Determinants of Fertility Stall In India: A state-level analysis

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CHAPTER 1

Introduction

1.1 Introduction

The demographic scenario changes from high mortality and high fertility to low mortality and low fertility, which has been experienced throughout the world. In the last few decades, the fertility pattern has changed dramatically in every country, but the rate and pace of declining fertility varies. The best example of these changes is that the French had experienced demographic transition about two hundred years ago. In contrast, in some African countries, it began in the last decade (UN, 2017). The global population continues to increase and it has reached 7.7 billion in mid-2019. Though the pace of population growth has decreased over time since 1950s (2.1% per year 1965-70 to 1.1% 2015-2020); this happened due to decline of world fertility level almost from five in 1950-55 to toward replacement level in 2019 (UN, 2019). Lutz and team's projected (2001) population growth in 2100 of the International Institute for Applied System Analysis (IIASA) state that *"Approximate 85% chance of world's population growth will be stopped before the end of 21st century"*. The demographic trend in many developed countries or even developing country like China are going towards below replacement level or even to ultra-low fertility level, which is a significant emerging issue for them (Longman, 2004), whereas many countries (mainly underdeveloped countries) are still experiencing rapid population growth with high fertility and have inadequate agricultural resources, lack of infrastructure and high incidence of diseases (Alexandratos, 2005). As a part of the controlling population, several developed countries have adopted pro-natal policies, i.e., given some incentives for a higher number of births as they face the consequences of lowest-low fertility. On the other hand, some developing countries adopted anti-natal policies to reduce the total fertility rate at a replacement level. Over time, in these countries, fertility grew at a constant rate in different consecutive years or positively grew over the period. If any country's fertility rate is not declining or positively growing between two successive demographic and health survey (DHS) years, it is called fertility stall (Bongaarts, 2006; Shapiro et al. 2010). Alternatively, in some other articles, the stall in fertility is considered if the statistical technique shows that the changes in TFR over the period is insignificant (Garenne, 2011). Fertility stall is viewed as a barrier for many countries to bring down the fertility level. Bangladesh, India's neighboring country where demographic characteristics are similar, experienced a fertility stall for several years (Bongaarts, 2006). In the work of Bongaarts on fertility transition progress or stagnation in developing countries in 2006 observed that, India did not face any stall condition at the national level. Incontrast, some similar demographic characteristics countries or neighborhood countries of India experienced fertility stall multiple time, for example in sub-Saharan Africa countries like Guinea, Mozambique, Nigeria, Tanzania and Zambia experiencing stalling fertility and Brazil, Colombia, Peru from Latin America exhibiting stalling behavior in the past (Shapiro et.al., 2010). These countries have almost similar demographic characteristics with different Indian states. On the other hand, neighborhood courtiers like Bangladesh and Pakistan experienced fertility stall multiple time ((Bongaarts, 2006; Ismail 2007).Which countries have similar socio-demographic characteristics with Indian states (e.g., Bangladesh with West Bengal, Tripura). Based on this observation, it is assumed that, though at the national level, India has not experienced fertility stall, at the state level fertility stall condition is observed. Based on different country's experience, the present study is an attempt to look into the fertility trend in India.

1.2 Background

1.2.1 History of world fertility decline

About 2000 years after the death of Christ, the world population reached 1 billion that means the world population was growing at 0.04 percent per year on an average from 1 AD to 1650 AD. only in the last 10 to 12 years added one billion population or since 1994 added 2 billion or in previous 200 years added 7 billion population (UN, 2019; Cohen, 1995). The growth of the world population was the highest in 1965 to 1970, when the rate of increase reached 2.1 percent per year on an average. After that the world fertility rate started going down, recording half of the previous growth i.e., 1.1 per year between 2015 and 2020, and it is projected to continue the slowdown until the end of this century. The UN variant projection estimates that the world population could grow to around 8.5 billion in 2030, 9.7 billion in 2050, and 10.9 billion in 2100 (UN 2019; UN 2017). After that it has been predicted that the world population will be stagnant or start growing negatively (Lutz et al., 2001).

1.2.2 History of fertility transition in high populous countries

There are 195 countries globally, spread across the seven continents where 54 countries are in Africa, 48 are in Asia, 44 are in Europe, 33 are in Latin America and the Caribbean, 14 are in Oceania, and 2 are in Northern America, respectively. The world human population was approximately 7.7 billion in April 2019 (World Population Clock, 2019). The population of the world is not evenly distributed throughout the countries or continent. Asia is the most populous continent with 4.5 billion population accounting for 60 percent of the total population of the world, followed by Africa with around 1.28 billion population (16 percent of the world population), Europe with 742 million people making up 10 percent of the world population as of 2018, while the Latin American and Caribbean regions are home to around 651 million (UN, 2010). The distribution of the population is highly distinct among different countries; only eight countries out of 195 contribute more than 50 percent share of the world population, for example, China (18.6%), India (17.7%), United State (4.3%), Indonesia (3.5%), Pakistan (2.8%), Brazil (2.7%), Nigeria (2.6%) and Bangladesh (2.1%) respectively. World fertility data shows that the countries like Rwanda, Kenya, and the Philippines had fertility rates higher than seven children per woman from 1950 to 1955. At the same time, China's fertility rate was just over six and India was under six. From 1950 to 1955, there was only one country in the world with a fertility rate below 2 in tiny Luxembourg. Until 1975-80 some countries subsequently reduced their fertility, e.g., China's fertility reduced to 3 per woman (before 1 child Policy). Simultaneously, some countries' fertility continued to remain high, like Yemen where the fertility rate was 8.5 in 1985 when the global average was four children per woman. Subsequently, global fertility continued to decline, China reached a fertility level of 2.0 in 1992 and has remained below replacement level since then (Xizhe P., 2006). In Iran, the decline of TFR was dramatic over the short period as in 1985 it was 6.2 children per woman reduced to 1.6 during 2013, which is lower than the US, UK, or Sweden (Max Roser, 2014). The decline of the total fertility rate was remarkable in Bangladesh and it is entering the below-replacement fertility club much earlier than the neighboring country of India. The average TFR was found to be 6.3 in 1975; after that, it continued to decline and fall at replacement level in 2011 (Rabbi, 2015). According to the UN 2010 population prospect estimate in most developed countries population growth will remain unchanged because of low TFR in future, but in developing countries population will grow continuously till the end of this century. The report also illustrates that the population increase is the highest in India (350milion) and China (196 million) in between 1990 to 2010.

1.2.3 History of fertility transition in India

India is the seventh largest country (2.4% total land area of the world) in the world, with a population of 1.21 billion i.e. the 17 percent of the global population (2011 census), holding the second rank after China and it's projected to surpass China in 2027 as the world's most populous country (UN 2019). Surprisingly in the 1951 census, India's population was only 68 percent of China, now it is more than 95 percent. After examining different census data (Census 1901-2011) it is observed that the population of India slightly increased from 235 million in 1901 to 358 million in 1951, but recorded considerable jump thereafter to 1.2 billion in 2011, indicating more than three time increase in 60 years period. Now India's population is growing at a declining pace. The annual average of exponential growth rate declined from 2.1 in 1991-2001 to 1.6 in 2001-2011, which is the lowest growth rate since 1961 (Census 1991-2001). Currently, the United Nations estimates in the World Population Prospect that the India's population will reach 1.7 billion by 2050 and will continue to grow marginally until around 2075.

The fertility rate in India began to slow increase in some states in 1960, and the tempo of fertility decline increases after 1980. At present India's fertility rate is close to the replacement level of 2.2 children per woman (NFHS 4). Some scholars of population studies think declining fertility is an outstanding achievement for India because within just 50 years it reached from world's highest fertility club country to replacement fertility level in spite of largest socio-cultural diversity, in contrast, some other researchers suggest India took more time to achieve the replacement fertility than usual. However, after independence the total fertility rate of India decline from 5.8 in 1951-56 to 4.8 in 1976-81 (Rele, 1987). The Sample Registration System (SRS) reveals that the TFR declined from 5 birth per woman in 1971-75 to 2.2 in 2017. The change of fertility decline is not equal in every part of India, it varies from region to region, which is shown in figure 1. The total Fertility Rate in India was more

