private sector.<sup>36</sup>

### The Index of Non-contraception

The index of noncontraception is calculated using information on method-specific contraceptive prevalence rates among currently married women in the reproductive age group, and on the use effectiveness of the various methods. If contraceptive prevalence is absent or completely inefficient, the value of the index equals one and with increasing prevalence and effectiveness, it approaches zero. The equation used to calculate this index is as follows:

$$C_c = 1 - (1.08 \times u \times e)$$

Where, u = proportion currently using contraception among currently married women of reproductive age and

e = average use effectiveness of contraception

The methods considered for the calculation of the index were sterilization, IUD, pill and others including condom and following Bongaarts the use effectiveness of these methods was taken as 1.00 for sterilization, 0.95 for IUD, 0.90 for pills and 0.70 for others including condoms. Data on proportion using the various methods of contraception in the reproductive age group was taken from NFHS 1 and NFHS 2.

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<sup>36</sup> Another reason why contraceptive prevalence would tend to be higher among the wealthier segment of the population even if all contraceptives were provided by the public sector is that, there are additional costs such as transportation costs and information cost that are likely to deter the use of contraception among the poor.

In all the states of the North-eastern region, the method most prevalent during the 1990s was female sterilization (Appendix 2). In addition, with the exception of Meghalaya, there has been increase in the proportion of females sterilized in the North-eastern states during this period. The proportion of males sterilized declined during the same time though the proportion itself was insignificant during the entire 1990s. However, total number of sterilizations increased during this period because of increase in female sterilizations. During the late 1990s, between IUD and the pill, the latter was found to be more popular. Overall, this reflects that the responsibility of contraception largely lies with the females in NER. This is perhaps not surprising in light of the fact that the thrust of Government policies in the area of family planning over the years has been on female sterilization (see for instance Santhya, 2003).

During 1990-92, the fertility inhibiting effect of contraception was highest in the state of Tripura and lowest in Nagaland (please refer back to Table 4.4). However, it is interesting that the fertility inhibiting effect of contraception was comparatively low in nearly all the states of NER during the early 1990s. The relative situation of the states with respect to contraception did not change significantly until the end of the nineties, although there was increase in contraceptive prevalence and its effectiveness and nearly all the states except Meghalaya, where the value of the index increased marginally during this period. The greatest increase in contraceptive prevalence was experienced in Nagaland followed by Arunachal Pradesh. Again, as in the case of nuptiality, the change in the index was *not* substantial in the remaining North-eastern states.

For the period 1996-98 to 2003-05, the changes in  $C_c$  suggest that the effect of contraception has been such as to lower fertility in all the states during the period

except for Nagaland. However, the change in the index in Nagaland has been very marginal, affecting fertility change only slightly. Thus, fertility stalls in the states of Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland and Tripura cannot be attributed to a commensurate leveling off or reduction in the use of contraception. Nevertheless, the decline in fertility in Meghalaya over this period has been, to a certain extent, brought about by increase in contraceptive prevalence.

Interestingly, with respect to the distribution of contraceptive use by various methods data suggests that there has been a shift from terminal to non-terminal methods during this period (Appendix 2). In fact, among all the states that experienced fertility stall during 1996-98 to 2003-05, there was a decline in the percentage of female sterilizations, except Arunachal Pradesh, where there was a small increase. In the case of male sterilizations, again we find a reduction in it among all the North-eastern states except Arunachal Pradesh, where there was no change. The percentage of women using pill and men using condom increased significantly during this time in all the states. Remarkably, the use of the IUD declined in all the states. It is possible that since this non-terminal method is more cumbersome compared to the pill or condom, couples have shifted their preferences increasingly away from the former and towards the latter methods of contraception. Overall, even though the index of non-contraception suggests otherwise (Table 4.4), there is a strong possibility that the fertility stall witnessed in the majority of the states of NER can be attributed to the increasing use of non-terminal methods whose effectiveness is less compared to male and female sterilizations.<sup>37</sup> Thus, for the period 1996-98 to 2003-05, the fertility stalls

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<sup>37</sup> Here, it should also be mentioned that the effective rates of the various non-terminal methods of contraception have been derived from those experienced in developed countries and there may be

observed in the various states of the region have been probably brought about by changes in the method mix of contraception from terminal to non-terminal methods. The decline in the female age at marriage in Manipur and Tripura has also probably contributed to the fertility stall during this period.

#### ***4.2.1.3 BREAST FEEDING AND POSTPARTUM AMENORRHEA***

Postpartum amenorrhea is another important proximate determinant of fertility. It is generally observed that the timing of the resumption of ovulation after childbirth nearly coincides with the onset of menstruation. In the large majority of women, the first ovulation takes place a few weeks before or after the first postpartum menses. Thus, the mean duration of amenorrhea is a good indicator of the mean duration of anovulation (Bongaarts and Potter, 1983). It is well established now that there is a direct relationship between breastfeeding and the duration of amenorrhea in women. The longer the duration of lactation and the greater its frequency, the longer is the delay from parturition until the resumption of ovulation. Without lactation, the duration of amenorrhea is around 1.5 to 2 months (Leridon, 1977 cited in Bongaarts and Potter, 1983). Studies on several populations and among subgroups among populations have shown that long durations of breast-feeding increases the length anovulation, but by less than the duration of lactation. The length of postpartum amenorrhic period could range from nearly two months to two years, depending on the duration and intensity of lactation (Bongaarts and Potter, 1983: 26).

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such differences that affect the index of noncontraception to hide the real effect of the change in the method mix in favour of the non-terminal methods.

**TABLE 4.6: DURATION OF POSTPARTUM AMENORRHEA, ABSTINENCE AND NONSUSCEPTIBILITY IN NORTH-EASTERN STATES: 1992-93, 1998-99**

(duration in months)

State	Year	Mean postpartum amenorrhea	Mean postpartum abstinence	Mean postpartum nonsusceptibility
Arunachal	1992-93	11.0	4.9	12.1
	1998-99	7.5	5.7	10.1
Assam*	1992-93	12.5	5.9	13.7
	1998-99	11.4	6.6	13.7
Manipur	1992-93	10.0	5.2	11.2
	1998-99	9.6	5.2	10.4
Meghalaya	1992-93	9.9	11.7	15.8
	1998-99	8.4	6.3	12.5
Mizoram	1992-93	7.5	4.3	9.6
	1998-99	8.0	3.8	9.8
Nagaland	1992-93	7.2	12.0	14.5
	1998-99	8.9	6.7	12.1
Tripura	1992-93	10.8	5.7	11.9
	1998-99	8.7	7.5	10.7
India	1992-93	9.5	5.4	11.1
	1998-99	10.7	6.2	12.2

Note: \* the figures for Assam are the percentage of births during the three years preceding the survey whose mothers are amenorrhic, abstaining and nonsusceptible to contraception.

