

CHAPTER THREE

FERTILITY LEVELS, TRENDS AND DIFFERENTIALS IN NORTH-EAST INDIA, 1971-2011

3.1. Introduction

Owing to the large and growing body of research on fertility in India, it is now largely known that Indian fertility rates began their downward journey at least since the beginning of the 1970s. It is perhaps also well-recognized that there are significant differentials in both the level and pace of fertility decline among the various regions and states of India. Interestingly, recent fertility estimates from national level surveys draw attention to the fact that NER, along with the proverbially backward Hindi-speaking belt of North India, has demonstrated great resistance to fertility decline in the recent past, and indeed, the states of the region evince the highest fertility rates in the country presently [International Institute for Population Sciences (IIPS) and Macro International, 2007: 82-84]

In this context, it is quite remarkable that one finds relatively little investigation on the subject of fertility in NER, not merely from the historical standpoint as indicated in the previous chapter, but surprisingly in the contemporary sense as well. Indeed, most of the inquiries into fertility transition in India (national and international) have been practically silent on NER barring of course, a few instances involving Assam (some notable examples being Guilmoto and Rajan, 2001; Manna,

1998; Preston and Bhat, 1984; Rele, 1987; Retherford and Mishra, 2001; Visaria and Visaria, 1994; Visaria, 1999 among others). In fact, in so far as the subject of fertility (or for that matter even most other demographic variables and processes) is concerned, the North-eastern region appears literally as a *terra incognita* on the map of the Indian subcontinent.

Of course, one of the primary reasons behind the lack of demographic research on the region, as mentioned earlier, has been the paucity of data on most of the states till recently. Even when such data were available, there were serious doubts on their reliability. For instance, fertility and mortality statistics from official sources such as the Civil Registration System (and that from the Sample Registration System to a certain extent), were found to be severely flawed in case of most of the Indian states and particularly so for the states of NER. This necessitated the treatment of these data with utmost caution (but more on this in the following section). Needless to say, such problems presented huge (but perhaps not insurmountable) obstacles in the analysis of demographic processes in India and obviously for the states of NER. However, research on the subject has shown a distinct tendency to move forward in the Indian context even with the aforesaid drawbacks. This has often taken the form of supplementing existing sources with data from censuses and surveys. But NER remained an exception to the trend and we find that such efforts have been largely non-existent for the states of the region.

In fact, as is well-known, the census has been the primary source of information for demographers throughout the world, who have had to deal with inadequate/non-existent population statistics; a situation that is perhaps not uncommon in developing countries. Indeed, data from the Census of India provides an opportunity to both

determine levels and trends of demographic variables of interest *and* establish the veracity of information on vital statistics from the direct sources mentioned earlier. The Census of India started to collect information on fertility since 1971 (two questions, one on the age at marriage and the other on children born during the last year to currently married women were canvassed during 1971) and the task of indirect estimation of demographic indicators such as fertility was rendered even more easier (and reliable) since 1981, when the Registrar General's office added two more questions to the fertility schedule, viz., children ever born and children surviving (classified by the age-group of the mother). Whereas these opportunities for investigation have been exploited to a large extent for India and many of its larger states, they were ill-used as far as the North-eastern states of India are concerned. Indeed, a review of existing literature on fertility in the Indian context, finds very little reference to NER; a situation that certainly needs to be redressed.

However, it would be only fair to mention that the volatile socio-political climate of the region for most of the period following Independence has been a further source of the deficiency in statistics and research on the region. In fact, the imagination of researchers (both inside and outside of the region) has largely been caught up by the ongoing socio-political turmoil and politics in NER. Alongside with this, and due to similar reasons, the capacity of individual scholars and even national (and international) organizations to carry out investigations on the region has been fairly limited till the recent past (see for instance, Chakravarti, 1998). This has also been certainly aggravated by the sensitivity of the people of the region towards divulging demographic information as perhaps a lot of the politics in NER has been inextricably linked to demographic issues. Surprisingly however, even the avenues opened up by

the availability of the NFHS data since the early 1990s did not stir up research on NER, at least to the extent one would have expected.

In this context, the principal object of the present chapter is to draw together and analyze fertility levels and trends in the North-eastern region from available (official) sources for the period beginning early 1970s to the present. As mentioned in the previous chapter, data from the NFHS suggest the possibility of *stalling* fertility decline among several states of the region during the 1990s. In fact, according to these statistics, there has even been a reversal of the earlier trend and consequently several states of the region have witnessed a rise in fertility during the aforementioned period. However, it is not entirely clear that such a phenomenon has indeed transpired in NER. First and most importantly, there is a lack of consensus among the different data sources regarding fertility *trends* in the region. Also, a few researchers (e.g. Singh, 2006) have argued that the recent rise in fertility suggested by the NFHS for one of the states of NER, viz., Manipur is not real and is largely a result of overestimation. Thus, an examination of alternative (i.e. indirect) estimates of fertility becomes imperative for establishing the ‘actual’ trend in fertility in the recent past in NER. For this purpose, we employ some indirect estimation procedures based on census data to calculate fertility levels in NER for the 1990s, and results largely support the lack of fertility decline among several states of NER. Second, it also needs to be verified that the rise in fertility (if at all) is not of a pre-transitional nature, which is inherently different from the possibility of a *stall* we just mentioned.¹⁹

¹⁹ The examination of the stall in fertility decline has been explained in greater detail later in this chapter. In fact, as we shall see in the following chapter, the trend in the proximate determinants reveal that commensurate with the stalling fertility decline among the majority of

Further, it would be of interest to see whether and to what extent fertility differentials exist within the states of NER. Indeed, fertility transitions in developed countries [that have already reached replacement levels (and are indeed moving towards below-replacement fertility rates)] have shown that fertility differentials typically diverge during initial stages and converge again at near replacement levels (even though some differentials could persist). In the context of the states of NER, while it is quite certain that differentials would exist by socio-economic categories, we cannot be definite about the extent to which such differences might have narrowed overtime, provided they have moved in that direction at all. Indeed, in view of the possibly rising fertility rates in the region, it is well-nigh possible to encounter further divergences in fertility among different social and even cultural categories. With these questions in mind, we move ahead to examine fertility trends and differentials among the states of NER.

3.2 Fertility Trends in the North-eastern Region: 1971-2011

This section traces the fertility trends in North-east India in a comparative perspective over the span of nearly four decades from 1971 to the present. However, before we begin the discussion on fertility trends in NER, it would be useful to discuss the nature and reliability of the various sources of information on fertility.

the states in NER there has been very marginal change in the proximate determinants during this period.

3.2.1 Data Sources and their Limitations

The principal source of direct estimates of the TFR over a relatively long period is the SRS that provides data at the national and state level since the beginning of the 1970s. However, such data for smaller states of North-east India have been made available only since the beginning of 1990s.²⁰ The other major source, which is also based on large-scale sample survey like SRS, is the NFHS, which made such data available (at national and state level) since the beginning of the 1990s. The Sample Registration data for Indian states are however far from perfect as the data suffer from incomplete registration, and as expected, the extent of under-registration varies over the states. A major source of error in SRS data seems to be the outdated sampling frame in most of the states. In addition, these data are prone to be particularly deficient in states with poor administrative machinery and/or financial constraints (see for instance, Wells, 1967). It has been held by some researchers that perhaps the incompleteness of registration in the SRS has been diminishing over time (at least over the period from 1970 to 1990 and among the major Indian states). While the 1972 Fertility Survey conducted in a 25 per cent subsample of the SRS found SRS under-registration of births by about 8 per cent, two subsequent inquiries (RGI 1984a; 1988) indicated decline in the extent of under-registration of births to 3.2 per cent in 1980-81 and further to only 1.8 per cent in 1985 (Retherford and Mishra, 2001). However, there are less optimistic estimates, for instance, those by Narsimhan et al. (1997), suggesting that the actual level of under registration could be closer to 10 per cent.

²⁰ This is partly because the majority of the smaller states of the region were part of Assam, until as late as 1987. The details on the formation of the present day states of NER are contained in Chapter 1.