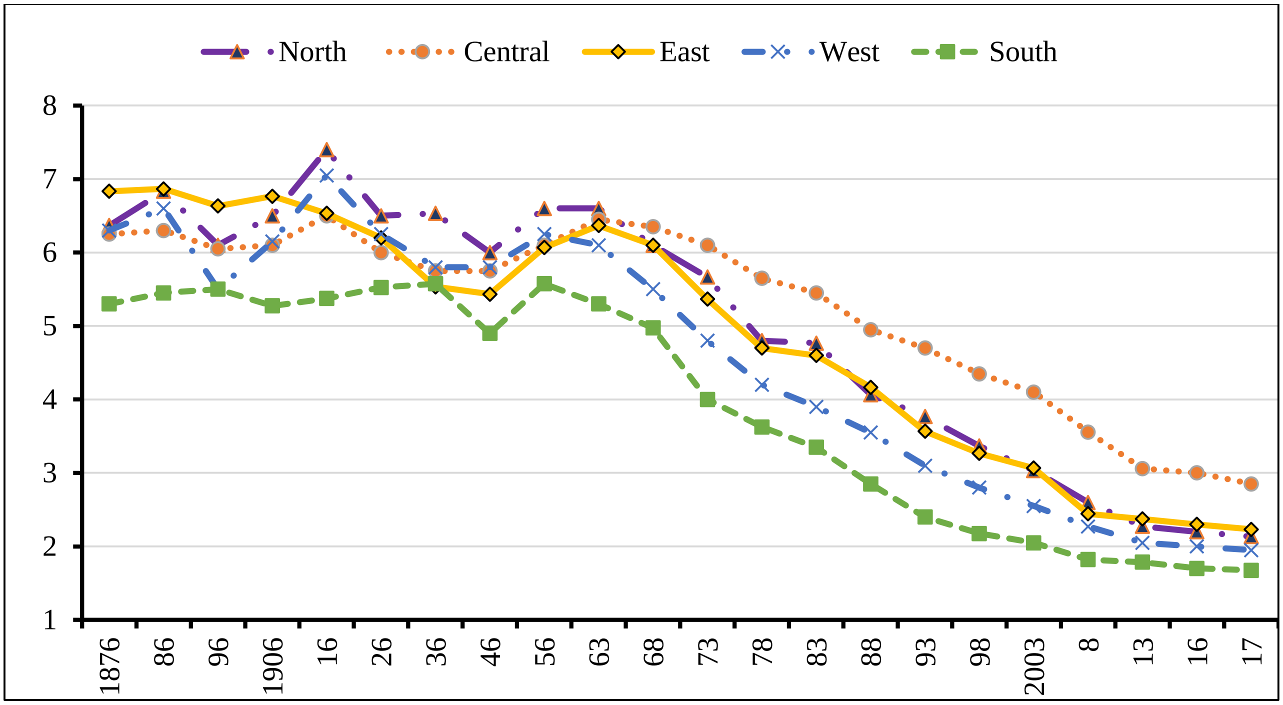


Figure 1.1 Fertility trend in different states of India

Source: Ram and. Ram (2009), Rele (1987), Office of Registrar General of India. (1971-2017)

than 6 before 19th century except for the southern states. Over the period of time, fertility continued to decline at replacement level. Only the northern states (Madhya Pradesh 2.7, Utter Pradesh 3.0) and one eastern state (Bihar 3.2) having higher TFR at present. Several states of India (Punjab 1.6, West Bengal 1.6, Maharashtra 1.7, and all south Indian States) touched the lowest low fertility level (1.2 to 1.7) in the year of 2017. The analysis indicates that the higher diversity of fertility level in different region or states of India and most of the state located in a satisfactory position.

1.3 Literature Review

Stalling fertility is a newly emerging concept in the discipline of demography. World Bank published a report in 1985 on stalling fertility decline in South Korea, Sri Lanka and Costa Rica (Gendell, 1985). After the World Bank report, not a large individual survey focuses on this topic, and after turn of the century UN concentrate on this issue in 2002. At the time of emerging this concept scholars try to relate the fertility stall with future population growth of a country, and they always focus on the limited field due to lack of data availability (Bongaarts, 200 6). After studies various paper on this topic, shows most of the developing or underdeveloped countries experience fertility stall condition; these are Africa (Egypt, Ghana, Kenya, Tanzania), Asia (Bangladesh, Indonesia, Philippines, Iran, Turkey) and Latin America (Colombia, Dominican Republic, Argentina) (Howse, 2015). The literature review is also organised by region to easily get the research gap and outcome differences by region.

1.3.1 Fertility stall and transition in Africa

Since early twenty first century different scholars throughout the world work on fertility stall or reverse of fertility condition on numerous African countries. Among the African countries, Ghana and Kenya experienced constant fertility growth for a longer time (Askew, 2016). Bongaarts in 2006 studied stall fertility transition which also included these two countries. Wastoff and Cross (2006) work extensively in their paper on fertility stall conditions in these two countries. They studied with country level data demographic and health survey and try to comprehend the main factor responsible for fertility stall. After analyzing the predictor of fertility trend over fertility transition and stalling period, the result shows the main reason behind fertility stall in Kenya was plateau of contraceptive prevalence and wanting an additional child. This paper's limitation was that the authors (Wastoff and cross, 2006) try to relate with fertility stall and additional demand of children, whereas the fertility stall mainly depends on child preference or increase number of eventual birth. In this paper, they try to explain the demographic dynamics of the stall in fertility transition, but they failed to provide a full explanation. Askew, Maggwa and Obare (2016) found that Kenya's fertility declined rapidly from 8.1 in 1970 to 3.9 in 2014 and experienced fertility stall between 1993 to 2008. Their analysis shows that Kenya's government shift focused on HIV/AIDS pandemic as the cause of the donor withdrawal their support from family planning program to HIV/AIDS and as a result remarkable rises in Contraceptive Prevalence Rate (CPR) seen over the previous decade. Blacker (2002) another scholar who extensively works on fertility transition in Kenya. He observed in the areas where there are development indicators like under-five mortality, nutrition status, education level and housing amenities, experienced fertility decline. He was of the view that the fertility level of Kenya was not going down below three birth per woman due to stabilization of ideal family size, stall of contraceptive prevalence and the fertility rate for women with at least a secondary level of education (Blacker, 2002). In the work of Odwe, Agwanda, and Khasakhala (2015) on fertility stall in Kenya by DHS data, the result shows at the time of comparing socioeconomic factors during fertility transition, fertility stall occurs in Kenya due to rising poverty and increase in the demand for children and declining use of contraceptive prevalence rate among poor people. In the study on Egypt's fertility conditions, different scholars extensively worked on it to check the transitional condition. The scholar gives attention to this country due to its high population and slow transition. In the study on comparing fertility transition in different periods in Egypt, Eltigani (2003) observed different fertility stall periods. He finds out that the reason for fertility stall is the increased reproduction among the women of high and medium economic group. The author also predicts on Egyptian fertility level; according to his analysis the future fertility transition in Egypt depends on the tendency in desired family size among those two group of women.

The different scholars did their work combining with many countries to test the fertility stall and their responsible factor in Africa. Among these works, some well-known scholar findings have been described below, which review in this study. Shapiro and Gebreselassie (2008) try to relate fertility stall or transition with socioeconomic factors and proximate determinants in sub-Saharan countries by half of Demographic and Health Survey data. Their study counted women's educational attainment, change in infant and child mortality, and GDP growth as per capita as a socio-economic indicator. The results show that women's education and infant and child mortality are responsible for fertility stall in sub-Saharan Africa. Similarly, the other parts of the analysis did not find any significant relation with GDP per capita growth or proximate determinants on the fertility stall in this region. On the other hand analysis of some other scholar like Garenne (2009) and Ezeh et al. (2009) studies found that the fertility stall in sub-Saharan Africa was associated with the level off in the contraceptive prevalence and decline in age at marriage. In their paper, they argue that the rapid population growth is one of the major problems in the world, where fertility stall is a barrier to lowering population growth. The paper of Ezeh et al. (2009) also found that the other responsible factors for fertility stalls are stall or declining female income and female labor force participation, level off in desire for children and rises in adolescent fertility.

The above discussion shows that the results behind fertility stall in African countries ended up with mixed and contradictory results. Some studies support that the fertility stall and family planning condition have well-established relationships (Wastoff and cross, 2006; Blacker, 2002; Garenne, 2009 and Ezeh et al., 2009). Among these scholars also have different opinions related to fertility stall like, someone says fertility stall occurs at the time of plateau of contraception, some said at the time of decline in contraceptive use and others argue it happens due to stall of contraceptive use. Other scholars prove that the fertility stall has no relation with contraceptive prevalence rather they find out a significant relationship between socio-economic condition and fertility stall (Shapiro and Gebreselassie, 2008; Eltigani 2003). After reviewing different articles on sub-Saharan Africa, one thing clearly shows that the maximum number of researchers supporting the fertility stall associated with the increased demand larger family or child preference or additional child (Wastoff and cross, 2006; Blacker, 2002; Agwanda, and Khasakhala, 2015).