Source: IIPS, Northeastern states 1995, 2002; IIPS Assam, 1995, 2000

Among the North-eastern states, the mean duration of amenorrhea has declined in the majority of the states during the 1990s, except Mizoram and Nagaland that experienced an increase (Table 4.6). This has the effect of increasing fertility in the concerned population, the influence of other proximate determinants remaining unchanged. The mean duration of postpartum amenorrhea ranged from nearly a year to nearly 7 months during both 1990-92 and 1996-98 within the North-eastern states. Thus, there seems to be variation, though not large, among the states in this proximate determinant of fertility. The length of the nonsusceptible period is further prolonged by sexual abstinence after childbirth imposed by various social norms and cultural taboos on coitus during a certain period after parturition. However, among the majority of the states in NER it was found that the period of sexual abstinence was far shorter than that of postpartum amenorrhea, except in Meghalaya and Nagaland during the early 1990s.



Nevertheless, even in these states, the situation changed during the late 1990s, and the period of sexual abstinence was shortened than that of postpartum amenorrhea by a few months. Overall, the duration of postpartum abstinence seems to have declined during the 1990s in NER and, postpartum nonsusceptibility is governed primarily by lactation and postpartum amenorrhea in these states.

Interestingly, the duration of postpartum amenorrhea in the beginning of the 1990s was longer among the states of the North-eastern region (except for Mizoram and Nagaland) vis-à-vis the national average. By the late 1990s, the situation changed and (except for Assam), the duration was shorter in all the states of the region vis-à-vis the all-India level. It is notable that whereas at the all-India level there was an increase in the duration of postpartum amenorrhea, most of the North-eastern states registered a decline suggesting a decrease in duration and/or intensity of lactation in all these states during the 1990s. Coming to the average period of postpartum abstinence, we find that it was higher among all the states in NER vis-à-vis all-India level during early 1990s with the sole exception of Mizoram. However, during the late 1990s, there was no significant difference between the North-eastern states and the all-India average levels (except for the much shorter duration in Mizoram) suggesting that there has been gradual transformation of the social norms in favour of early resumption of sexual relations between spouses in NER. The implication of this for fertility is that it would tend to rise (unless otherwise compensated by higher use of contraception).

#### The Index of Postpartum Infecundability (Amenorrhea)

The index of postpartum infecundability equals the ratio of total natural fertility (TN) in the presence and absence of postpartum infecundability caused by lactation

and abstinence. Postpartum infecundability influences fertility through its impact of the length of the birth interval. Hence, the ratio of natural fertility in the presence and absence of postpartum infecundability becomes the ratio of the birth interval in the presence and absence of postpartum infecundability. In the absence of lactation and postpartum abstinence, the average duration of the birth interval has been approximated to be about 20 months. This is the outcome of 1.5 months of minimum postpartum anovulation, 7.5 months of waiting time to conception, 2 months of time added by spontaneous intrauterine mortality and 9 months of full gestation period. In the presence of breastfeeding and postpartum abstinence, the average birth interval equals approximately 18.5 months (7.5+ 2+ 9) plus the duration of postpartum infecundability. Thus, the index  $C_i$  is calculated as:

$$C_i = 20 / (18.5 + i)$$

where,

$i$  is the average duration of postpartum infecundability.

NFHS data on duration of postpartum amenorrhea (PPA) have been used for the calculation of  $C_i$  for the period 1990-92 and 1996-98 (Table 4.4). There is little variability among the North-eastern states in the duration of postpartum amenorrhea and hence the value of the index  $C_i$  does not differ significantly among the states. Postpartum amenorrhea had the greatest fertility inhibiting effect during 1990-92 in Assam and the least in Arunachal Pradesh. In 1996-98, there was only slight difference among the states with respect to  $C_i$ . It had the greatest fertility inhibiting effect in Tripura and the least in Nagaland. The fertility inhibiting effect of this proximate determinant changed marginally in most of the states of NER during the 1990s, except

Arunachal Pradesh and Tripura, where the fertility inhibiting effect increased significantly.

Thus, as seen from Table 4.4, the decline in the indexes of proximate determinants was marginal during the period 1990-92 to 1996-98 in almost all the states. However, there was increase in the index of marriage in Arunachal Pradesh and Nagaland as well as increase in the index of contraception in Meghalaya. The index of postpartum infecundability increased in the state of Nagaland.

#### ***4.1.2.4 INDUCED ABORTION***

Induced abortion or the deliberate termination of pregnancy before the fetus is capable of independent survival outside the womb, is another proximate determinant of fertility whose influence is the most difficult to quantify. Induced abortions are permissible in certain cases viz., the pregnancy is life threatening to the mother, is the result of forced sex, is unwanted or malformed etc. As Visaria notes, “In India, induced abortion has been legal since 1972 and yet there are no firm estimates of the number of such abortions performed in the country. The lack of information stems from the fact that, besides the governmental facilities, many women use private facilities for abortions. Abortions in these facilities are often performed by unqualified health practitioners and are rarely recorded” (Visaria, 1999: 3036). However, the recent trend in India and among the majority of the states is the termination of pregnancy with the ‘wrong’ (female) sex and is arguably the major reason for abortion in India. This being declared illegal in India as well as in most other countries, data on induced abortions are difficult to get and where they present themselves, are of dubious reliability. As Visaria (ibid) notes, Chabra and Nuna (1993) estimated that 11 million abortions

occurred in India annually in the early 1990s, of which 60 per cent were probably induced and the remaining were spontaneous. The NFHS 1 reported the outcome of all lifetime pregnancies from ever-married women and found that as against 4.5 per cent of pregnancies ending due to spontaneous abortion, the percentage reported of induced abortion was as low as 1.3 per cent. This suggests that on the one hand, as noted above, such data are difficult to get and even where available, are unlikely to have much significance for examining fertility differentials.