There is hardly any reason why the extent of under-registration in SRS would be relatively less for the North-eastern states especially when these states have been late in initiating the programme. In fact, Narsimhan et al. (1997) noted that the 1980-81 SRS evaluation study found the level of birth under-registration in Assam to be as high as 9 per cent. Some researchers (for instance Mari Bhat, 1994) have also argued that levels of under-registration of births under SRS are much higher in NER as compared to the major states of India.

However, it is interesting that, as pointed out by Mahapatra (2010), the RGI did not conduct any study to assess the performance of the SRS since the 1990s, which leaves a doubt about the quality of the SRS data during the 1980s into the 1990s and beyond. To fill in this lacuna, Mahapatra assessed the extent of registration/under-registration under the SRS for the 1990s. He finds that the completeness estimates suggest that registration of *deaths* within sample areas by the SRS worsened during 1990s up until 2007. The all India estimate of SRS completeness ranged from 77 per cent to 99 per cent and was around 82 per cent in 2007. Thus, it is clear that although there might have been some improvement in the SRS during the 1990s, it has definitely not been carried into the following years.

Similar problems of operational and administrative nature however, are also likely to present themselves in the NFHS. As a matter of fact, it was mentioned in the NFHS 1 Report for the Northeastern states (IIPS, 1995) that data collection in these states was troubled due to lack of proper approachable roads in the primary sampling units located in hilly areas as well as due to unseasonal heavy rains. These problems manifest themselves broadly as omission and misreporting of events and cast doubt on the reliability of the statistics generated by the NFHS.

Commenting on the relative deficiencies of the two sources of information, Retherford and Mishra (2001) point out that while SRS suffers primarily from the under-registration of births, the NFHS data is infested primarily by misreporting of events. Specifically, NFHS data would likely be contaminated by backward displacement of births from the first five years preceding the survey to earlier years and omission of births at the time of the survey, as the data are retrospective in nature. The implication is that while both the sources would be providing lower than actual estimates of fertility, the NFHS would be *overestimating* the pace of fertility decline.

The Census, which was the primary source for indirect fertility estimation prior to the advent of the SRS, remains an important alternative source, primarily for the indirect estimation of fertility in view of the deficiency in the above-mentioned sources. In fact, as pointed out by the Committee on Population and Demography (Bhat, Preston and Dyson, 1984) some specific questions on fertility and mortality had been included, albeit on a sample basis for certain states, as early as the Census of 1911, but the data did not lend themselves to any meaningful analysis due to poor quality, incomplete coverage and irregular tabulation categories. In addition, sample information has been collected ever since 1971 Census on the number of births to women in the reproductive age group during the last year, which provides an opportunity to directly calculate current fertility. However, we find that the in general and throughout the developing world, these data are severely affected by recall errors, lending it unsuitable to estimate fertility, for all practical purposes. The chief problem that arises on the part of the respondent while reporting births during a specified period in the past is that of locating the event on a time-scale, especially when no written record is available. The average length of time covered by the reports may span more

or less than the intended 12-month period by a margin of several months. Thus, the age-specific fertility rates (ASFR), and hence the TFR, calculated from such statistics, would misreport the fertility rate (Shryock et al, 1976). In the case of Indian data, the same problem lies in under-reporting of the TFR to a considerable extent (see for example Registrar General, 2004).

A related piece of information contained in the Indian censuses since 1981, as mentioned earlier, is that on children ever born recorded by parity and age-group of the mother, which have been more widely used by researchers for the indirect estimation of fertility. However, such data are yet again likely to be affected by misreporting, particularly under-reporting, due to memory lapses, omission of dead children, or children who have left home (Shryock et al, 1976)²¹. Nevertheless, they have proved to be very useful in establishing as well as verifying direct fertility estimates, and have been widely used in the Indian context, albeit with necessary qualifications (and corrections). It could be mentioned in passing that the problems encountered when dealing with census data are likely to present themselves to a considerable extent in the NFHS statistics as well and needless to say, in most other sources that construct estimates based on retrospective questions. With the above mentioned shortcomings within each of the data sources on fertility in the Indian context, we now examine the alternative estimates of TFR and attempt to establish the trends in fertility in NER.

²¹ Indirect estimates of fertility based on Census data for India and several of its major states have been presented and discussed in Chapter 5.

3.2.2 Alternative Estimates of the Total Fertility Rate of NER and States, 1990-92 to 2003-05

Table 3.1 contains the estimates of TFR from two direct principal sources viz., the SRS and the NFHS, along with our own estimates obtained using the Arriaga-Arretx method based on census information. We begin with a discussion on the available estimates from the SRS and NFHS, pointing out the discrepancies in the fertility trends as indicated by these two sources.

Fertility data on the North-eastern states for the period following Independence are available solely from the SRS since early 1970s and indeed, primarily for Assam until the beginning of the 1990s. The NFHS provides estimates for the period 1990 to 2005 for all the North-eastern states, whereas the SRS estimates for the 2000s are again available just for Assam (Table 3.1). According to the SRS, Assam evinced a somewhat higher fertility as compared to the all-India average during the beginning of the 1970s. It is interesting to note here that fertility in the urban as well as rural areas of Manipur, Meghalaya and Tripura was found to be lower than that for Assam as well as below the corresponding national averages during this period. Even though these statistics should indeed be taken with a pinch of salt (given the varying accuracies of SRS data over states as indicated in the earlier section), nevertheless, they indicate that much like the rest of India, fertility transition had begun among the North-eastern states somewhere between the late 1960s and early 1970s . Arunachal Pradesh had the highest fertility in the region during the early 1970s that surpassed that of the other states and the national average by at least two and a half children per woman.

The fertility in Assam pertaining to the period 1981 to 2010 has been remarkably close to, and perhaps slightly lower, than the all-India average figures. Data indicate that from early 1970's to late 1980's, fertility has been around four children per woman in Assam, whereas it was around half a child higher at the all-India level. There has been a decline of nearly 1.5 children per woman in Assam from early 1970s until the end of the 1980s, much like it has been at the all-India level. Between 1972 and 1992, the fertility in the remaining states of the NER has also followed a downward trend. In other words, fertility seems to have followed a distinct downward trend in NER during the post-Independence period at least up to the beginning of the nineties. This is a rather important observation discarding doubts about pre-transitional rise in fertility in NER during the 1990s.

Now, for the period 1990-92 for NER, the two sources do not seem to disagree significantly for the region taken as a whole, with the SRS and NFHS providing comparable estimates of TFR during this period. Indeed, it is quite remarkable that in the case of the largest state in the region, viz., Assam, the estimates from the two sources are in fact, identical. It is notable however that except for Tripura and Meghalaya, TFR estimates from the NFHS in the remaining states of the region are higher (*howsoever* slightly) than the corresponding SRS estimates (as against the situation at the all-India level, where the SRS estimates have been relatively higher). In the case of the former two states, SRS estimates of fertility are vastly higher than the corresponding NFHS ones. In fact, in the case of Tripura, the SRS fertility estimate is about 3 children per woman higher than the corresponding NFHS estimate and much higher than the all-India level fertility for the same period. Nevertheless, as far as the relative ranking of the states of NER vis-à-vis all-India are in question, we find

**TABLE 3.1: TOTAL FERTILITY RATE IN INDIA AND INDIVIDUAL STATES IN INDIA DURING
THE POST-INDEPENDENCE PERIOD, VARIOUS SOURCES**

Year	India	NER*	Assam	Arunachal	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
Total Fertility Rate (SRS)										
1970-72	5.2	5.7	5.7	-	-	-	-	-	-	-
1972	5.8 (4.3)		5.7 (4.1)	7.0	4.5 (3.5)	4.7	-	-	-	4.3 (3.2)
1981	4.5	4.1	4.1	-	-	-	-	-	-	-
1982	4.5	-	4.2	-	-	-	-	-	-	-
1987	4.1	-	4.0	-	-	-	-	-	-	-
1990-92**	3.6	3.6	3.5	4.1	2.5	4.1	-	2.3	3.0	5.9
1996-98**	3.3	3.0	3.2	2.8	2.4	4.0	-	1.5	2.5	2.1
2003-05**	2.9	-	2.9	-	-	-	-	-	-	-
2010	2.5		2.5							
Total Fertility Rate (NFHS)										
1990-92	3.4	3.4	3.5	4.3	2.8	3.7	2.3	3.3	-	2.7
1996-98	2.9	2.6	2.3	2.5	3.0	4.6	2.9	3.8	2.8	1.9
2003-05	2.7	2.6	2.4	3.0	2.8	3.8	2.9	3.7	2.0	2.2
Total Fertility Rate (Arriaga-Arretx Method)^										
1992	3.9	4.2	4.1	5.0	3.9	4.9	4.5	5.1	4.6	3.4
2000	3.5	4.4	4.3	5.8	3.5	4.9	4.8	5.5	4.1	2.4

Note: * Weighted average of the individual states in the case of SRS and NFHS, with weights being the proportion of state population to total population in NER during the respective years ** Three year moving averages ^ Author's calculations (the method of estimation has been described in the succeeding section) figures in parentheses are urban fertility rates.