1.3.2. Fertility stall in other than Africa and Asia countries

The concept of fertility stall is a newly emerging issue in the studies of human fertility trends. Researchers mainly choose African countries and use Demography and Health Survey (DHS) to analyse the fertility condition. Gendell (1985) is a demographer who considers the first researcher to work on fertility stall. At the time of this analysis DHS was not conducted, so he uses different data sources like the World Bank data, National vital registration data, world fertility surveys to check fertility trend in three countries Costa Rica from Central America and Sri Lanka and South Korea from Asia. His paper shows the total fertility rate of Costa Rica rapid declining after 1960 to mid-1970, but the transition level off or slightly increased between 1976-1980. In his paper, the author discussed why the rapid fertility decline is leveled off in marital fertility and increases of contraceptive use. On the other hand, the study concludes that the fertility stall in Costa Rica due to level off in marital fertility and a weakening in the use of the family planning method. Another pioneering researcher John Bongaarts work on causes of stalling fertility transitions in 2006. His analysis used DHS data to focus on 38 countries, these are 14 from Asia and Latin America and 24 from Africa. Fertility stall condition experienced in seven countries out of thirty eight, and among these two (Colombia 1990, Dominican Republic 1999) from Latin America. He concludes that the pace of increased contraceptive use drops sharply in stall countries and increases contraceptive prevalence rate lower in the stall countries than the other. Here also added the decline in median age at marriage in Colombia and the Dominican Republic was responsible factor for slight increase in fertility or stall fertility condition.

1.3.3 Fertility stall in Asia

After an extensive review, few studies are found exploring the reasons for fertility stalls in the Asian countries, and not a single study observed which is well recognized and exclusively focused on India’s fertility stalls. The study of Gendell on fertility (1985) analysed the fertility stalls in two Asian countries – Korea and Sri Lanka – along with Costa Rica from Central America, where he provided a different explanation for each country. The study of Gendell (1985) presented proximate determinants as the probable reasons for the stalls in those two Asian countries, where programmatic factors were not found to play any significant role. The proximate determinants that were found to influence the Korean fertility stall during the period 1967–1972 included decelerated contraceptive use and declining duration of breastfeeding, while the Sri Lankan fertility stall during the period 1975–1982 was found to be influenced by the rise in marriage and declining duration of breastfeeding. A study was found to explore the causes of Indonesian fertility stall during the period 2002–2012 by using the data of the DHS programme (Kumar, 2016). The study focused only on the role of proximate determinants and tried to find the responsible factor by comparing the changes in the effects of major proximate determinants during fertility-stalling periods with those during the transitioning fertility period in Indonesia. The study concluded that reduced duration of breastfeeding was the reason for that stall (Kumar, 2016). The study on Indonesia did not prioritize the effects of other factors whose increased fertility-inhibiting effects could surpass the fertility-increasing effect of declining breastfeeding duration, which in turn could contribute to the continuation of fertility decline even in late-transitional stage.

Along with the other Asian countries, Bangladesh also experienced two stalls in its fertility decline in two different fertility transition stages in a space of a decade. The first stall occurred in the middle stage of fertility transition during the period 1996–2000, while the second stall occurred in the late-transition of fertility during the period 2011–2014 (BDHS, 2014). Bongaarts's (2006) was the first pioneer observer to examine the fertility stall (1996–2000) of Bangladesh in detail. The study mainly used the DHS program data and compared the trends in various fertility determinants in Bangladesh during the stalling period with those in the fertility-declining countries. The study could not provide any concrete conclusion about that stall in Bangladesh, as contraceptive use was observed to increase during that stalling period. Islam (2007) highlighted different explanations regarding the fertility stall from 1996 to 2000 in Bangladesh where he argued, slow decline in child mortality relative to the increase in contraceptive use causes stall in some division of Bangladesh; those divisional stalls play an important role for fertility stall at the national level. However, the most doubtful part of Islam's work is that he relates the effect of slow decline in child mortality on fertility with the increasing fertility-inhabiting effect of increasing contraception use. Because these effect directly impact on decline in induced abortion and post-partum infecundibility or increased marriage, which have direct impact on conception and child birth (Bongaarts, 1982).

Besides the studies on the aforementioned countries, India also suffered from high population growth resulting from persistently high fertility. Many regions in these countries also experienced fertility stall that impeded the achievement of national fertility targets and lowering the population growth, but no study was found to investigate in brief the fertility stalls in the states of these countries.

1. 4 Definition of Fertility Stall

After examining different literature, it is clear that the researcher defines fertility stall by adopting two different approaches: the periodic method and the point estimate method. The majority of the studies applied periodic method to estimate fertility stall where it is assumed that, after starting fertility transition it will level off or increase in the next survey period. (Bogaarts, 2008; Eltigani, 2003). Another scholar, Gendell in 1985 describes some criteria by using periodic method to define fertility stall; fertility must be started in transition for some years, second is fertility must be stop for few years, and when the stall fertility comes to an end then the fertility must have resumed. Bongaarts is a pioneer researcher in the fertility field, contributing to some important work on fertility stalls in sub-Saharan countries and developing countries of Asia. He introduces a more straightforward and less rigorous definition for fertility stall in his paper (2006). According to him (i), fertility decline can only be stalled in a country where fertility transition has already started, countries with pre-transitional level (TFR >5) are not consider as cases of stalling, (ii) fertility can only be stall in mid transition (TFR 2.5-5) countries, (iii) countries which experienced replacement level (TFR 2.1) fertility are not being counted as stall fertility. In another paper Bongaarts (2008) modified his definition, as any countries fertility level decline less than 0.25 children per woman between two Demographic and Health Survey (DHS) could also be regarded to have stalled since these declines were too small to be statistically significant. The remaining studies define fertility trend to be stalled as a point during which the slope recorded a statistically significant change from negative to nil or positive (Gerenne, 2011). The strict criteria to measure fertility stall with a linear regression model was elaborated by Gendell. Fertility stall calculation through regression model must be observed, a statistical significance variation on fertility level over two time period of at least five years interval and a slope of the line of stalling periods did not fluctuate significantly from zero (Moultrie et.al 2008). Nonetheless, Bongaarts (2008) argued that we don't get any information regarding the pace of decline from the presence or absence of a significant decline, it can not specify whether the fertility decline is different from zero.

Uses of various tasting fertility stall methods in different countries result in controversial findings on how many and which countries experienced fertility decline. But whatever technique is used by the researcher, they must try the accurate measurement of stalling for their respective region. The constant fertility growth for an area is not a long-term process, after a certain period it continues to reduce. The impact of such change may profoundly affect the future growth of population, which was shown in the UN projection of population estimation. UN population projection 2010 estimates India's population surplus china in 2021, but in their 2019 report, it will happen in 2027 (UN 2010, UN 2019). The main reason behind this may be the fertility stall in different states of India.

Considering all the above-mentioned factors, this study first uses different methods to check fertility stall at state level (because all the aforementioned analysis based on the national level) and identify the best fitted model for India's states. All the chapters in this study use the definition of this best fitted model.

1.5 Conceptual Framework

Different demographers published various theories on changes of fertility transition in different times. In 1952, Castro argued that protein deficiency is the cause of fertility increases. In the same decade, another demographer explained how cultural factors control proximate determinants of fertility (Caldwell 1982). But at that time all the demographers are not concerned about the socio-economic factors of fertility decline. First time Thomas Robert Malthus in his theory principle of population in 1798 considered that late marriage is one of the means to control birth (Van de Kaa, 1987). Earlier Kingly Davis and Judith Black introduced an analytical framework of intermediate determinants of fertility that effected intercourse gestation and successful parturition. They observed different behavioural and biological factor among this socio-cultural and environmental factor influence fertility (Davis and Black, 1956)

Since observed different aspects of fertility change, socio-economic development is the prime factor of a decline over time in the benefits of having children and rise in their cost. After considering the cost benefit analysis by the parents they going for fewer children. Increases in child survival is a leading cause to reduce the number of desired children in many families. In any region, people going for lower children automatically increase the demand for using family planning methods (Bongaarts, 2006). After studies of fertility transition in different parts of the world, most of the work guided some analytical model (three or four) (Bongaarts, 2006; Ezeh et al., 2009; Gendell, 1985). This model is classified into three categories, socio economic factor, reproductive preference and use of family planning which cover up all the factors done by the previous researcher and included some new ones.

The analytical framework in this study has been constructed under the hypothesis that fertility stall was set in by the deterioration or stall in certain responsible factors have causal link with fertility. Conventional theories on fertility have included various factors ranging from socio-economic characteristics to the physiological and psychological aspects of the individuals. For the analytical framework of this study, these factors have been segregated in a slightly distinct way to study their influences under the model where they fit functionally more accurately on the basis of their causal link with fertility. The chains of relationships between these factors and fertility course have been presented in Figure 2.1. Socio-economic factors are those that represent the social and economic background of an individual or a group. Socio-economic factors commonly used in fertility studies include education, level of wealth possession, residence, religion, etc. (Hayes & Jones, 2015; Miah, 1993). Reproductive preferences reflect the desire of an individual regarding desired family size, Son preference, and unintended birth. The family planning factor referred to using modern contraception, adolescent child bearing, access & acceptability of family planning.