As Bongaarts (1978) observes, even in cases where good estimates of induced abortions are available it is difficult to determine the extent of fertility reduction attributable to it. However, an induced abortion always averts less than one birth and its effect on fertility strongly depends on the use of contraception after abortion. The reason for this is twofold. First, an induced abortion may have been unnecessary, as the pregnancy might have ended in spontaneous abortion or a stillbirth. Secondly, women would resume ovulation much sooner after the abortion than if the pregnancy would have carried to its full term followed by the postpartum nonsusceptible period (Bongaarts and Potter, 1983).

Data on the percentage of pregnancies that end in an induced abortion are available for the period 2000-02 to 2005-07 from the District Level Household Surveys for the corresponding period. Though we do not have enough information to construct the index of induced abortion, we can make an educated guess about the effect of this proximate fertility on fertility for the closest corresponding period (i.e. 1996-98 to 2003-05). In fact, we find that there was an increase in the percentage of induced abortions increased among all the states (except Sikkim) of NER (IIPS, 2006, 2010). This suggests that induced abortion is not likely to have contributed to the fertility stall

observed among the North-eastern states during the period 1996-98 to 2003-05. However, the fertility decline in Meghalaya and Sikkim is commensurate with the rise in the percentage of induced abortions in these states.

#### ***4.2.1.5 The Combined Index of Proximate Determinants and its Change over the 1990s***

The value of the combined indexes ( $C_m \times C_c \times C_a \times C_i$ ) captures the total fertility inhibiting effect of all the proximate determinants taken together. As noted above, the index of induced abortion is not available and hence we assume that there has been no change in this intermediate variable during the period 1990-92 to 1996-98 and set its value equal to one. Table 4.8 presents the values of the combined indexes for 1990-92 and 1996-98. In the early 1990s, the fertility inhibiting effect of the three proximate determinants  $C_m$ ,  $C_c$ , and  $C_i$  was greatest in Nagaland and the least in Arunachal Pradesh followed by Meghalaya. In 1996-98, the fertility inhibiting of the proximate determinants was highest in Tripura, followed by Manipur and Nagaland. Interestingly, the values of the combined indexes for the different states did not change significantly in most of the states between 1990-92 and 1996-98.

**TABLE 4.7: COMBINED INDEX FOR THE NORTH-EASTERN STATES:  
1990-92 TO 1996-98**

State	COMBINED INDEX 1990-92	COMBINED INDEX 1996-98
Arunachal Pradesh	0.36	0.27
Assam	0.23	0.21
Manipur	0.20	0.17
Meghalaya	0.33	0.30
Nagaland	0.17	0.19
Tripura	0.30	0.13

Source: Author's calculations

The trend in the combined index, points towards a decline in fertility in Arunachal Pradesh and Tripura during the period 1990-92 to 1996-98. In Arunachal Pradesh, the index of noncontraception and postpartum amenorrhea worked towards reducing fertility during 1990-92 to 1996-98, while the index of marriage had the opposite effect. However, the former two indexes together exerted a stronger effect than the latter on fertility change leading to significant decline in fertility in the state. Between the two, the index of noncontraception had a greater effect on reducing fertility compared to postpartum amenorrhea in Arunachal Pradesh. In the case of Tripura, changes in all the three indexes tend to reduce fertility. Among the three, the index of marriage had the greatest fertility inhibiting effect, followed by the index of postpartum amenorrhea and index of noncontraception.

Overall, the movement of the proximate determinants points out that a stall in fertility decline is indeed a possibility in Manipur and Nagaland during the 1990s. However, as we have seen, there has been significant decline in fertility in Assam but the proximate determinants suggest a fertility stall in this state. Significant increases in induced abortion in Assam during this period could be a plausible explanation for it, though data are far from conclusive.

Table 4.9 presents data on percentage of induced abortion among youth (ages 15-19 and 20-24) in the North-eastern states and India for the period 1990-92 to 1996-98. Among all the states of NER, we find that the percentage of induced abortions (taking into account both age groups) was highest in Assam both in 1990-92 and in 1996-98. The percentage increase in induced abortion for adolescents (15-19 years) was largest in the latter as well. Thus, even though it cannot precisely explain the

decline in fertility in Assam, there are indications that substantial increase in induced abortion may have been responsible for the decline.<sup>38</sup>

**TABLE 4.8: PERCENT OF PREGNANCIES ENDING IN INDUCED ABORTION AMONG ADOLESENTS (15-24) IN NORTH-EASTERN STATES: 1990-92 TO 1996-98**

State	15-19 Years		20-24 Years	
	1990-92	1996-98	1990-92	1996-98
Arunachal Pradesh	0.0	0.0	0.6	0.3
Assam	2.4	5.1	2.1	4.1
Manipur	-	2.4	0.9	4.1
Meghalaya	0.0	0.0	0.0	0.8
Mizoram	-	0.0	0.0	1.5
Nagaland	0.0	0.0	0.4	0.4
Sikkim	-	0.0	-	0.8
Tripura	2.5	0.0	3.4	6.5

Source: IIPS 1995, 2000

In Manipur, the change in the various indexes during this period has been very marginal. In Meghalaya, the small changes in the index of marriage and that of postpartum amenorrhea tended to reduce fertility, while there was a slight increase in the index of noncontraception, signifying the possible fertility-raising impact of contraception during this period. Thus, the reduction in contraception is perhaps the most important proximate reason for the rise in fertility in Meghalaya. In Nagaland, the change in the index of marriage and postpartum amenorrhea has a quite strong effect towards reducing fertility, which was offset by the almost matching, but opposite influence of the index of noncontraception towards reducing it.

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<sup>38</sup> As noted elsewhere, there is significant under-reporting of abortions, especially that of induced abortions in NFHS data. Hence, theoretically it is possible that the extent of under-reporting has been the highest in Assam, resulting in underestimation of the extent of fertility decline due to this factor. In addition, the data on the other proximate determinants are not sacrosanct as well. Thus, some bias would be introduced by the latter factor as well.