Source: Registrar General 1976, 1982, 2009; IIPS and ORC Macro, 2007

agreement among the two sources in nearly fifty per cent of the cases. Specifically, both indicate that fertility had been relatively lower than national average in the case of Manipur and Nagaland and higher than the national average in Arunachal and Meghalaya during 1990-92.

The situation seems to be one of increasing discrepancy between the data sources between 1990-92 and 1996-98. Overall, for NER as a whole, fertility estimates from the SRS have been higher than the corresponding NFHS estimates during 1996-98 (as in the case of all-India) by about half a child. Nevertheless, as during 1990-92, TFR estimates from the NFHS are higher in majority of the states (except Assam, Tripura and Arunachal Pradesh), indicating the possibility of greater under-registration in the SRS. The NFHS estimates have been higher to the extent of nearly two children per woman in Nagaland and slightly more than half a child per woman in Manipur and Meghalaya than the corresponding SRS estimates during this period. Again during 1996-98, as for the earlier period, there is considerable consensus in the relative position of the states of NER apropos India. Specifically, both the sources indicate that fertility in Assam, Tripura, Arunachal and Sikkim was relatively lower than the all-India level, whereas it was higher in Meghalaya. However, in the case of Manipur and Nagaland, the SRS estimates indicate comparatively lower level than the national average, whereas NFHS shows relatively higher fertility in these states than the all-India level.

As far as fertility *trends* are concerned, we find rather more disagreement than consensus between the SRS and the NFHS. Overall, however both sources indicate that there has been decline in fertility during the 1990s in the region as a whole, but there are

serious discrepancies in the data for the individual states. For instance, while the SRS data show that there has been marginal decline in fertility in Assam, Manipur and Meghalaya and significant decline in the remaining states, the NFHS data find that there has been significant decline in fertility in Assam, while there has been *rise* in fertility in Manipur and Meghalaya and for that matter even in Nagaland and Mizoram. Apart from Assam, the other states that have experienced decline in fertility during the 1990s are Arunachal Pradesh and Tripura.

For the period 1996-98 to 2003-05, as already noted, data are available from the NFHS alone (and for Assam from the SRS too). According to NFHS, for the region as a whole, data indicates that there has been probably no change in the TFR, which remained at 2.6 children per woman from the late 1990s to mid 2000. Apart from Meghalaya and Sikkim, there has been no significant decline in the remaining states. In fact, there was substantial rise in fertility in Arunachal Pradesh and perhaps Tripura. In Assam, for which fertility estimates are available from both sources, we find that whereas SRS indicates a marginal decline, NFHS shows practically no change in fertility during this time. On the whole, both sources show that several states of the region, experienced sharp decreases in the pace of fertility decline, which is especially true of the tribal majority states of NER. However, it is indeed remarkable that Assam has perhaps also not been an exception to the general trend observed in the region.

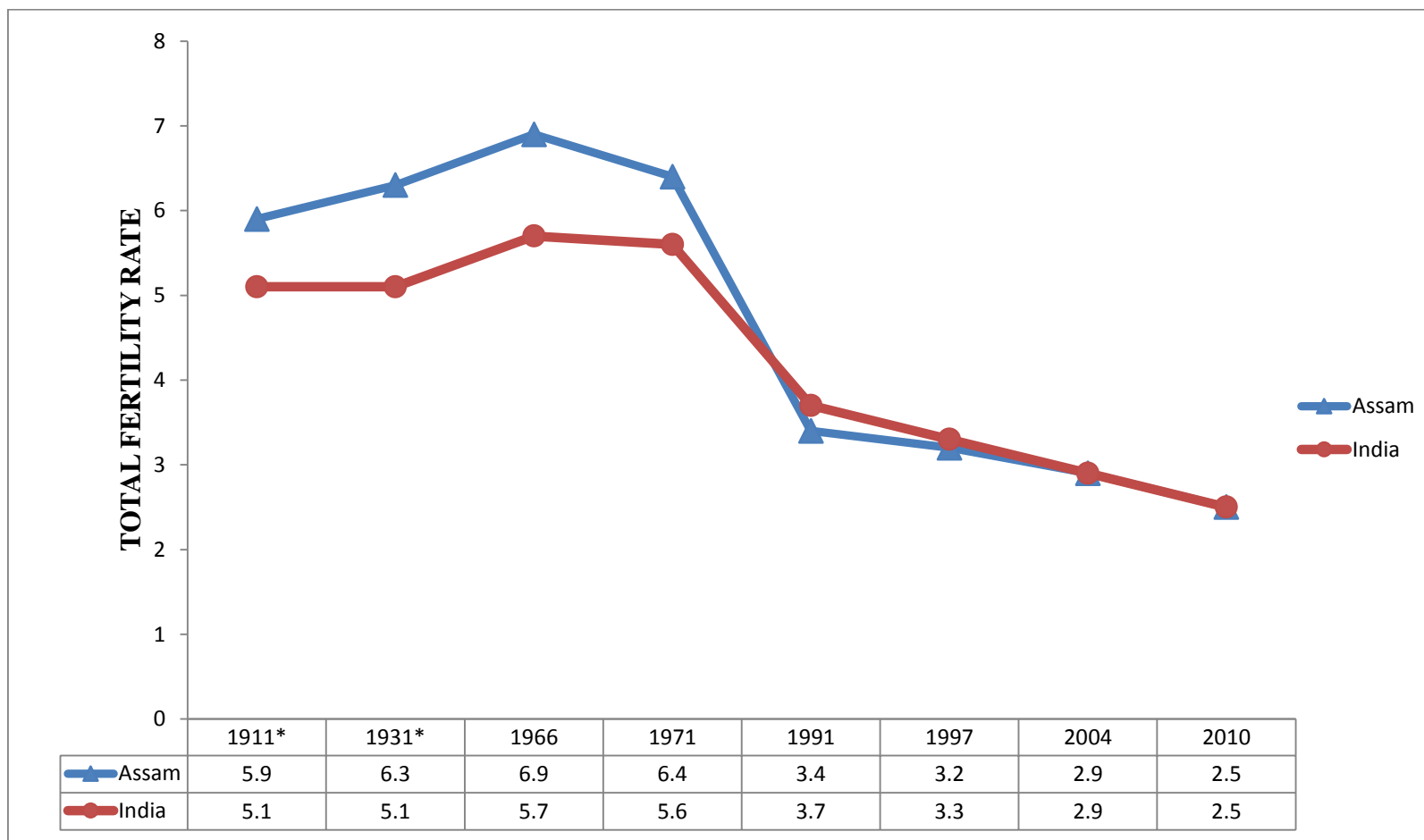
Fig. 4 presents long-term trends in fertility for Assam and India covering the entire period from 1911 to 2010. As discussed earlier, the TFR has been historically higher in Assam vis-à-vis all-India for most of the colonial period and in fact, most of the period following Independence as well. It is interesting to note that the TFR showed a rising trend in Assam as well as all-India from at least the beginning of the 1900s till

the middle of the 1960s. Significant downward movement in fertility occurred during the late 1960s, marking the onset of the third phase of fertility transition in both the former and the latter regions (Fig. 4). Interestingly, SRS data reveal that at the point of downturn, fertility rates in Assam were among the highest in India. While the all-India fertility during 1966 was nearly 5.7 children per woman, Assam evinced a fertility of around 6.9 children per woman; which was slightly more than one child per woman as compared to the national average. Nevertheless, the TFR in Assam declined substantially during the following three decades, and by early 1990s, Assam evinced comparable fertility with all-India, though it was still above replacement level.