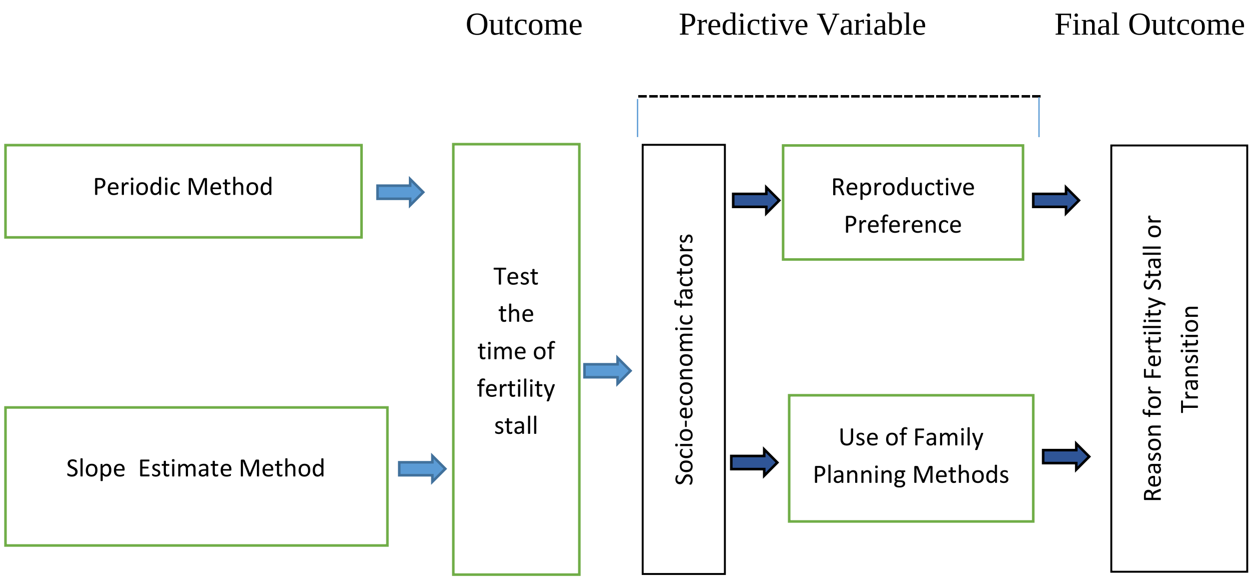


Figure 2.1 Analytical framework for the factors associated with fertility stall

1.6 Need for the Study

A growing number of studies advocate fertility stall in different countries (developing country) through out the world, but the researchers overlook the stalling condition in India at state level. This study examines fertility stall at the state level along with considering regional variation so that if the effect of one predictor cannot be examined at one level it can be examined at another level. Analysis of fertility stall in different states (region wise) will help to understand the characteristics of cross regional variation in the different level of fertility stall. Several previous works (Shapiro, 2010; Bongaarts, 2008) examine the fertility transition in India at national level, but in their analysis did not observe any stall in fertility condition. It is assumed from the neighborhood country that, if at national level fertility stall was not experienced in India but at state level must be experienced fertility stall at different time, and because of that in different states where fertility level is above 2.5 in 1990 but could not reach at replacement level or the state where TFR at replacement level in before 21st century but could not reach at ultralow fertilituy level until now. Findings of this study can directly be fed to policy formulation, if any states experienced fertility stall multiple times or one time may help in reversing into fertility transition, which will be reduced the population pressure. . Result of this study may also help to reduce the risk of stall in currently fertility transition countries.

1.7 Research Questions

- Which is the most appropriate method for testing stall fertility measure at state level
- What was the scenario of fertility decline and time of fertility stall condition in different states of India and are there any relation with less or more developed states criteria.
- What were the causes of fertility stall and stall fertility transition in different states of India?
- What are the responsible factors for fertility decline in fertility stall states?

1.8 Objectives

- To identify fertility trend and stall at the state level of India, and highlighted the situation of stall condition in different states by adopting different methods.
- To determine the role of Socio-economic condition, reproductive preference and uses of family planning method on fertility stall
- To examine the responsible factors for fertility decline in fertility stall states.

1.9 Organisation of the Study

The study has been presented in five chapters. The first chapter introduced the background, review of literature, research question, objective of the study while the second chapter stated data source and methodology. The fertility stall estimation by different methods and choosing the best one have been presented in the third chapter. The fourth chapter determinants the role of Socio-economic condition, reproductive preference and uses of family planning method on fertility stall and the cause of fertility decline in fertility stall states. The findings of the study are summarised and conclude in the last chapter, the fifth chapter. The reference to the study were attached in the last portion of the dissertation after the fifth chapter.

CHAPTER 2

Data and Methodology

This chapter provides an account of the data sources and methods of analyses used in the study. This study has used data from multiple sources and used multiple methods to fulfill its objectives. They are discussed in the following section.

2.1 Data Sources

In this study data has been obtained mainly from secondary sources. Data include a fourth round of National and Family Health Survey (NFHS) (IIPS and Macro International, 1992-2016) to assess the fertility transition and stall condition in different consecutive periods and analyse the main factors responsible behind this condition. The fourth round of India's NFHS is a widely used source of information for estimating fertility, mortality, women, and child health trend in each state and union territory. TFR, socio-economic condition, reproductive preference, and use of family planning methods are the indicators considered for fourth NFHS rounds. Analysis of this study is based on NFHS program in different states of India. A total of four survey were conducted between 1992/93 to 2015/16. Calculated data mainly extracted from the published report. If the facts are not available in the report, then the data has been extracted from the raw data file.

Table 2.1 Year of survey and number of states include in the analysis

Survey year	Total states	No of states include in the analysis
1992/93	25	25
1998/99	26	26
2005/06	29	26

Sourrce: Survey condected under NFHS programme (NFHS 1 to 4)

The data of NFHS (worldwide known as Demographic and Health Survey) has used a multi-stage sampling technique. The two-stage sampling design was adopted for rural India and three-stage sampling design was chosen for urban India. The survey sample size was quantified in terms of target number, which was determined based on the total population in each state or territory. The surveyor interviewed women of reproductive age who entered into a sexual relationship to collect fertility-related information. The people usually get the social sanction of entering into a sexual relationship through marriage. Thus, the survey information related to fertility was collected by asking question only to ever-married women. The number of eligible women interviewed in the first survey was 89,777 (in 1992-93 survey) whereas it was 699,686 (in 2015-16 survey) during the fourth survey with a response rate of 97 percent.

2.1.1 Data Quality Assessment

India is a large country with a substantial number of illiterate or middle to low educated people. So in any survey there are chances of different type of sampling or non-sampling error. Some researchers related to data quality in India talk more about the issue such as comparability between two survey or survey data or in longitudinal or cross-sectional studies compare between one survey to the next survey, incompleteness of survey area or information, length of survey, reporting bias, social desirability bias and data collectors behavior bias. In these studies measures of fertility stall condition is highly sensitive to analyse, a small error may change the trend of fertility estimate. Fertility related information are very complicated to underreporting of birth events, missing data or sampling error. Misreporting of birth information indicates the increases of TFR, which define fertility stall when it is not. It is not possible here to assess whole NFHS data quality, but only try to summarize the available data that used in this work.

Table 2.2 Number of eligible women interviewed and the response rate in the National Family and Helath survey

Survey Year	No of Interviewed	Response rate (%)
1992/1993	89777	96.1
1998/1999	90303	95.5
2005/2006	124385	94.5
2015/2016	699686	97.0

In the view of birth-related information from different NFHS report books highlighted various question on sampling error. In general, reporting error in birth events is considered if there is a rapidly increasing the fertility rate without increases the number of samples. In some states sharp decline in birth, whereas rapid increases in the number of women interviewed are replicated in the sharp decline in fertility during the stalling period (NFHS II to NFHS-III & NFHS-III to NFHS-IV). It is very important to collect data from interviewed women and events should be portraying with the real scenario of an area. Otherwise, they may produce too many missing cases that reflect misleading results. The response rate indicates the best measure of the completeness of the survey. The report shows the response rate in all the interviewed women in all states was high. In the fertility stall analysis, data collection related to birth are very important. The National Family and Health Survey reports show that the percentage of birth three years preceding the survey with complete birth data was relatively high, ranging from 98 to 100 in all the states (NFHS-I, NFHS-II, NFHS-III, NFHS-IV). In the survey method, sampling error one of the significant challenging issues for quality of data. The sampling error was observed higher for smaller sample size, and in large sample size increases the probability of non-sampling error. Numerous manuals were prepared for various training programs to maintain a standardized survey method in NFHS data in all states and minimize nonsampling error and ensure data quality. The NFHS table “estimates of sampling error” shows that the relative error of the total fertility rate in all states was much lower in all survey periods. The number of sample collection increases from NFHS-I to NFHS-IV, consequently the relative error of fertility were lower in recent survey period also. The data quality observation from the NFHS report concludes that the number of birth and sample size was quite consistent, the data coverage and reporting of complete birth data rather high and sampling error low in all surveys. The observing analysis accomplishes that the survey were not dauntless problem which explicitly distorts the fertility estimate.