In the next section, we explore the contextual or background factors behind the fertility stall among the states of NER.

#### **4.3 CHANGES IN FERTILITY PREFERENCE AMONG THE NORTH-EASTERN STATES, 1990-92 TO 2003-05**

The NFHS provides information on several indicators of fertility preference, such as wanted fertility, mean ideal number of children, and the desire to limit childbearing (i.e. the percentage of currently married women who want no more children). Whereas, the meaning of the latter two measures can be gauged from their nomenclature, that of the former requires some explanation. “A birth is considered wanted (in the DHS) if the number of living children at the time of conception of the birth is less than the ideal number of children as reported by the respondent.” (Rutstein and Rojas, 2006: 90). In this connection, researchers, for instance Bongaarts (1990) point out that both the wanted fertility rate, as well as the mean ideal number of children are likely to be biased leading to over-estimation of wanted fertility. Bongaarts mentions the following reasons that might lead to this outcome in the case of the former measure: respondents’ tendency to rationalize previously unwanted births as wanted, couples’ limiting fertility voluntarily before reaching their desired family size, their preference for a particular combination of male and female offspring, and the tendency of some respondents to give non-numeric responses to structured survey questions. Similarly, the response to the question on the ideal number of children may be biased due to the fact that couples may not reveal *their* ideal number of children, but rather respond with what is considered ideal for the society at large (Bongaarts, 1990). Nevertheless, it has been shown by researchers (for instance Kodzi et al., 2010; Roy



2008) that fertility preferences as measured by the various indicators of the DHS are meaningful indicators of future fertility trends.<sup>39</sup>

In line with the foregoing discussion, we now examine the change in fertility preferences among the North-eastern states over the period 1990-92 to 1996-98, followed by that during 1996-98 to 2003-05. For gaining a comprehensive understanding of the possible changes in fertility preference among the North-eastern states during this period, we analyze trends of three indicators of fertility preference of the North-eastern states- the wanted fertility rate, the percentage of women who want no more children and the mean ideal number of children.

**TABLE 4.9: WANTED FERTILITY, PERCENT OF WOMEN WHO WANT NO MORE CHILDREN, AND MEAN IDEAL NUMBER OF CHILDREN: NORTH-EASTERN STATES, 1990-92 TO 2003-05**

State	Wanted Fertility Rate			Percent of women who want no more children			Mean ideal number of children (women)		
	1990-92	1996-98	2003-05	1990-92	1996-98	2003-05	1990-92	1996-98	2003-05
Arunachal Pradesh	3.84	1.74	2.26	34.7	47.0	63.8	4.7	3.2	3.1
Assam	2.52	1.75	1.80	62.6	59.7	69.0	3.2	2.9	2.3
Manipur	2.29	2.50	2.32	55.2	52.0	62.5	3.7	3.6	3.1
Meghalaya	3.39	3.83	3.08	27.0	38.5	40.3	4.7	4.7	3.6
Mizoram	2.09	2.66	2.69	54.7	57.7	57.6	4.3	4.1	4.0
Nagaland	2.95	2.98	2.67	41.5	47.3	63.7	4.1	4.0	3.5
Sikkim	-	1.65	1.22	-	76.0	81.3	2.2	1.9	1.9
Tripura	1.98	-	1.64	69.9	70.9	74.2	2.6	2.3	2.1

Source: Compiled from IIPS and ORC Macro, 1993; 1999; 2007

<sup>39</sup> For a brief discussion of the various indicators of fertility preferences and their relative strengths and weaknesses, one may also refer to Bongaarts (2006) and the literature cited therein.

During the period 1990-92 to 1996-98, as noted earlier, fertility failed to decline in four out of the seven states of NER, viz., Manipur, Meghalaya, Mizoram and Nagaland and declined among the remaining three - Arunachal Pradesh, Assam, and Tripura. Interestingly, whereas there was indeed a decline in the wanted fertility rate among the states that witnessed fertility decline during this period, there was in fact, a rise in wanted fertility among those states where fertility stalled (Table 4.9). However, the rise was marginal in the case of Manipur and Nagaland and hence, these states can be considered to have experienced no change in wanted fertility during this period. In Meghalaya and Mizoram, on the other hand, there was considerable increase in wanted fertility. However, this increase was less than the actual increase in fertility in these states. Thus, the trend in the wanted fertility rate during 1990-92 to 1996-98, points towards the distinct possibility of a shift in fertility preference towards increasing the number of children among those states in NER that experienced rise in fertility. Overall, the trend in the wanted fertility rate over this period has been matched by the trend in actual fertility.

Now, the percent of women who want no more children, shows increase for the period 1990-92 to 1996-98 in Arunachal Pradesh and Tripura, commensurate with the decline in fertility in these states (Table 4.9). In Assam however, (the other state that witnessed fertility decline during this period) there was practically no change in the percentage of women who want no more children during this period. In Manipur and Nagaland, corresponding to the fertility stall there was little change in the percentage of women wanting no more children. However, the change in this indicator of fertility preference does not agree with the rise in fertility experienced by Meghalaya and

Mizoram during this period. In fact, there was significant increase in the percentage of women wanting no more children in the former state. In the case of the mean ideal number of children for women for the North-eastern states during the period 1990-92 to 1996-98, interestingly, there was a decline across all the states of NER during this period with the sole exception of Meghalaya, where there was no change during this period. Nevertheless, compared to the states that experienced fertility decline, the reduction in the mean ideal number of children was insignificant in the case of those states that experienced fertility stall (Table 4.9).

Taken together, the three indicators point towards change in fertility preference to larger number of children, where fertility increased during the period 1990-92 to 1996-98, and practically no change in the preferred family size among the states that experienced no change in fertility during this period. It is perhaps worth mentioning here that among the various indicators of fertility preference, the wanted fertility rate was found to be most closely associated with the fertility trend among the North-eastern states. Also, the unchanging mean ideal number of children among the states that witnessed fertility stall and the increases, albeit marginal, in the percentage of women who want no more children, point towards the distinct possibility of a worsening of the family planning services in these states (more on this presently).