It is quite remarkable that most of the fertility decline in Assam had in fact, been achieved prior to the 1990s. In fact, as can be seen from Fig. 4, fertility declined relatively more sharply between 1966 and 1991 (at the average rate of around 0.14 children per year), whereas the decline was much smaller (and indeed, less than half that of the former period, at around 0.05 children a year on average) between 1991 and 2010. In fact, Assam's TFR was slightly *below* the national average during 1991. However, fertility decline could not continue with the same velocity thereafter so that during 2004, the Indian average fertility rate caught up with that of Assam. In other words, fertility decline in Assam, as in the remaining states of the North-east also probably suffered a setback after the 1990s.

Overall, official statistics from the NFHS, as also from the SRS to a certain extent, suggest a slowdown in the pace of fertility decline in NER, and the former in fact, suggests the possibility of a rise in fertility among several states of NER during 1990 to 2005. However, there remains some confusion regarding the real trend in the case of these states. Indeed, while it is easy to overlook this finding as a possible short

FIG. 4: TRENDS IN TOTAL FERTILITY RATES IN ASSAM AND INDIA, 1911 TO 2010



Note: * TFR estimates derived by author using Rele method for respective years.

Source: Bhat, Preston and Dyson, 1984; Registrar General (various years)

term fluctuation or a data error (partly due to the reason that population-wise, these states are among the smallest in the Indian subcontinent),²² it would be unwise to do so without a deeper investigation. In the following section, we undertake the indirect estimation of fertility for NER and its constituent states for the period following the 1990s.

3.2.3 Indirect Fertility Estimates Based On Census Data: NER and States

Census information on children ever born to women tabulated by age groups can be used for the indirect estimation of fertility, primarily through the Brass method (Brass, 1968) with its various modifications [such as the Arriaga-Arretx method, Arriaga (1983)] and the Own-children method (Grabill and Cho, 1965 etc). Among the indirect methods of fertility estimation for India from Census data, the more commonly used have been the Brass's P/F method (1968) and its various modifications (Registrar General, 1984b; 1997), the method of reverse survival (Bhat, 1994; Guilmoto and Rajan, 2001) and the Rele method (1987). In addition to this researchers have also applied the own children method of fertility estimation (Retherford et. al. 1997). It should however be noted that as opposed to the Brass method and Own children method, which estimate current fertility, the reverse survival method generates estimates of the CBR, and thus the latter has to be necessarily combined with some regression based method, which would predict the relationship between the CBR and the current fertility rate.

²² Indeed, it would be rather difficult to explain why such an error in data should be manifest only in the case of the NER and not the other states of India.

The TFR estimates generated by the Brass method (1968) are generally used to check the accuracy of the estimates generated by direct methods, like those from the NFHS or SRS. This method is based on the assumption that fertility has been constant in the past, that the pattern (although, of course, not the level) of the recorded age-specific fertility rates (ASFR) is correct, and that the level of lifetime fertility of the younger cohorts provided by the children ever born (CEB) is correct. The recorded ASFR data are cumulated and graduated to be in the form of CEB. Under the assumption of constant fertility, these transformed data (F) are comparable to the recorded CEB. The ratios of CEB/ F for the younger age groups are assumed to provide possible adjustment factors to be applied to the recorded fertility rates.

Arriaga (1983) later modified the method and extended it to the situation of changing fertility. Rather than transforming the recorded ASFR figures to CEB-type figures, he suggested transforming the recorded CEB data into estimates of age-specific fertility. The method is better suited to cases where children ever born data are available at two points in time (for instance two consecutive Census enumerations). The approach of Arriaga can be described in the following steps (i) to obtain average number of children ever born for women exact age x at the time of the first and second enumeration [$CEB_x(t_1)$ and $CEB_x(t_2)$] through graduation by a ninth degree polynomial, on the data on children ever born in five-year age groups recorded in each enumeration; (ii) to estimate children ever born at exact age x for the year after the first census [$CEB_x(t_1+1)$] and the year before the second census [$CEB_x(t_2-1)$] by linear interpolation between $CEB_x(t_1)$ and $CEB_x(t_2)$ for every age x ; (iii) to calculate single-year ASFR for the one-year period following the first census as $f_x^1 = CEB_{x+1}(t_1+1) - CEB_x(t_1)$ and for the one-year period preceding the second census as $f_x^2 = CEB_{x+1}(t_2) -$

CEB $x(t_2-1)$; (iv) to ensure that the ASFR at older ages decrease monotonically and exponentially to zero at age 50, adjust the estimated single-year ASFR at ages 40 and over by assuming that $f_x^i = f_{39} + (1 - f_{39})^{(x-39)/11} - 1$; and, finally, (v) to calculate ASFR in conventional five-year age groups for each time period by taking the arithmetic average of the single-year ASFR within each five-year age group. These two sets of ASFRs are then cumulated by age, and the ratios of these cumulated figures provided possible adjustment factors. According to Arriaga, this modification not only has analytical and diagnostic advantages but leads to extension of the method to conditions of changing fertility (Arriaga, 1983: 3-8). If the children ever born (CEB) and fertility pattern data (ASFP) are available from two census enumerations, ASFR can be estimated for the one-year period following the first enumeration and the one-year period preceding the second enumeration (United Nations, 1988).

Here, we use data on children ever born tabulated by age-group of the mother from the 1991 and 2001 Censuses for NER and its constituent states for the indirect estimation of TFR using the Arriaga-Arretx approach.²³ Table 3.1 contains the

²³ Researchers (for instance Mari Bhat, 1996) have used the Reverse survival method (RSM) for the estimation of TFR of India and major states. However, we abstain from using this method as the RSM requires estimates of child mortality which are of doubtful quality (perhaps more so for NER where sample size are smaller). Further, the estimated regression that predicts TFR from estimates of birth rate using RSM might not be particularly suited for NER as these states deviate from the generally observed correspondence between the former and the latter at the all-India level [See Bhat (1996) for further reservations in using RSM]. However, it might also be mentioned here that although the *Arriaga-Arretx* method assumes a closed population, in-migration does not cross six percent of the total population in any of the states of the region in either 1991 or 2001 and hence is very unlikely to disturb our results for all practical purposes.

Also, it is pertinent to mention here that even though we have not corrected the census data for possible age misreporting, visual inspection of the data did not largely reveal any irregularities such as zero parity at older age groups, or fluctuating trends over the various age groups for women. Also, evidence for age concentration (Whipple and Myer's index) for the states of NER suggest tolerable levels of such errors, and in fact, age reporting seems to be much better

Arriaga-Arretx (A-A) estimates of fertility for the North-eastern states for the years 1992 and 2000. Let us begin by examining the level and trend of these estimates over the 1990s. The A-A estimates for the period 1992 for the region as a whole are slightly higher than the national average. Among the individual states we find the highest fertility in Nagaland (slightly more than five births per woman) followed by Arunachal Pradesh (five births per woman) and Meghalaya (slightly less than five births per woman). All the states in NER except Tripura (which had lower fertility) and Manipur (comparable fertility) had higher fertility vis-à-vis India. The relative position of the states in terms of fertility did not change during 2000. However, the fertility rate in NER *increased* slightly during this period while that at the all-India level declined. This resulted in a gap of nearly one child per woman between NER and India during 2000 according to the A-A estimates.

Fertility decline in NER appears to have been stalled during the 1990s both at the aggregate level and at in the majority of the states in the region according to the A-A estimates. In fact, these estimates suggest an increase in fertility during this period in all states except Manipur, Sikkim and Tripura. This seems to reaffirm the finding from the NFHS that there has indeed been a stalling in fertility decline in majority of the states of the region during the 1990s. A careful look at the various estimates shows that the A-A estimates are in greater agreement with the NFHS estimates than the SRS for this period as far as relative ranking of states within NER in terms of fertility is concerned (Table 3.1). In fact, despite some difference in the reference period of the

than the all-India level and closer to advanced states like Kerala (where age misreporting is tolerable) in Manipur, Meghalaya, Nagaland, Sikkim and Tripura (Registrar General, 2001; Borkotoky and Unisa, 2014). More importantly, there is practically very little chance for age reporting to have changed significantly for the period between 1991 and 2001. Hence, we largely ignore such errors and do not expect them to affect our results significantly.