The discussion above reveals that the NFHS data are very authentic source for fertility estimates. Some articles also express the misleading of the quality of NFHS data due to unexpected results in some variable. Because of that, in chapter 3, use two methods for fertility analysis, one directly collected from the cohort measure of raw data and another method we estimate from slope estimate fertility stall.

2.2 Methodology

The methodology of this chapter is divided into several subsections that include the concepts, theoretical framework, statistical methods and organisation of the study.

2.2.1 Concept

The fertility stall condition considered for three consecutive periods in between 2nd, 3rd and 4th surveys. Different scholars provided distinct definitions to represent fertility stall, but their view of considering fertility stall is much similar to consider must have fertility transition period before fertility stalling (Bongaarts, 2008; Shapiro, 2010; Garenne 2009). This study uses the definition of leveling off or increases fertility level in between two or more consecutive years.

In this study uses suitable model to study the individual or group effect on fertility stall. The variable categorized into different group these are

2.2.1. i. Socio-economic factors

Socio economic condition of any country or region directly or indirectly influence fertility transition or stalling. The analysis of George Odwe (2015) suggested that the fertility condition of a nation depends on the economic status of people, poverty is the major factor for stagnation of fertility transition. They also said in their article, poor people are unable to purchase contraceptive use which effects birth control and results in a fertility stall. Most of the time socio-economic factors control fertility behaviour of couples, which influences childbearing characteristics (Bulatao and Casterline, 2001). Socio-economic and cultural aspects indirectly determine the use of birth control through reproductive preference and directly influence on couple to use birth control through diffusion of information about the benefits of using birth control on reproductive health and purchasing power capacity (Giusti & Vignoli, 2006; Mahmood & Ringheim, 1996). In this study using the socio-economic variable from NFHS are (i) mother's education,(ii) wealth quintile (iii) paid employment (iv) age at marriage, (v) institutional delivery (vi) infant and child mortality. Bongaarts and Watkins (1996) examine in their article that as the socio economic condition goes up, fertility decline occurs at progressively lower level. It also appears that improvement of socio economic conditions will contribute to more fertility decline while worsening socio economic conditions will lead to slower fertility decline and increase the probability of higher fertility rate (Shafiro, 2010).

2.2.1.ii. Reproductive preference

The characteristics of reproductive preference significantly effects the outcome of increased fertility transition or level off fertility condition. Socio-economic factors and family planning services consider the main factors for influencing human mind to determine reproductive preference and behaviour (Gubhaju, 2007; Smith, 1989). The reproductive preference of couples examined from three variables in the analysis are (i) Son preference, (ii) Desired family size, and (iii) unwanted pregnancy. Basu (2009) argues that fertility stabilizes near replacement level in the south Asian countries due to son preference. In Korea couples want one son, and when they have one son never go for another child unless he is their only living children (Gendell, 1985). Desired family size and unintended birth and fertility stall have a positive relation, if the number of children increases or unintended birth increases then the TFR automatically grows up. An analysis of fertility stall transition in Kenya shows declining fertility stall in two consecutive survey period of DHS because of wanting more children (Westoff & Cross, 2006). Existing literature suggests that fertility preference controls the use of family planning through goal achievement, if couples achieve their desired family size, they use contraceptives otherwise, they never used any family planning method. Palmore & Concepcion (1981) Ezeh (2012) argue that the increased landlessness, modern technology use for farming, rise in job opportunities in non-agricultural sector and effective family planning programme decreases demand for children and stall fertility started to decline.

2.2.1.iii. Use of Family Planning

The relation between family planning and fertility stall or transition comes out always contradictory from different scholars. Some agree that it is a background factor of fertility stall and someone disagrees with this argument. A study in Asian countries on fertility suggests that the lower fertility transition in the region was mainly for rise age at marriage, birth spacing, use of modern contraception, teen age child bearing (Gubhaju & Moriki-Durand, 2003). In the study of Westoff and Cross (2006), suggested in their working paper, the fertility rate had been declining a quarter of century and contraceptive prevalence increased at the same time in Kenya. This study induced variables such as (i) use of modern contraceptives, (ii) adolescent childbearing, (iii) Women in union, (iv) unmet needs for family planning, (v) hear/saw/read family planning on TV, radio and newspaper. Research on different developing countries observed that the fertility stall and leveling off or sharp deceleration in the trend in contraceptive use have well established interconnection (Bongaarts, 2006).

2.2.2 Geographical and Socio-demographic differences in analysis perspective

This study examines the different states as a particular region to understand regional and state similarities and differences. The main chapter of the analysis tries to find out the important factors that are consistently associated with the fertility stall among different states, mainly by comparing the trends in the relevant factors of fertility change during the study period with the fertility trends during that period. The rationale of the analysis in this study regarding the regional cultural differences is explained as follows.

India is popularly known across the world for its diversity. It is home to the largest number of different socio-cultural groups (based on caste, religion, language etc.), demographic distinctness and diversity in geographical area. India is the seventh largest and 2^{nd} populous country in the world. There is diversity in the physical feature like dry deserts in the western region, evergreen forests, snowy Himalaya in the northern side, a long coast in the east to west (West Bengal to Gujarat), fertile plains observed in the middle of India. Indian culture is one of the oldest and unique. There is incredible cultural diversity throughout the country. The South, North and Northeast have their own distinct culture and almost every state has carved its own cultural niche. Most of the states in India having Hindu majority, whereas seven states/UTs have Hindus in minority. They are Jammu and Kashmir, with majority Muslim (68.3%), Nagaland (87.9%), Mizoram (87.2%) and Meghalaya (74.6%) with Christian majority, while Punjab predominantly inhabited by Sikhs (57.7%; GOI, 2011). The majority of India's people are Hindus (79.8%), and the caste system among them is divided into four categories- Brahmins, Kshatriyas, Vaishyas and the Shudras. India is also the land of diverse tribal groups. Among these castes, there are 3000 sub-castes and more than 300 tribal groups live in different states. One tribal group is distinct from other groups in terms of customs, practices, tradition, faith and language. Among these groups, most socio-economically marginalized are constitutionally scheduled and referred as scheduled castes and scheduled tribes. Like other marginal groups, they sometimes have higher fertility. The Scheduled Caste (SC) and Scheduled Tribe peopleare habitat through-out the country with varying frequency. This study obeys the modern theory of fertility transition, contributing to the influence of core cultural factors on fertility transition (Bongraats, 2006; Casterline & et al., 2001). The work of fertility change in India by different prominent scholars did not put much emphasis on the influence of the core cultural factors like caste, tribe, and religion (Dharmalingam, Rajan, & Morgan, 2014; Mohanty, Fink, Chauhan, & Canning, 2016). These cultural differences are also observed in demographic distinctiveness, like educational qualification, sex ratio, women work participation, etc., in different states. Such as in the state of Kerala (93.41%), Mizoram (91.58%), Goa (87.40) literacy rate is high as compared to the northern states of Bihar (63.82%), Uttar

Pradesh (69.72%) and Madhya Pradesh(70.63%). Similarly, women work participation is high in most of the developed states than economically weaker states (GOI, 2011).

After observing all the above fact, this study considers all Indian states as a unit of analysis for fertility stall in the light of the analytical framework developed for this study. This study intends to estimate fertility stall and explain the reasons for fertility stalls at the state level of India, and then the analysis tries to determine the causes of fertility transitions in stalled states.

2.2.3 Variables, Measures and Classifications

This study focused on the reasons for the stall taking place between the 2nd to 3^{rd} and 3^{rd} to 4^{th} NFHS survey**.** Different scholars have discussed the definition of fertility stall in different ways, which already has been elaborated in earlier chapters. The fertility stall analysis is considered to level off or increase the total fertility rate between two consecutive surveys. According to this, if any state's fertility transition between 2nd to 3rd or 3rd to 4th survey has experienced no improvement or decline in progress, then the state is said to have experienced fertility stall and in regression analysis the state is coded as 1. Otherwise fertility trend is classified as declining and coded as 0.

In this study, all the variables that are strongly connected with the fertility event are also related to the occurrence of the fertility stall. In India, due to social-cultural or political conflict after independence, different time originated new states. This analysis included only those states that were present in NFHS-1 and NFHS-2; because of this, states like Jharkhand, Chhattisgarh, and Uttarakhand were merged with their parent states . To understand the effects of the variables under the most suitable model, variables are classified into three broad categories which is discussed in above. The variables included considering the work on previous work on fertility stall and availability of data are classified as follows: (a) socio-economic factors: (i) mother’s education, (ii) age at marriage, (iii) infant and child mortality, and (iv) wealth quintile, (b) reproductive preference: (i) son preference, (ii) desired family size and (iii) unintended birth, (c) use of family planning: (i) use of modern contraception, (ii) adolescent childbearing, (iii) women in union, (iv) mass media exposure on family planning. All the factors in this analysis are measured in terms of percent except that of under five mortality and infant death. Desired family size is calculated as the mean size of ideal number of children (less than 2) among the family during the study period.