The explanation of the fertility stall among the North-eastern states in terms of fertility preferences, for the following period 1996-98 to 2003-05 from available data, is slightly tenuous in the case of a few states. During this period, whereas fertility showed no significant change in Assam, Manipur, Mizoram, Nagaland and Tripura, it increased in Arunachal Pradesh and declined in Meghalaya and Sikkim. The wanted fertility rate correspondingly increased in Arunachal Pradesh and declined in

Meghalaya and Sikkim. Wanted fertility showed marginal increase in Assam and Mizoram and can as well be taken to have stalled in these two states. The trend in fertility and wanted fertility do not correspond to each other in Manipur and Nagaland where there was a stall in fertility but a decline in wanted fertility during this period.

The percentage of women who do not want any more children, increased considerably in all the states of the region during 1996-98 to 2003-05 with the exception of Mizoram where there was no change in this indicator (Table 4.9). Hence, even in most of the states that witnessed fertility stall during this period, there was increase in the percentage of women who wanted no more children. However, this could possibly be the outcome of incorrect responses from the women as pointed out earlier. Coming now to the trend in the mean ideal number of children, we find practically no correspondence between this indicator of fertility preference and the trend in actual fertility among most of the states of NER. Among the states that experienced fertility stall, there was in fact, significant decline in the mean ideal number of children in Assam, Manipur, Nagaland and Tripura. On the other hand, in Arunachal Pradesh and Sikkim, where there was significant rise in fertility, there was insignificant decline in the mean ideal number of children. The only exceptional states, where the trend in fertility matched that in the mean ideal number of children were Mizoram and Meghalaya.

Overall, as was the case with the period 1990-92 to 1996-98, among the various fertility preference indicators, the trend in wanted fertility rate is most closely associated with the trend in fertility during 1996-98 to 2003-05 (Table 4.9). However, the other two indicators of fertility preference viz., the percentage of women who want no more children and the mean number of ideal children for women, hardly tally with

the increase or no change in fertility preference among the North-eastern states. In fact, taken together, these two indicators would lead to the conclusion that there have been such changes in fertility preference that should lead to fertility decline among the majority of the states of this region during this time. For example, the stalling in fertility is not captured by any of the indicators of fertility preference in the case of Manipur and Nagaland. In both these cases, fertility preferences changed in a manner that should, in the presence of a well-functioning family planning system, lead to a decline in fertility in these states, an issue to which we turn next.

#### **4.4. THE IMPACT OF FAMILY PLANNING PROGRAMS ON FERTILITY**

While the general conclusion of a number of studies on the impact of family planning programs (FPP) on fertility is that, there is a frequent and often strong fertility reducing effect associated with FPP in the context of developing countries (see for instance Bongaarts et al 1990; Mauldin and Ross 1991; Freedman 1987; and Simmons and Young 1996), there have also been researchers who have questioned the role of family planning programs in reducing fertility (see for instance Pritchett, 1994). According to Pritchett, the effect of family planning programs on fertility is very small compared to that of fertility preferences which in turn are primarily shaped by socio-economic factors. One of the major criticisms of Pritchett against those studies that found a statistically significant and large effect of family planning programs on fertility (Bongaarts, 1993; Bongaarts, Mauldin, and Phillips, 1990; Lapham and Mauldin, 1984; Mauldin and Ross, 1991) is that, in the multiple regression analyses employed, the socio-economic indicators had been clubbed together into a single index, which diminished the effect of individual socio-economic variables and attached none to

those that were not considered in the index. However, a perusal of these studies reveals that even the index of family planning had been included as a composite index of several variables that reflected the strength of family planning programs. Thus, the relative size of the coefficients of socio-economic development and family planning are, to say the least, not misleading in these studies as far as the impact of family planning programs on fertility is concerned. The other major criticism of Pritchett is that empirical research on the subject has not considered the possibility of endogeneity in the measure of family planning programs; that acceptance of the family planning programs is itself influenced by fertility preferences. That is, as fertility preference shifts towards smaller families, people start to adopt family planning methods to a greater extent as compared to the past. However, this is perhaps the very issue that family planning programs address. In fact, researchers in the area have consistently pointed out the primary role of the family planning programs is meeting the unmet need for contraceptive methods. Although theoretically, family planning programs can affect fertility directly through the provision of information and access to contraceptives and indirectly through its influence on the fertility preferences of households, most of the literature on the subject shows that whereas the direct effects are important as far as their fertility reducing influence are concerned, the indirect effects are small or insignificant in many of the cases (see for instance Angeles et al 2001).<sup>40</sup> Bongaarts (1990, 1994) argues that family planning programs reduce fertility

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<sup>40</sup> Freedman (1987) however points out that a strong family planning program (involving mass media campaigns, home visits and incentives) can be expected to have a stronger effect on fertility preferences as compared to weak or practically nonexistent ones. In addition, the effect of family planning programs might have 'multiplier' effects, in the sense that those who adopt the program may serve as role models for others who gradually adopt the small family norm through social learning (ibid).

primarily through enhancing the *access* to contraceptives, thus reducing the unwanted fertility among couples. Thus, in addition to providing low-cost contraceptive methods, effective family planning programs also reduce the non-economic impediments to contraceptive use such as the lack of knowledge, fear of side effects, and social and familial disapproval.

In our analysis, we have incorporated unwanted fertility, public sector share in the provision of contraceptives and the exposure of women to family planning programs in NER, in an effort to capture the trend in the program strength overtime in the North-eastern states. It is hypothesized that a reduction in program strength would have negative consequences for the access to and thus use of contraception and family planning methods, which might be reflected in increasing unwanted fertility, and possibly in the reduction of exposure of women to family planning messages on mass media. The public sector provides contraceptives free of cost and hence a reduction in the share of the public sector in its provision, though may not affect the wealthier households, could lead to lower access to contraception for the poorer households leading to stalling in fertility decline.<sup>41</sup>

Tables 4.11 present information on the various indicators on the performance of the family planning program among the North-eastern states. We begin with the examination of the trend in the various indicators for the period 1990-92 to 1996-98. As already noted, fertility stall occurred among four states of the region during this period- Manipur, Meghalaya, Mizoram and Nagaland. Among these four states, at the

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<sup>41</sup> Here, it should be mentioned that this argument finds strength in our observation in the earlier part of the chapter that contraceptive use varies directly with the wealth of the household, with women from richer households exhibiting greater contraceptive prevalence compared to their counterparts belonging to poorer households.

onset of the stall, unwanted fertility ranged from 0.2 children per woman in Mizoram to 0.5 in Manipur. Thus, in all these states, unwanted fertility was quite low during the beginning of the 1990s. Whereas, there was no change in the unwanted fertility rate in Manipur and Mizoram, there was considerable increase in unwanted fertility in Meghalaya and Nagaland from 1990-92 to 1996-98. Among the states that witnessed fertility decline during this period, the unwanted fertility declined in Assam but increased in Arunachal Pradesh (data on Tripura for this period is not available).