NFHS and the indirect fertility estimates, there is congruence between the two sets of estimates regarding the trend of fertility decline in more than fifty per cent states of the region during this period, thus largely dispelling concerns of an artificial rise in fertility in NER stemming from data problems.

In the remainder of this chapter, we continue our analysis of fertility patterns and trends in NER with existing evidence on related indicators, primarily, the cohort fertility rates. As we shall see presently, fertility decline was in progress in all the states of the region at least since the beginning of the 1980s, dispelling any lingering confusions regarding the possibility of a pre-transitional fertility rise, especially among the tribal majority states of NER after the 1990s. In fact, an examination of changes in the distribution of children by birth order supports a slowdown in the pace of fertility decline in NER during this period. However, before going into that and in the subsequent section, we discuss the issue of stalling fertility decline in NER within the larger context of a global decline in the pace of fertility decline, and especially that witnessed in most of the developing world during the 1990s.

3.2.4 Fertility Stall in NER during the 1990s: A Closer Look

The stall in fertility decline in the North-eastern states can be seen in the wider perspective of a global decrease in the pace and the stall in fertility decline observed among a number of countries in Asia, Latin America, Middle East and Sub-Saharan Africa during the 1990s (Garenne, 2007). While there has been significant decline in fertility in the developing world since the 1960s, after the initial phase of rapid decline, its pace has been slowing down over time (United Nations, 2002). That said, in the

majority of the countries, the pace of decline has been slower for those that had attained relatively lower levels of fertility and faster among those that did not. Overall, the developing countries including India have been undergoing the process of fertility transition for almost the past quarter of a century- albeit at varying paces and under different circumstances. The TFR of the developing countries dropped from 6 births per woman in the late 1960s to 2.9 births in 2000-2005 (Bongaarts 2008). It is interesting to note that among the population-wise largest countries with intermediate fertility levels (i.e. TFR between 5 and 2.5 children per woman) viz. Bangladesh, Brazil, India and Indonesia, fertility decline was relatively slow in India during the period 1970 to 1997, remaining slightly above 3 per woman in 1997.²⁴

The stalling of fertility decline can be considered a relatively recent phenomenon (perhaps not least due to the availability of data for monitoring fertility trends at relatively shorter intervals through the Demographic and Health Surveys). Although it is not difficult to presume that fertility transition is not a smooth and uninterrupted process, it is worrisome when such stalls occur at relatively high levels of fertility. The issue of stalling fertility decline among countries that have begun the transition but are to reach replacement level fertility (the mid-transition countries or those with intermediate fertility level) has been recently brought into sharp focus by Bongaarts (2006). In fact, prior to the 1990s fertility decline had stalled in a handful of countries and investigations into the reasons for fertility stall precede Bongaarts' concern.

Notably, fertility stalls and their explanations (primarily for regions outside the African continent) have been studied by Hirschman (1986) in the context of the Malays

²⁴ In fact it has been argued by researchers (for instance Chaurasia, 2006) that there has been stalling in marital fertility decline in India in the period following the adoption of the target-free approach to family planning after 1995-97.

(one of the major ethnic groups of Malaysia), by Aghajanian for Iran (1991), by Khawaja (2000) for Palestine and by Nahmias and Stecklov (2004) for the Moslems of Israel. Since then, as noted by Bongaarts (2008), the number of countries experiencing fertility stall has increased considerably and currently it is more than a dozen. Of late, quite a few researchers have investigated the phenomenon largely in the context of Sub-Saharan Africa (Garenne, 2007; Moultrie et al., 2008; Shapiro and Gebreselassie, 2007; Schoumaker, 2009) as well as other regions of the developing world (Bongaarts 2008; Eltigani, 2003; Menken, et. al. 2009).

Although researchers are broadly speaking, in consensus with the notion of a stall (absence of a *significant* decline in fertility between two points in time), there is lesser unanimity on the operational definition of a stall. Gendell (1985) listed at least four criteria for identifying a fertility stall- (i) Least Developed Countries (LDCs) where fertility fell from a high level (TFR>5) by at least 20 percent, (ii) rapid decline (0.2 births per year) for a period of at least five years prior to the stall, (iii) failure of fertility to decline at all or at least a decline at half the speed as compared to the period of rapid decline earlier and for a period of at least five years even if the stall subsequently ended, (iv) cases where the stall brought the fertility close to the replacement level should be excluded.

Bongaarts (2006:5) adopted a relatively simple though strict condition of fertility stall. "A country is considered to have stalled if its TFR failed to decline between two DHS surveys while the country was in mid-transition". Thus, this definition of a stall excludes countries where decline in TFR might have been slower compared to earlier periods, and encompasses those where the TFR might have increased during the intervening survey period. Bongaarts (2008) later modified the definition of a stall to

include all mid-transitional countries where the *pace* of fertility decline has been statistically *insignificant* between the last two fertility surveys. Thus, even countries that have experienced slight reduction in fertility would be identified as stalling if the decline has been insignificant. Many researchers in the field have broadly relied (usually implicitly) on the earlier definition of stall as given by Bongaarts²⁵ (Eltigani 2003; Schoumaker 2009; Shapiro and Gebreselassie, 2007; Menken et. al. 2009). However, we have utilized the criterion of insignificant fertility decline in an inter-survey period to identify a stall (naturally, countries or states that have not witnessed a decline at all but a rise in fertility qualify within this definition).

To operationalize the above criterion we employ a one-tail t-test of significance of the difference between sample means for identifying fertility stall. The results are provided in Table 3.2. The significance ratios associated with the decline/stall for the period 1990-92 to 1996-98 indicate that whereas Assam, Arunachal Pradesh and Tripura witnessed significant decline in TFR during this time, Meghalaya and Mizoram had significant rise in their fertility. During this period, there was insignificant change in fertility in Manipur and Nagaland. Thus, four out of seven states experienced fertility stall in NER during the early part of the 1990s. During the period 1996-98 to 2003-05, we find that all the states experienced fertility stall with the exception of Meghalaya.

²⁵ Moultrie (2009) defines stalling in a way similar to Bongaarts, as one where the difference between fertility decline between the stalling period and prior period is significant. Garenne (2007) defined stalls as “periods during which the slope changed from negative (fertility decline) to nil or positive, the change in slope being significant at the $P < 0.05$ level”.

TABLE 3.2: FERTILITY CHANGE AMONG THE NORTH-EASTERN STATES: 1990-92 TO 2003-05

Year	1990-92 (1)	1996-98 (2)	2003-05 (3)	Change (2-1)	Change (3-2)
Arunachal	4.3	2.5	3	-1.8 (-3.24)	0.5 (0.32)
Assam	3.5	2.3	2.4	-1.2 (-10.51)	0.1 (2.66)
Manipur	2.8	3	2.8	0.2 (0.97)	-0.2 (-1.06)
Meghalaya	3.7	4.6	3.8	0.9 (3.44)	-0.8 (-2.05)
Mizoram	2.3	2.9	2.9	0.6 (3.17)	0.0 (0.00)
Nagaland	3.3	3.8	3.7	0.5 (1.52)	-0.1 (-0.36)
Sikkim	-	2.8	2	-	-0.8 (-5.79)
Tripura	2.7	1.9	2.2	-0.8 (-4.15)	0.3 (1.82)

Note: figures in parentheses are the respective values of the t-statistics.

Source: IIPS and ORC Macro, 1995; 2000; 2007

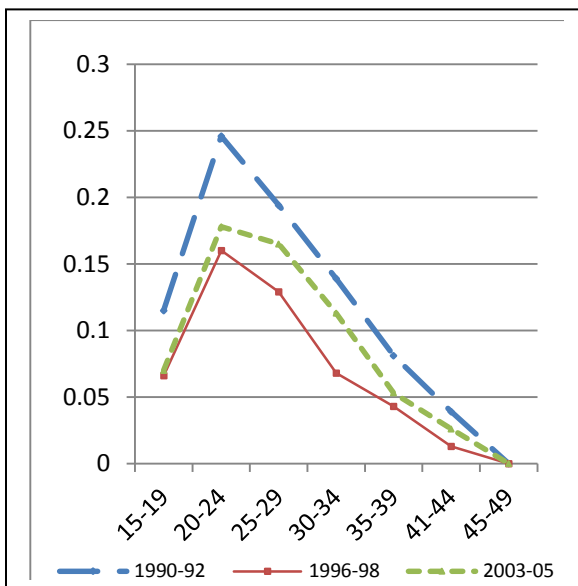
Interestingly, among the states where fertility stalled, it was insignificant in all but Arunachal Pradesh, where it increased during 1996-98 to 2003-05.