Infant death is measured as the death below one year and under five mortality rates are measured as death at age zero to four years per thousand of live births. Wealth index is directly used from the NFHS individual level data, where the poor households are considered in the lowest and second quintile. Adolescent childbearing measures the proportion of women in age group 15 to 19 who has become a mother.

2.2.4 Statistical Methods

To fulfill the objective and test hypothesis of this study, univariate, bivariate and multivariate analyses have been carried out. Univariate analysis includes descriptive statistics; bivariate comprises chi-square test; and multivariate incorporate logistic regression and probit regression. Descriptive statistics, calculate the fertility transition in different consecutive survey years as state-wise and check their slope of decline for testing the fertility stall. The Logistic regression method is applied to determine the change in slope of fertility trend in statistical way. Chi-square (($\chi2$) test and welch's t-test were used to test the significance of change in proportion and mean overtime respectively. The P-value in the probit analysis were calculated using the Wald Chi-square test. The result of linear, logistic regression and probit regression models are presented in the form of the table and elaborated in this study. All the analysis has been carried out by STATA 14 and MS Office Excel 2013. The details of analysis tools applied in this study are following:

2.2.4.1 Period estimate versus slope estimates

Period estimate calculated from the average number of children a group of women would have by the end of her childbearing years (age 50 or 45) if they were to give birth at the current age specific fertility rate. The calculation of TFR by periodic method examined in the NFHS report or raw data file, which is easy to extract and used by most researchers for calculating fertility stalls in different countries. Another method focuses on slopes computed over period for which annual fertility rates were available. According to Garenne (2011), slope estimation of fertility is much more applicable than the simply computing period estimate. Because in period estimation, if the survey is conducted five years apart and the difference between the fertility rate is less (<0.50), it is impossible to establish a trend from these two points. For example, in a DHS based on 6000 women, a TFR of 3.50 in three years preceding the survey could be given with a confidence interval of 3.15 to 3.85 (about 0.25 due to sample size and 0.10 due to design effect). If between the surveys gap five years apart, it is almost impossible to test a trend from those two points. Analysis of slope testing is different, it considers all point over the period covered, ten years before each survey, totaling 15 years if two surveys were available. In later merging all value for computing slope allow one to smooth out erratic values of point estimates. The erratic fluctuations is the result of sample size and design effect. So that a simple test is enough to prove the slope or changing of slopes.

i) Descriptive statistics

The descriptive analysis was used for fertility transition in different states of India. For this method extract point data from the National and Family Health survey report to understand the nature of total fertility rate in different NFHS surveys (1992-2016). Total and annual percentage of change in between 1st to 4th survey were estimated for the analysis of fertility stall at state level. Apply the most straightforward definition that, after started transition (i.e. NFHS 1 to 2), if the percentage of change in fertility is constant or positive, the period is considered as fertility stall.

ii) Logistic Regression

The calculation of fertility stall by slope estimation using various information from NFHS is attempted in this section. For this analysis compute birth by year and age group of the mother, compute person-years lived by women, by year and age group, and therefore calculate cumulative fertility rate by period for ten years of preceding the survey. This information analysed from maternity history for women with details of the date of each birth and the age of the mother at the time of each birth.

A logistic regression is commonly used to assess the effects of independent variables on outcome variable when the dependent variable is dummy having two category, and independent variables are numerical and categorical. In this study consider dependent variable 1 for a birth and 0 for no birth. The logistic regression model has an advantage because it does not need any assumption on the distribution of the outcome variable. The binary logistic regression produces a result based on the maximum likelihood function. The mathematical formulae for the binary logistic regression model are following.

$$Logit\ P = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_kx_k + e_k$$

$$Log\frac{P}{1-P} = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_kx_k + e_k$$

Where

- b_0 = intercepts
- b_1, b_2, b_3....b_k = coefficients of predictor variables
- e_k = error term (natural logarithm of odds of outcomes)

iii) Probit Regression

Probit regression, also called probit model is a function that is used to model dichotomous or binary outcome variables. In the assumption of this probit model observed Brounouli success or failure results from an underlying normally distributed random variablies but can not be observed directly. Suppose z is the underlying unobservable random variable and x_{i1}, x_{i2},, x_{i3},$\cdots x_{ik}$ are k predictor variables. Thus, the probit linear regression model can be written as follows,

$$\pi i = \Phi(zi) = \Phi(\beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik}) \cdots\cdots\cdots (i)$$

where $\Phi(z)$ is a standard normal cumulative distribution function and takes the following form,

$$\Phi(z) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{z} e^{\frac{z2}{2}}\, dz.$$

In the form of an inverse link, the equation (i) can be written as,

$$(\pi_i) = \Phi^{-1}(\pi_i) = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik} \cdots\cdots\cdots (ii)$$

where, π_i is the probability that z_i=1 and $\Phi^{-1}(\pi i)$ is the inverse of the cumulative distribution function. The parameters of the model (ii) were estimated using the method of maximum likelihood. Since probability ranges between 0 and 1, the (π_i) can take any value between $-\infty$ and $+\infty$.Although the coefficient analysis provides valuable information regarding the association of the predictors and outcome variable, the marginal effect calculation facilitates summarizing results in a more convincing way. Marginal effect delivers the fact on the change in response related to the change in a covariate. The marginal effect (ME) for xi can be given as,

$$ME(x_i) = \frac{\partial P(\pi i=1|xi)}{\partial xi} = \frac{\partial E(\pi i|xi)}{\partial xi} = \Phi(xi'\beta)\beta$$

In calculating marginal effect, two approaches are followed: i) computation of the marginal effect at the sample means of the data, and ii) calculation of marginal effect at each observation. The sample average of individual marginal effects is then calculated to obtain the overall marginal effect. Both the approaches yield similar results for large sample sizes, but for smaller samples, averaging the marginal individual impact is preferred (Greene, 1997). As the probit regression model in this study has been applied on a smaller sample, the average of the individual marginal effects has been used to interpret the impact of change in predictors on response variable

CHAPTER 3

Fertility Stall Estimation in the States of India

3.1 Introduction

Fertility transition is a primary concept of the demographic transition, which indicates the transformation from high rate of fertility and mortality in the less developed era in most of the human history to the low rates of fertility and mortality in developed or developing period. Fertility decline started in most of the countries of Europe, the US and elsewhere at the same time period of the nineteenth and early twentieth century. Except some African countries the transition has almost been finished in the majority of the countries by 2010. The United Nations Population Division anticipates that the world fertility transition will stop before reaching the middle of the twenty-first century, except for the high fertility countries of Sub-Saharan Africa. In many countries, fertility patterns observed the smooth decline of TFR from five or eight children per woman to two or fewer children of women in just fifty or sixty years (UN, 2015). Whereas, in some cases, fertility decline is not continuous and observed a constant fertility transition in a long period of time. A similar kind of situation is documented in the state of Argentina where fertility decline from 7 children per woman in 1895 to 3.2 children per woman in 1947 and after that TFR constant at this point (3.2) for approximately thirty years (Pantelides E. A., 1996). The pace of decline in the level of fertility was not equal in developed and developing countries. In more developed countries such as Europe, United States, Japan, Australia and New Zealand, average fertility declined to 1.6 birth per woman in the late 1990s. While in the more developed countries, fertility level was less than 2.8 birth per woman in the mid-twentieth century, and at that time fertility rate in most developing countries was more than six birth per woman (UN, 2006).

In the past history, numerous researchers work on fertility transition at the world level or at an individual country level. Most of them always try to show the rate or pace of declining fertility over the time. After observing the previous research gaps, this chapter analyzed the fertility change in different periods by using various methods and highlighting the fertility stall condition at a particular time. Based on the previous research, fertility stall can be categorized into three stages, first is early transition stall (TFR more than five), second is mid-transition stall (TFR below five and above three), and late transition stall (TFR above two), whereas fertility stall in below replacement level considers as the post-transition (Shapiro et al., 2010).