**TABLE 4.10: UNWANTED FERTILITY, PERCENT SHARE OF PUBLIC SECTOR IN PROVISION OF MODERN CONTRACEPTIVES, AND PERCENT OF WOMEN (15-19) EXPOSED TO ANY MEDIA, NORTH-EASTERN STATES, 1990-92 TO 2003-05**

State	Unwanted Fertility Rate			Percent share of public sector in provision of modern contraceptives			Percent of women (15-19 years) exposed to any media		
	1990-92	1996-98	2003-05	1990-92	1996-98	2003-05	1990-92	1996-98	2003-05
Arunachal Pradesh	0.5	0.8	0.7	85.7	72.2	63.5	29.9	67.9	60.1
Assam	1.0	0.6	0.6	72.0	63.7	45.8	23.7	60.8	59.1
Manipur	0.5	0.5	0.5	82.3	76.8	52.2	63.3	80.8	86.8
Meghalaya	0.3	0.8	0.7	68.2	47.3	42.9	35.4	62.8	55.5
Mizoram	0.2	0.2	0.2	90.6	81.0	84.6	50.8	77.7	65.2
Nagaland	0.4	0.8	1.0	70.7	57.7	47.6	38.6	64.4	36.8
Sikkim	-	1.2	0.8	-	-	66.5	-	-	53.0
Tripura	0.7	-	0.6	75.3	71.4	54.5	38.1	88.0	69.0

Source: Compiled from IIPS and ORC Macro 1993; 1999; 2007

The percentage of women exposed to family planning messages through mass media and the share of the public sector in the provision of health and family welfare



services are relatively direct measures of the performance of the family planning machinery of the state (Table 4.10). Interestingly, the percentage of women exposed to family planning messages on mass media increased during the period 1990-92 to 1996-98 among all the states of NER but the percentage increase in the states that experienced fertility stall was smaller than those that experienced fertility decline. This lends further support to the observation that fertility stall during the 1990s occurred in states where the family planning programs had faltered to some extent. However, the share of the public sector, in the provision of contraceptives declined among all the states of the region from 1990-92 to 1996-98, and there is no significant difference in the decline between the states that experienced fertility decline and those that witnessed a stall during this period. The examination of the impact of this decline on the ability of poorer households to have timely and adequate access to contraceptives would have been revealing, but this cannot be undertaken due to the lack of data. Nevertheless, insofar as the poorer households are concerned, they would naturally have a greater reliance on the Government for the provision of family welfare services. Hence, any fall in the share of the public sector could lead to a shortage of contraceptives and rise in unwanted fertility among them.

For the following period, 1996-98 to 2003-05, fertility stalled in all the states of NER except Meghalaya and Sikkim. Among the states that experienced no significant change in fertility, there was no change in unwanted fertility in Assam, Manipur and Mizoram and slight increase in the unwanted fertility in Nagaland. In Arunachal Pradesh, where fertility increased significantly during this period, we find that there was in fact, a marginal decline in the unwanted fertility rate. In Meghalaya and Sikkim unwanted fertility declined during this period, as did their fertility.

Furthermore, there has been a reduction in the percentage of women exposed to family planning messages among all the states in the region, except Manipur, where there was a small rise. In Arunachal Pradesh, where there was significant rise in fertility during this period, we find that commensurate with that there was an increase in unwanted fertility as well. The percentage of women exposed to family planning messages on mass media as well as the share of public sector in the provision of contraceptives declined in this state. On the contrary, Meghalaya (that experienced significant decline in fertility during this period), as already noted, witnessed a reduction in unwanted fertility. However, the percentage of women exposed to family planning messages as well as the public sector's share in the provision of contraceptives declined. Nevertheless, the fall in the latter was much smaller than that experienced by the other states during this period. Overall, there seems to be a slackening in the Government's commitment to the family planning programs among the North-eastern states that experienced fertility stall as far as these indicators lead us. The case of Manipur remains slightly hazy as neither the indicators of fertility preference nor particularly that of family planning programs could explain the fertility stall in the state for the period 1996-98 to 2003-05.

#### **4.5. THE SOCIO-ECONOMIC CORRELATES OF FERTILITY AMONG THE NORTH-EASTERN STATES**

While the role of socio-economic factors in fertility decline is well understood, it is particularly interesting to examine the part played by these variables in the situation of a fertility stall. In this context, the present section examines various indicators of socio-economic development in the North-eastern states for the period

1990-92 to 2003-05, in an effort to uncover the differences (in any) among the states that experienced fertility stall and those that witnessed a decline in fertility.

Bongaarts (2006) argues that a lack of progress on the socio-economic front is capable of bringing about a momentary lull in the process of fertility decline among the mid-transitional countries. While the classical (socio-economic) and diffusion perspectives, are both important, their roles change during the course of the transition. "...diffusion and the social interaction processes accelerate the decline early in the transition. Once this process has largely run its course, fertility late in the transition becomes more closely tied to level of socio-economic development" (Bongaarts, 2005:12). Thus, we may expect that fertility stall would take place in those states in NER where there has been a slowdown in the socio-economic development in the recent past. Although we do not attempt to test the proposition that ideational changes have largely accounted for the initial phase of fertility decline among the North-eastern states, data permit us to examine whether there has been, of late, stagnation in the socio-economic development indicators among the North-eastern states where fertility failed to decline. The analysis of most of the socio-economic variables is limited to the 1990s.