During the period 1990-92 to 1996-98, as noted above, fertility declined in Arunachal Pradesh, Assam and Tripura and the decline was observed uniformly across all age-groups (Fig. 5). However, the largest percentage drop was experienced by the older age-groups (41-44 and 35-39) in all the states.²⁶ Among the states that

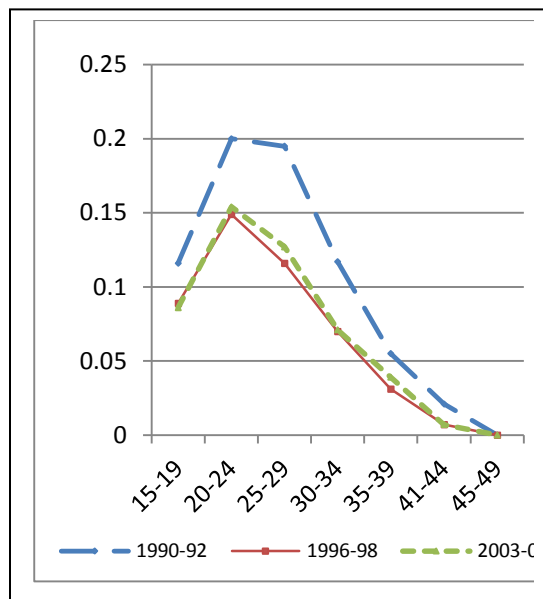
²⁶ This is perhaps not surprising if the decline in fertility has been brought about (as we shall see presently) by the increased use of contraception. In that case, the older cohorts would be able to meet their latent demand for family planning as they may have already attained their desired family size.

Fig 5: AGE-SPECIFIC FERTILITY TRENDS IN NORTH-EASTERN STATES: 1990-92 to 2003-05

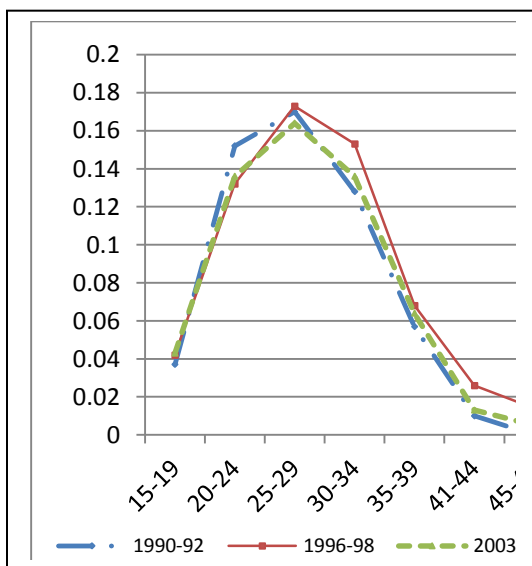
5(a) Arunachal Pradesh



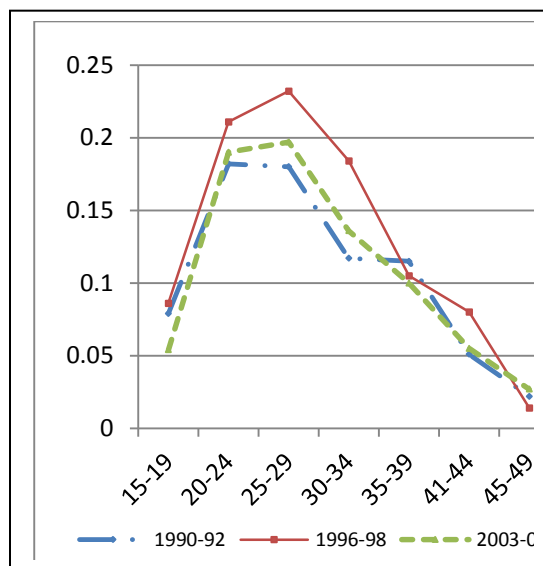
5(b) Assam



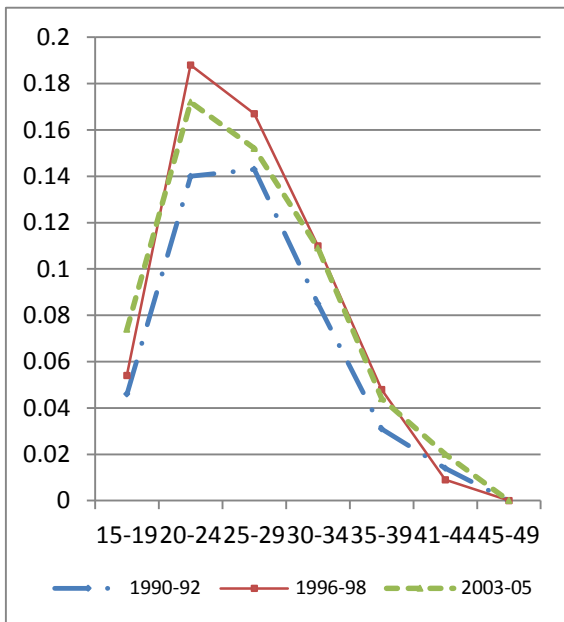
5(c) Manipur



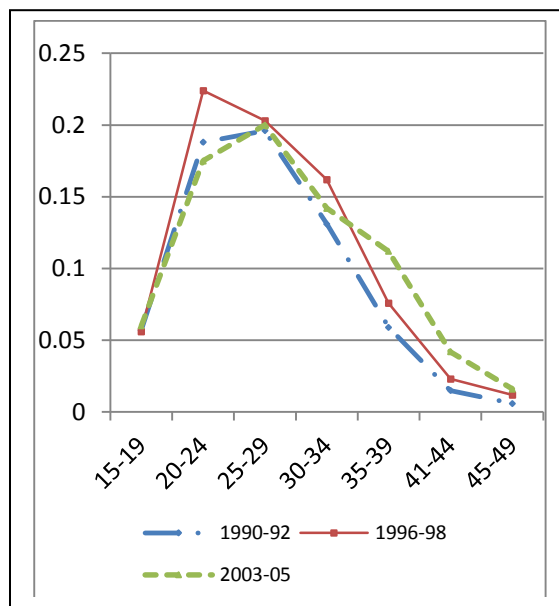
5(d) Meghalaya



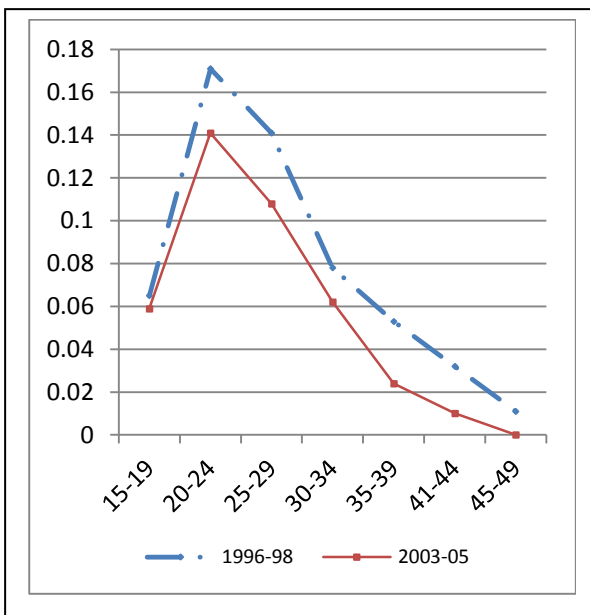
5(e) Mizoram



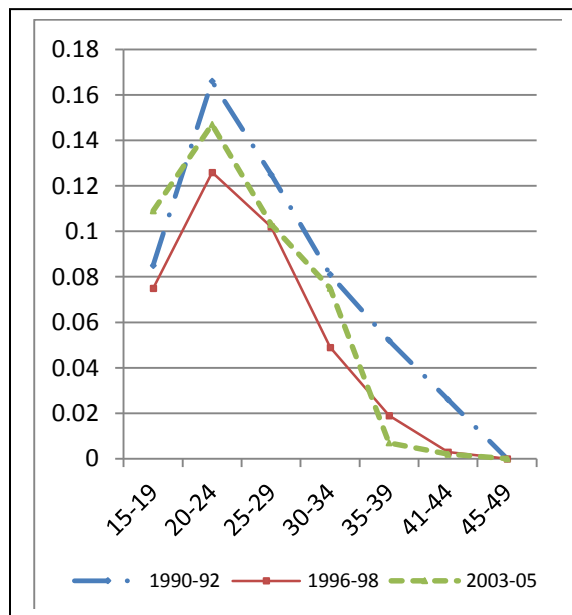
5(f) Nagaland



5(g) Sikkim



5(h) Tripura



Source: IIPS and ORC Macro, 2007

experienced a rise in fertility viz. Meghalaya and Mizoram, there has been no significant decline in any age-group.²⁷