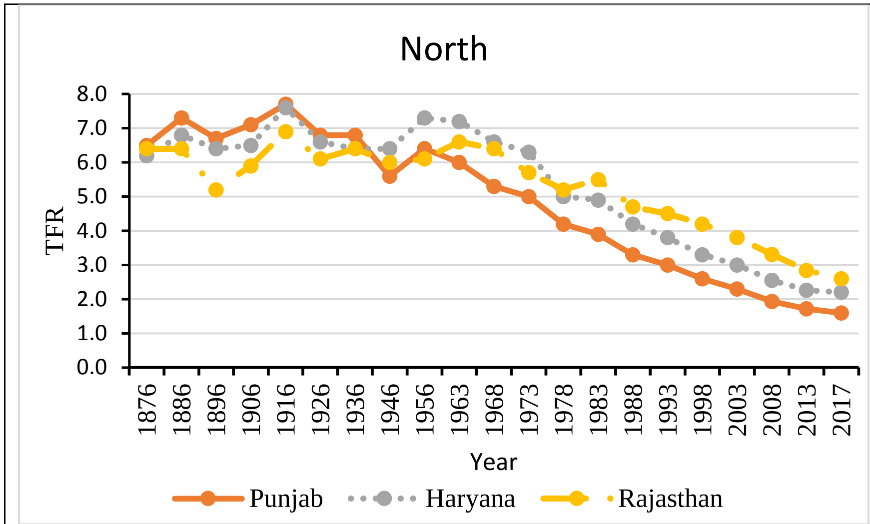
Furthermore, in the late 20th century or beginning of the 21st-century different scholars worked on fertility stalls. They accepted the view that, if in any country fertility has started to decline after the first survey and in later period there is no change or increase in fertility level at any stage (above or below replacement) over some period of time, it may be considered as a stall (Gendell, 1985; Lesthaeghe and Willems, 1999). Most of the researcher documented fertility decline in African and other countries seem to be smooth and continuous, although it has been identified that fertility has stalled in different countries (Bongarts, 2006; Bongarts, 2008; Shapiro, 2008; Machiyama, 2009). Contrast of these studies observed that authors disagree whether or not experienced fertility stall in the same countries (Machiyama, 2010). These discrepancies arise due to use different definition and differeces in the case of statistical testing methods (Moultrie, 2008). Borrowing from different scholar's ideas, mainly two definitions of testing fertility stall have been used in this research. The first one is the most straightforward definition, i.e., the fertility decline can stall in a region where fertility transition already has started and after that, it has been stagnated at a specific level for some period of time. The second definition of stall fertility would require a statistically significant difference from negative to nil or positive. Thus the first definition does not emphasise on significant difference, whereas the second one emphasizes statistical significance.

3.2 Fertility Stall and Regional Variation in Fertility Trends

India is a large country with wide variation in its population characteristics. A wide range of variations are also observed interms of development of the regions which is affecting the demographic trends. Fertility transition leading to smooth declines in India over the period of time at the aggregate level, but at the sub-national level, it is not declining continuously since 1986. The present chapter will highlight the trends in fertility. The major thrust of the chapter will be analyse fertility stall by using point estimation method and by slope estimation method. Four rounds of NFHS have been used for analyzing the stall. The four rounds cover a period of 1992-93 to 2015-16.

3.2.1 Regional Variation in the Fertility trends

In some point of time fertility decline at a higher rate, whereas in some period identified very slower transition (Figure 3.1). In this figure represent the fertility decline of different states of India


North
TFR
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
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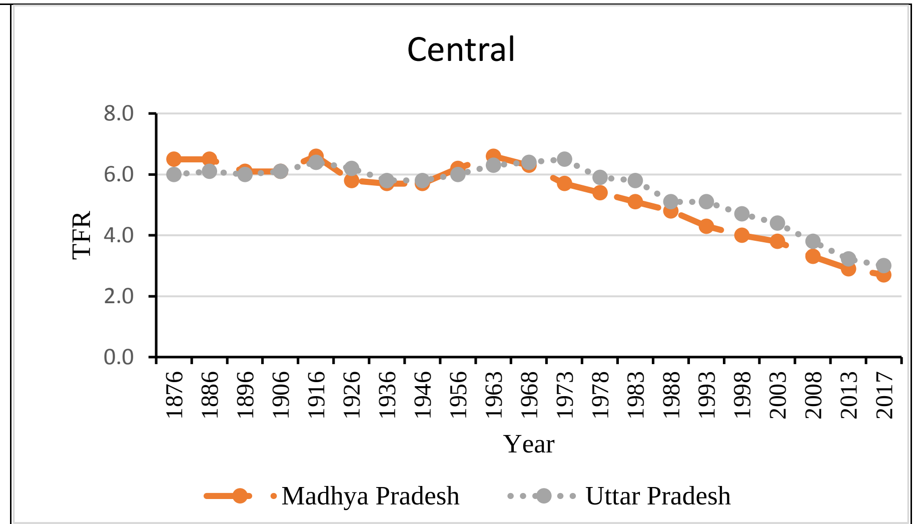
1876 1886 1896 1906 1916 1926 1936 1946 1956 1963 1968 1973 1978 1983 1988 1993 1998 2003 2008 2013 2017
Year
Punjab
Haryana
Rajasthan


Central
TFR
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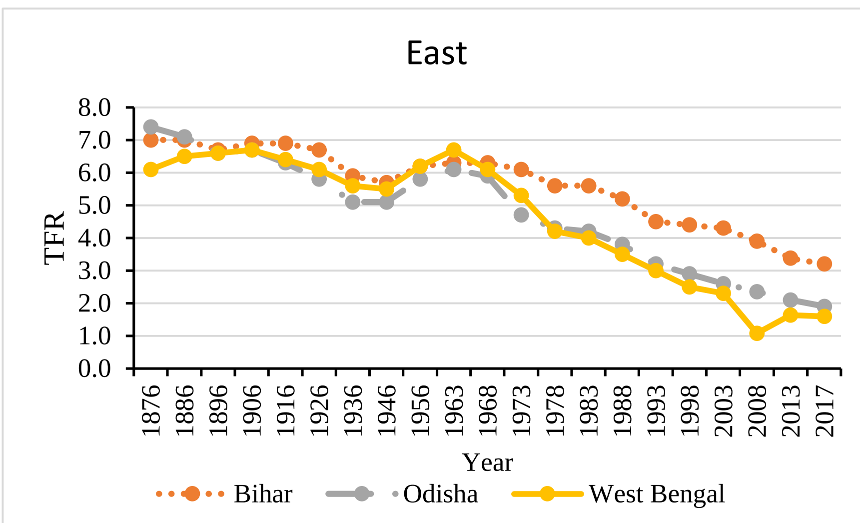
Year
Madhya Pradesh
Uttar Pradesh


East
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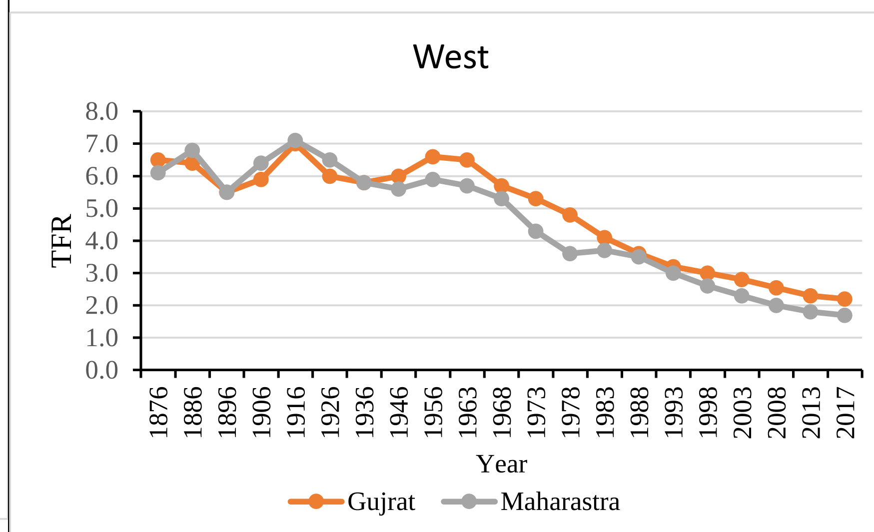
1876 1886 1896 1906 1916 1926 1936 1946 1956 1963 1968 1973 1978 1983 1988 1993 1998 2003 2008 2013 2017
Year
Bihar
Odisha
West Bengal


West
TFR
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1876 1886 1896 1906 1916 1926 1936 1946 1956 1963 1968 1973 1978 1983 1988 1993 1998 2003 2008 2013 2017
Year
Gujrat
Maharastra