The compound annual growth rate of per capita gross state domestic product had been higher in NER during the period 1980-81 to 1990-91, but showed a distinct decline in the post liberalization period at least up to the end of the 1990s (Table 4.11). Among the states that experienced fertility stall during early to mid 1990s- Manipur, Meghalaya, Mizoram and Nagaland (referred to as Group A collectively in this discussion for simplicity of exposition), we find slower growth in per capita GSDP than the average of the *region* in all the states except Meghalaya during the

**TABLE 4.11: PER CAPITA GROSS STATE DOMESTIC PRODUCT GROWTH  
IN NER AND STATES. 1980-81 TO 2005-06**

State	1980-81 to 1990-91	1980-81 to 1995-96	1993-94 to 2000-01	1999-00 to 2005-06
Arunachal Pradesh	5.5	5.7	1.0	6.1
Assam	1.9	1.7	0.7	3.5
Manipur	2.4	2.5	2.3	5.1
Meghalaya	3.0	2.4	4.1	4.2
Mizoram	-	-	-	-
Nagaland	3.3	-	3.0	-
Sikkim	8.2	-	2.8	5.7
Tripura	2.6	3.3	7.7	7.0
NER*	3.8	3.1	3.1	5.3
India	3.1	2.7	4.1	4.8

*Note:* the value of the per capita gross state domestic product is the simple average of that for the individual states.

Source: Electronic data obtained from [www.mospi.nic.in](http://www.mospi.nic.in)

corresponding period (1993-94 to 2000-01). Among the states that witnessed declining fertility (viz., Arunachal Pradesh, Assam, Sikkim and Tripura- the Group B states) per capita income growth was low in Assam and Sikkim but substantially higher than the average for NER in Tripura during the same period. However, the *group average* for the states that witnessed fertility stall was not different from that of the other group where fertility declined during the period 1990-92 to 1996-98 (Table 4.12). Nevertheless, over the longer period preceding the stall (i.e. 1980-81 to 1995-96), we find that the average per capita income growth had been mostly higher in the states where fertility declined vis-à-vis those where fertility stalled during early to mid 1990s

(Table 4.11). The observation supports the view that there was stagnation in the purely economic indicators of development in the states where fertility stalled as against those where it declined during the 1990s.

Data on the remaining socio-economic variables and their changes over the period 1971-2001 are contained in Table 4.12.<sup>42</sup> The growth of urbanization, as that in the growth of per capita GSDP, has been slower in those states where fertility stalled vis-à-vis those where it did not during the period of the stall and it is also true of the entire period from 1981 to 2001.<sup>43</sup> The other socio-economic indicator, where the states that experienced fertility decline seemed to have fared better than those where it stalled, is the female literacy rate. The female literacy rate increased much slowly during the period 1991-2001 (as well as over the longer period from 1971 to 2001) among the states that experienced fertility stall during 1990-92 to 1996-98 (Table 4.12).

However, the same cannot be claimed when we consider other development indicators. Surprisingly, the reduction in poverty for the period 1983 to 1993-94 (the period preceding the fertility stall), had been faster among the Group A states as compared to those Group B. However, for the period 1990-92 to 1996-98, there had been no significant difference in the decline in poverty between the two groups of states in NER, though the decline in poverty was marginally higher in the states that experienced fertility stall during that period (Table 4.12).

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<sup>42</sup> We should mention here that the variables mentioned above have actually been already encountered in the context of analyses elsewhere in the thesis. However, for the present purpose of comparison, we present them again, but arranged differently.

<sup>43</sup> That said, the percentage of urban population was higher during the period 1981 to 2001, among the states where fertility stalled compared to those where it declined.

**TABLE 4.12: CHANGES IN SOCIO-ECONOMIC INDICATORS OF DEVELOPMENT 1990-2005**

Year	Group A States	Group B States
<i>Per capita gross state domestic product (compound annual growth rate)</i>		
1980-81 to 1995-96	2.5%	3.6%
1993-94 to 2000-01	3.1%	3.1%
<i>Female Literacy Rate</i>		
1971	27.4	15.7
1991	56.5	40.8
2001	67.1	54.3
% change 1991 to 2001	18.8%	33.2%
% change 1971 to 2001	145%	245%
<i>Percent of urban population</i>		
1981	21.2	9.1
1991	27.5	13.0
2001	28.2	16.8
% change 1991 to 2001	2.5%	28.5%
% change 1981 to 2001	33.2%	82.5%
<i>Population below poverty line</i>		
1983	37.8	40.5
1993-94	33.8	39.7
1999-00	28.6	34.7
% point change 1993-94 to 1999-00	5.5	5
% point change 1983 to 1999-00	9.2	5.8
<i>Per capita Consumption Expenditure</i>		
1993-94	144.0	107.03
1999-2000	176.9	118.4
% change 1993-94 to 1999-00	22.8%	10.6%

Table 4.12 concluded

Year	Group A States	Group B States
<i>Nutritional status among women (% anaemic)</i>		
1996-98	46.7	63.7
2003-05	43.2	62.5
% point change 1996-98 to 2003-05	3.5	1.2
<i>Nutritional status among children (% anaemic, % thin)</i>		
1996-98	56.7, 23.0	59.8, 31.3
2003-05	57.7, 25.7	70.3, 33.7
% point change 1996-98 to 2003-05	-1, -2.7	-10.5, -2.4
<i>Female unemployment rate (usual principal status)</i>		
1993-94	6	77.3
1999-00	16.8	61.0
% change 1993-94 to 1999-00	179.2%	-21.1%
<i>Male unemployment rate (usual principal status)</i>		
1993-94	14.8	41.0
1999-00	19.3	31.3
% change 1993-94 to 1999-00	30.5%	-23.6%
<i>Social Sector expenditure ratio</i>		
1980-81	25.9	26.9
1990-91	29.5	29.4
1998-99	32.2	29.5
% change 1990-91 to 1998-99	9.1%	0.3%

Source: RGI (1951, 1971, 1991, 2011); NSSO (various rounds); www.mospi.gov.in; IIPS (2007)

Among the individual states (data not shown in table), the increase in fertility in Mizoram is associated with a large drop in poverty. The decline in poverty, in Meghalaya (the other state that witnessed an increase in fertility) is however not large. Not surprisingly, poverty also declined among those states where fertility declined during this period.