As noted, there has been insignificant decline in fertility during this period in Manipur and Nagaland. In both the cases, the increase in the ASFR between 1990-92 and 1996-98 according to NFHS seems to be a data artifact (in the sense that these are not significant)²⁸. In the subsequent period too (1996-98 to 2003-05), we find that fertility stall, at all age-groups, characterizes the states of NER except Meghalaya that witnessed decline in fertility. Overall, it appears that fertility stall, in whichever states it has occurred is not confined to any particular age-group during both periods. Likewise, the decline in fertility has also occurred across different cohorts among the North-eastern states.

3.3 FERTILITY TRENDS IN NER: A FURTHER EXPLORATION

The period measures of fertility, such as the TFR, are the most frequently used variables for the analysis of fertility patterns and trends, as these capture recent effects on fertility in a given population. However, the cohort fertility measures also contain information that could throw useful light on the (historical) process of fertility transition in NER. Indeed, in contrast to the experience of a synthetic cohort, such as

²⁷ We have tested for the significance of the age-specific fertility rates using the t-test, where data shows minor decline in ASFR that turned out to be insignificant at the five percent level.

²⁸ As expected, there is bound to be some arbitrariness in the selection of the significance level and the rise in fertility in Nagaland, though insignificant at the five percent level, turns out to be significant at the ten percent level. However, for reasons of maintaining comparability of significance level, we stick to the uniform five percent level for all states and both periods. Interestingly, whereas it is theoretically possible that there might have been decline in fertility at some age-groups and increase in others, and the latter compensated for the former, we do not observe any such pattern in Manipur and Nagaland.

the TFR, the cohort fertility measures, such as the children ever born to women aged 45-49, also known as cohort-completed fertility rate (CCFR) or simply the cohort fertility rate (CFR), capture the reproductive experience of a real cohort (birth cohort) of women who have reached the end of their reproductive career. In this sense, an analysis of the trends in CFR overtime inform changes in fertility that are probably closely associated with shared changes in socializing experiences or overall social change as distinct from those emanating from changes in recent socio-economic circumstances and for that matter contemporary changes in the State sponsored family planning programmers (Kye, 2012; Ryder, 1965; Pullum, 1980).

Table 3.3 below presents the CFR measures for the period 1990-92 to 2005-06. Data reveal that the CFR declined marginally for the region as a whole from 1990-92 to 2005-06, suggesting a decline in fertility between women who started their reproductive career during the early 1960s and those during the middle to late 1970s. However, there was a slight rise in the completed fertility estimates for NER between 1990 and 1998, suggesting that no clear declining trend in fertility was discernable at least till the late 1960s. Not surprisingly perhaps, Assam, the largest state of the region, revealed broadly the same pattern as the regional average, though the decline in CFR between 1990 and 2005 was slightly more in the former as compared to the latter. Interestingly, all this is broadly in line with the observations made earlier based on period fertility estimates for the corresponding period from the SRS, suggesting that fertility decline was well underway in Assam by the middle of the 1970s.

More importantly perhaps, the CFR estimates help us in identifying fertility trends among the remaining states of NER, for which we have little information from other sources (even if in a less specific way). Especially interesting is the finding that

TABLE 3.3: COHORT FERTILITY RATE AMONG THE NORTH-EASTERN STATES, 1990 TO 2005

Year	1990-92	1996-98	2003-05
Arunachal	-	4.1	4.7
Assam	4.2	4.3	3.9
Manipur	4.5	4.6	4.1
Meghalaya	4.5	5.5	4.9
Mizoram	4.1	3.9	3.8
Nagaland	3.7	5.2	4.8
Sikkim	-	-	3.4
Tripura	-	3.9	3.8
NER*	4.2	4.4	4.0

Notes: * population-weighted average of individual states. Sikkim has not been included in the CFR estimates of NER for any of the time periods.
Source: Compiled from IIPS and ORC Macro, 1995; 2000; 2007

along with Assam, fertility decline was well underway among the states of Manipur and Mizoram by the middle of the 1970s, as revealed by the negligible rise CFR in the former and indeed, decline in CFR in the latter state between 1990 and 1998. Though we do not have the estimates for Arunachal Pradesh and Tripura for 1990 and hence are unable to gauge the quantum of fertility for these states for the early 1950s, it seems reasonable to assume that fertility decline had perhaps even begun in the latter state during the same time as Assam, Manipur and Mizoram. Hence, overall it appears that among all the states of NER, Meghalaya and Nagaland (and perhaps even Arunachal Pradesh) are the ones that experienced the longest delays in the onset of

fertility decline in NER and that substantial declines in fertility in at least the former two states were evident only during early to mid 1980s.

3.4: An Exploration of Fertility Differentials among North-Eastern States by Demographic and Socio-Economic Characteristics: 1990-2005

Table 3.4 presents fertility differentials by background characteristics for the North-eastern states over the period 1990 to 2005. The emergence and continuation of rural-urban fertility differentials within a population is one of the most widely studied areas in demography. Theoretically speaking, the emergence of such a differential (with urban areas typically evincing lower fertility), has been broadly attributed to the socio-economic changes accompanying urbanization, viz., decline in the net benefits of having a large number of children, as well as the diffusion of the idea of a small family size and more importantly perhaps, the methods to do so (but more on the relationship between urbanization and fertility in Chapter 5). Not surprisingly perhaps, rural fertility is found to be higher than urban fertility among all the states and over the entire period. As noted earlier none of the states of the region experienced continuous decline in fertility for the entire period from 1990 to 2005. Interestingly however, in Meghalaya, Mizoram and Nagaland the rise in fertility between 1990 and 1998 was concentrated in the rural areas, while the urban areas continued to experience fertility decline. As expected, Arunachal Pradesh, Assam and Tripura-the states where fertility declined during the aforementioned period- witnessed a decline in rural fertility alongside urban fertility. Similarly, for the following period (1998 to 2005), we find again that the rise in fertility (among the states that experienced it, of course) was

mainly concentrated in the rural areas. However, there were some indications that even urban fertility rates might have been rising as suggested by the experience of some states such as Arunachal Pradesh and Tripura.

Three more points related to rural –urban fertility (differentials) are perhaps worth mentioning here. First, rural fertility rates are not uniformly high everywhere in NER. For instance, even as early as 1990, rural fertility rates in Assam were near (and in fact, slightly below) replacement level fertility. Indeed, during 2005, rural fertility rates in at least three North-eastern states, viz., Assam, Sikkim and Tripura hovered around replacement level (Table 3.4). Second, there is considerable variation in rural fertility rates among the states of NER and the variation has increased during the period 1990 to 2005, probably suggesting uneven socio-economic growth among the rural areas of NER during this period. Third, the difference between rural and urban fertility rates were relatively speaking, very small during the beginning of the 1990s, but have been increasing overtime, as exemplified by the case of Meghalaya. In fact, there was hardly any difference between rural and urban fertility rates in Meghalaya during the early 1990s. However, by mid 2000s the rural fertility rates were higher than the urban by least two children per woman. The movement of rural and urban fertility rates in Nagaland almost mirrors that of Meghalaya. The developments in the latter two states are however, not entirely unexpected. In fact, the divergence between rural and urban fertility rates in Meghalaya and Nagaland could be explained in terms of the delayed onset of fertility transition in Meghalaya and Nagaland, as mentioned earlier.