Commensurate with the larger decline in poverty, the increase in per capita consumption expenditure had also been higher in the states where fertility stalled. In fact, those states that witnessed fertility stall during the period 1990-92 to 1996-98 experienced a greater increase in both male and female employment. Even the social sector expenditure ratio (including expenditure of the Government on education, health, amenities i.e. water supply & sanitation, housing and urban development, and other social service including welfare of SC, ST & OBC; social security and welfare etc) had been better in Group A states (Table 4.12).

Interestingly, during the period 1990-92 to 1996-98, when fertility failed to decline in the four North-eastern states of Manipur, Meghalaya, Mizoram and Nagaland, there was in fact, a rise in infant and child mortality in all these states (the increase in the latter being stark), except Manipur. Even though, there was also a rise in infant and child mortality in Arunachal Pradesh, where fertility declined during this period, (data on Sikkim and Tripura not available), the increase was much smaller than those states where fertility stalled. The reason for lack of decline in infant and child mortality might be the deterioration of health facilities for mothers and their children during the concerned period (Appendix 3).

Curiously, this is not reflected in the provision of health services for infants, as there has been, in fact, an increase in the percentage of children 12 to 23 months of age, receiving all basic vaccinations in the states where fertility stalled and reduction in it in those states where fertility declined during the period 1990-92 to 1996-98. However, the percentage of children less than four years of age suffering from diarrhoea increased among the states that experienced fertility stall during this period as compared to those where fertility declined. Thus, there is some reason to believe



that health and sanitary conditions might have deteriorated among the states that experienced fertility stall during this period (Appendix 4).

Overall, as far as the relation between economic growth and fertility among the North-eastern states during the period 1990-92 to 1996-98 is concerned, the states experiencing fertility stall had a relatively poor performance in terms of growth in income, urbanization and the female literacy rate but performed better in terms of poverty reduction (at least over the longer run) and increase in per capita consumption expenditure as well as employment. Thus, there appears to be no strict correspondence between socio-economic indicators and fertility stall among the North-eastern states.

For the following period 1996-98 to 2003-05, as we saw earlier, fertility stalled among all the states of the region *except* Meghalaya and Sikkim, which witnessed decline in fertility during this period. Among the various socio-economic indicators, for this period we have data on per capita GSDP, infant and child mortality, percentage vaccinated and percentage suffering from diarrhoea among children and the nutritional status among women and children. Data on the former for the period 1993-94 to 2004-05 is not available for Mizoram, Nagaland and Tripura. However, data on the remaining states shows that among the states where fertility declined during this period, the annual compound growth rate of per capita GSDP was higher than the average for the region in Sikkim but lower in Meghalaya. Among the states where fertility stalled during this period, it was higher than the average in Arunachal Pradesh and Tripura and lower than the average in Manipur and Assam (Table 4.11). The nutritional status among adult women, while showing some improvement among the majority of the states, does not show much difference between the two groups of states (though the states where fertility stalled seem to have fared slightly better) . On the

contrary, there was significant deterioration in the nutritional status among children (measured in terms of percentage anaemic as well as percentage underweight) in all the states of the region, but the deterioration was lower in the states where fertility stalled during this period. The sole exception has been Mizoram, where there has been improvement in the nutritional status of children among states that experienced fertility stall during this period. However, the decline in infant and child mortality had been higher in the states where fertility declined during this period. In fact, the states where fertility stalled during this period also showed lesser improvement in percentage of children 12 to 23 months who had received all the basic vaccinations (Appendices 4.1, 4.2).

Overall, to put it briefly (at the expense of losing the details) it appears that purely economic indicators are poor predictors of fertility stall or its decline among the North-eastern states. The two factors that stand out as significant from the analysis for both periods, 1990-92 to 1996-98 and 1996-98 to 2003-05, are the female literacy rate and infant and child mortality. The states where fertility stalled, had lower female literacy as well as higher infant and child mortality on average as compared to the states that experienced decline in fertility in NER.

## **4.6 DISCUSSION**

In this chapter, we examined the proximate determinants as well as the contextual factors behind the fertility stall observed among the North-eastern states over the period 1990-92 to 1996-98 and 1996-98 to 2003-05. It is clear that even though the various proximate determinants- marriage, induced abortion, contraception and postpartum amenorrhea, have been influential in shaping the fertility trends in the

various North-eastern states, contraception stands out as an especially important proximate determinant in several instances. For instance, in Arunachal Pradesh contraception played a major role in fertility decline and in Nagaland, it was primarily responsible for the stall in fertility decline. Interestingly, nuptiality was also found to be a proximate determinant of much importance and its effect had been mostly towards reducing fertility as was seen in the case of Tripura and Nagaland.

Interestingly, the study on the proximate determinants of fertility in India during the early 1990s by Visaria (1999), also found contraception to be the primary driver of fertility decline, especially in states such as Punjab and Kerala, which achieved rapid and sustained declines in fertility from the 1970s. Even though the underlying factors that precipitated the decline were very different in these two states, the provision of family planning services facilitated the transition from a high to a low fertility regime.

Among the states that witnessed fertility stall during either 1990-92 to 1996-98 or 1996-98 to 2003-05, there was deterioration in the performance of the family planning program in all the states, but the stall in fertility cannot be attributed to it in all the cases. Specifically, in Assam and Meghalaya, the fertility stall was associated with an increase in wanted fertility. Hence, change in fertility preference in these states lead to the observed increase in fertility. However, in Arunachal Pradesh, Manipur, Nagaland and Tripura, the fertility stall had taken place in all probability, due to a lapse in the family planning programs in these states. Remarkably, among the states that experienced fertility decline during this period, there was reduction in the wanted fertility (i.e. change in fertility preference towards fewer number of children) as well as improvement in the family planning program of the state.

Among the various indicators of socio-economic development, we find that the states where fertility stalled especially during the period 1990-92 to 1996-98, were associated with increases in infant and child mortality. As noted earlier, female literacy rate was associated with fertility reduction among the states of NER. Thus, greater emphasis on such socio-economic variables as female literacy and improvement in the health facilities for women and children, together with improvement in the efficiency of the family planning programs can lead to the cessation of the fertility stall observed among the states of the region.