TABLE 3.4: FERTILITY BY SOCIO-ECONOMIC CHARACTERISTICS, NORTH-EASTERN STATES: 1990 to 2005

State	Residence		Educational level				Wealth Index				
	Urban	Rural	Illiterate	< middle school	Middle school complete	High school and above	Lowest	Second	Middle	Fourth	Highest
NFHS 1 (1990-92)											
Arunachal Pradesh	2.6	3.2	3.5	2.2	2.1	1.7	-	-	-	-	-
Assam	1.5	1.9	2.1	1.9	1.4	1.0	-	-	-	-	-
Manipur	3.1	3.5	4.0	3.5	2.8	2.4	-	-	-	-	-
Meghalaya	3.1	3.2	3.5	3.2	2.5	2.2	-	-	-	-	-
Mizoram	2.9	3.2	3.6	3.4	2.6	2.2	-	-	-	-	-
Nagaland	3.1	3.2	3.5	3.3	2.8	2.5	-	-	-	-	-
Sikkim	-	-	-	-	-	-	-	-	-	-	-
Tripura	2.7	3.4	4.1	3.3	2.2	1.6	-	-	-	-	-
India	2.7	3.7	4.0	3.0	2.5	2.2	-	-	-	-	-
NFHS 2 (1996-98)											
State	Residence		Educational level				Wealth Index				
	Urban	Rural	Illiterate	< middle school	Middle school complete	High school and above	Low	Middle	High		
Arunachal Pradesh	1.8	2.7	3.1	3.0	2.0	1.6	3.51	2.42	1.96		
Assam	1.5	2.4	2.8	2.4	1.8	1.3	2.96	1.95	1.39		
Manipur	2.4	3.4	3.9	3.2	2.9	2.4	3.79	2.86	2.01		
Meghalaya	2.8	5.2	5.4	5.4	3.7	1.5	6.02	4.10	1.18		
Mizoram	2.4	3.5	4.4	3.4	2.3	2.2	4.62	3.05	1.67		
Nagaland	2.7	4.1	4.5	4.3	3.5	1.8	4.81	3.67	2.32		
Sikkim	-	-	-	-	-	-	-	-	-		
Tripura	1.4	2.0	2.5	2.2	1.3	1.2	2.45	1.62	1.16		
India	2.3	3.1	3.5	2.6	2.3	1.9	3.37	2.85	2.10		
NFHS 3 (2005-06)											
State	Residence		Educational level				Wealth Index				
	Urban	Rural	Illiterate	< middle school	Middle school complete	High school and above	Lowest	Second	Middle	Fourth	Highest
Arunachal Pradesh	2.5	3.2	3.9	-	-	1.8	-	3.91	2.76	2.01	1.98
Assam	1.4	2.6	3.4	2.9	2.1	1.3	4.06	2.86	2.01	1.42	1.21
Manipur	2.3	3.1	3.7	3.4	2.9	2.5	-	3.87	3.14	2.29	2.07
Meghalaya	2.3	4.4	5.2	-	3.5	1.8	-	5.78	4.60	2.64	1.30
Mizoram	2.5	3.3	-	-	2.9	2.1	-	-	3.85	2.91	2.09
Nagaland	2.7	4.2	5.4	-	3.5	2.2	-	6.23	3.75	2.69	1.65
Sikkim	1.3	2.2	-	-	1.9	1.2	-	-	-	2.04	1.12
Tripura	1.7	2.3	3.4	2.1	2.0	-	-	2.68	1.97	1.42	-
India	2.1	2.9	3.5	2.4	2.1	1.8	3.89	3.17	2.58	2.24	1.78

Source: Compiled from IIPS and ORC Macro, 1995; 2000; 2007

Nevertheless it comes as a surprise that even in these states, the divergence has been almost entirely brought about by *rising* rural fertility rates as indicated earlier. Therefore, one cannot escape the conclusion that there is perhaps something more to the pattern of fertility transition among the states of NER, which differentiates it from the 'regular' transitions experienced in the majority of populations elsewhere.

Turning now to fertility differentials by the level of female education, it has been generally found that fertility declines with increase in female education, though the relationship is not necessarily monotonic. In the context of India, though there are a few studies that report that women who have completed primary education may in fact, have slightly higher fertility than those who are illiterate, the relationship between education and fertility has usually followed the inverse pattern (see for instance Parasuraman et al., 1999). NFHS data for the North-eastern states for the period 1990-92 to 2003-05 too finds an inverse relationship between female education and fertility at all levels of education. There is substantial difference between the fertility levels of the various educational categories, with that between illiterate women and those with a primary education also being considerable. Among the states that experienced fertility rise during the period 1990-92 to 1996-98, in Meghalaya and Nagaland, fertility increased at every level of education, except for those who had had attained high school or higher education. In Mizoram, fertility increased among the illiterate women during this period, and remained unchanged for other categories. In sum, fertility rise has been a feature of the lesser educated women from 1990-92 to 1996-98 and fertility decline continued among those who had attained higher education. Interestingly, among the states where fertility declined during this period, in Arunachal Pradesh, even as fertility declined among women from various educational categories, it

increased among those with a primary education. However, in Assam and Tripura, fertility decline was evident across educational categories. Surprisingly, for the following period (i.e. 1998 to 2005), we do not find the pattern observed during the earlier period and in fact, there was an increase in fertility across all educational categories among states that failed to evince a decline in fertility. Remarkably, in Meghalaya (one of the two states that registered a decline in fertility during this period, the other one being Nagaland) fertility declined primarily among the illiterate women during this period. Overall, however, it appears that fertility decline has generally *not* been a feature of the lesser educated women at least as far as the states of North-eastern region of India are concerned.

Fertility differentials according to the wealth index from NFHS data are available from the second round (1996-98), precluding analysis of change in fertility during the earlier half of the nineties. Data for both 1996-98 and 2005-06, suggest that fertility has been invariably higher among those who were placed on the lower rungs of the wealth ladder. Interestingly, fertility differed sharply between the lowest and the middle wealth categories in all the states of NER (except Meghalaya) and moderately between the middle and high wealth categories. For the subsequent period, although the wealth categories are not strictly comparable, we can see that whereas in Arunachal Pradesh there has been rise in fertility among those who are poorer, in Meghalaya, the reduction in fertility is concentrated in the aforementioned category. Among the remaining states of the region, fertility changes, as expected, is not significant among the various categories for which data are available.

Overall, the examination of the process of fertility decline among the states of NER in the post-Independence period reveals that even though fertility had started to

fall in the region and most of its states beginning the early 1970s, much like in the rest of India, it suffered a setback from at least the beginning of the 1990s. Indeed, the rate of reduction in fertility in Assam was higher than the all-India average for at least two decades (from the beginning of the 1970s till the end of the 1980s), and even though the tribal dominated states of the region (primarily Meghalaya and Nagaland) were slow in beginning the transition to low fertility, all the states NER, without exception, had begun the process of fertility transition at least from early to mid 1980s.

Even though there has been some discrepancy in reported fertility trend among the North-eastern states, especially for the period following the 1990s, between the SRS and the NFHS, our indirect fertility estimates using the Arriaga-Arretx method for the concerned period, fail to show a significant decline in fertility among most of the states of NER, thus confirming the stalling of decline fertility in NER, as indicated by the NFHS.

Interestingly, the slowdown in pace of fertility decline in NER has been relatively concentrated in the rural areas. However, the possibility of urban stalling cannot be ruled out as shown by the experience of Arunachal Pradesh and Tripura, where urban fertility rates have registered a rise. Also, an examination of fertility differentials by socio-economic characteristics show that female education (especially at secondary and higher levels) has been associated with fertility decline, even in cases where the reference population group has evinced a stall in fertility decline. Overall, however, it appears that fertility decline has generally *not* been a feature of the lesser educated women at least as far as the states of North-eastern region of India are concerned, thus pointing towards the importance of female education in fertility decline in NER. Finally, and perhaps not surprisingly, fertility is invariably higher

among those in the lower wealth categories as compared to the others. Particularly interesting has been the finding of sharp decline in fertility among populations belonging to the poorest and the middle wealth categories in NER.

With this background, in the following chapter we turn towards an examination of the determinants of fertility in NER and constituent states.