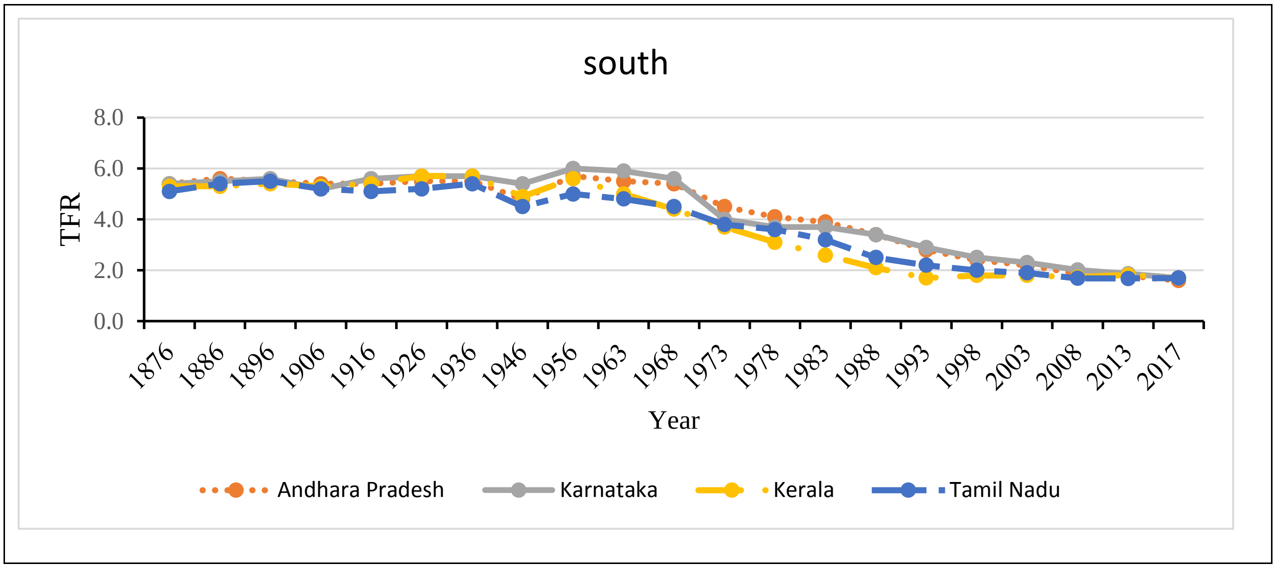

Figure 3.1 Region wise fertility trend in different state in india

Source: Ram and. Ram (2009), Rele (1987), Office of Registrar General of India. (1971-2017)

from 1876 to 2017 by using various data from direct or indirect estimation. In the northern states fertility was almost stagnant between 1896 to 1921, after that fertility continue to decline since 1921 at the TFR of 6.8 in Punjab and 6.6 in Haryana 6.1 in Rajasthan to TFR 1.6, 2.2 and 2.6 in 2017 respectively. Other regions of India such as central, east, west and south recognized similar characteristics of fertility decline. The figure 3.1 shows in each and every states fertility declined from more than 6 children per women to below replacement level fertility except for Bihar and Uttar Pradesh, where fertility level is as high as more than 3 children per women until now. Uttar Pradesh and Bihar is the highest and 3rd largest populous state in India with highest TFR; because of this reason, India's fertility is not declining and not reaching below replacement level. As a result population increases with magnificent rate even at twenty first century. If the fertility level of these states reaches below replacement level, India fertility is expected to reach to the lowest low fertility. Assuming the persistent fertility decline, United Nation (2015) predicts that the population in India expected to stabilize around 1750 million after 2075. If the state level of fertility decline being stalled, then observed to obstacles in the national level fertility transition and reduced the population growth rate.

Fertility stall is a newly emerging issue in demographic research. The work of Bongaarts (2006) assumes that the issue of fertility stall was a neglected theme around mid-1980s, demographic researchers started to pay attention on this issue when they realize the future growth of population may get affected by stall of fertility. After studied different literature it conclude that the maximum scholars have worked on fertility stalls as it is happening in African countries, whereas in the other developing countries of the world very less research is done on this area. No individual researcher has paid extensive focus on India's fertility stall so far. In certain mixed studies of some researchers like Bongarts (2006), Shapiro (2010) provide little focused on fertility stall in India at national level, though the socio-economic and cultural difference observed in between mixed countries.

3.3 Data and Methodology

Demographic and Health Survey (DHS) data provide health, family planning, mortality, fertility related information in 91 developing countries. DHS data in India known as the National Family and Health survey (NFHS). The data collected under the NFHS program, which categorized into two forms, in the report and raw data. In this study used data from both reports and raw data files, which is briefly discussed in chapter 2.

In the second method of fertility tasting based on logistic regression model, where the dependent variable represent 1 for a birth and 0 for no birth, and weight consider as proportionate to the exact person year lived over the period. Five age group are presented as a dummy variable, with the 20-24 age group accept as a reference category because it has the highest number of birth and is there for most stable the model is

$$\text{Logit}\,[F\,(i,\,t)] = \text{Constant} + B \times \text{Time} + \sum_i C_i \times X_i$$

where i is the age group and X_i is the dummy variables associate with each group, from 1=15-19, 2=20-24etc), with the fourth group (ages =20-24) omitted as reference category.

3.4 Testing fertility stall by different method

3.4.1 Testing fertility stall by periodic method

India never experienced fertility stall at aggregate level over the time, though the pace of fertility decline was slow over different National Family and Health Survey periods. India's total fertility rate (TFR) declined from mid transition (TFR 3.4) in NFHS-I to late transition (TFR 2.2) in NFHS – IV. Bongaarts (2003) categorized fertility transition into three phases, early stage of transition considered in between 5 to 6.9 births per women, in middle stage of transition fertility varies from 3 to 4.9 births per women, and the total fertility rate ranges from 2.1 to 2.9 was considered at the late transition. During the tenure of NFHS data, India did not observed any of its states in the early stage of transition. However, only some states come under mid transition stage and remaining are in late transition.

Out of the selected 26 (NFHS I - 25) states, 13 were at mid transition level (Delhi 3.0, Haryana 4.0, Himachal Pradesh 3.0, Jammu and Kashmir 3.1, Rajasthan 3.6, Madhya Pradesh 3.9, Utter Pradesh 4.8, Bihar 4.0, Arunachal Pradesh 4.3, Assam 3.5, Meghalaya 3.7, Nagaland 3.3, Gujarat 3.0) in the 1st survey (1992/93), 7 states at mid transition level in 2^{nd} and 3^{rd} survey, and in last survey (NFHS IV) only one state (Bihar 3.2) at mid transition level, remaining states at late transition or post transition (TFR < 2.1) level. A total of 8 states from NFHS II to III (Bihar 3.5 to 3.8, West Bengal 2.3 to 2.3, Arunachal Pradesh 2.5 to 3.0, Assam 2.3 to 2.4, Mizoram 2.9 to 2.9, Tripura 1.9 to 2.2, Goa 1.8 to 1.8 and Karnataka 2.1 to 2.1) and 2 states from NFHS III to IV (Himachal Pradesh 1.9 to 1.9 and Andhra Pradesh 1.8 to 1.8) experienced fertility stall. Among the eight stalling states in NFHS II to III only one states were at mid transition stage, five at late transition and two were at post transition stall and in between NFHS III to IV both two states were at post transition stall. All those states which were experienced fertility stall in between 1998

Table 3.2 Trend in TFRs at different states of India

Region	States	1st survey 1992/93	2nd survey 1998/99	3rd survey 2005/06	4th survey 2015/16	2nd to 3rd survey	3rd to 4th survey	2nd to 3rd survey	3rd to 4th survey	Fertility trend 2nd to 3rd survey	Fertility trend 3rd to 4th survey
North	Delhi	3.0	2.4	2.1	1.8	-12.5	-14.3	-1.6	-1.3	Decline	Decline
	Haryana	4.0	2.9	2.7	2.1	-6.7	-22.2	-0.8	-2.0	Decline	Decline
	Himachal Pradesh	3.0	2.1	**1.9**	**1.9**	-9.5	**0.0**	-1.2	**0.0**	Decline	**stall**
	Jammu & Kashmir	3.1	2.7	2.4	2.0	-11.1	-16.6	-1.4	-1.5	Decline	Decline
	Punjab	2.9	2.2	2.0	1.6	-9.1	-20.0	-1.1	-1.8	Decline	Decline
Central	Rajasthan	3.6	3.8	3.2	2.4	-15.8	-25.0	-2.0	-2.3	Decline	Decline
	Madhya Pradesh	3.9	3.3	3.0	2.3	-9.1	-23.3	-1.1	-2.1	Decline	Decline
	Uttar Pradesh	4.8	4.0	3.8	2.7	-5.0	-28.9	-0.6	-2.6	Decline	Decline
East	Bihar	4.0	**3.5**	**3.8**	3.2	**8.6**	-15.8	**1.1**	-1.4	**stall**	Decline
	Odisha	2.9	2.5	2.4	2.1	-4.0	-12.5	-0.5	-1.1	Decline	Decline
	West Bengal	2.9	**2.3**	**2.3**	1.8	**0.0**	-21.7	**0.0**	-2.0	**stall**	Decline
North-East	Arunachal Pradesh	4.3	**2.5**	**3.0**	2.1	**20.0**	-30.0	**2.5**	-2.7	**stall**	Decline
	Assam	3.5	**2.3**	**2.4**	2.2	**4.3**	-8.3	**0.5**	-0.8	**stall**	Decline
	Manipur	2.8	3.0	2.8	2.6	-6.7	-7.1	-0.8	-0.6	Decline	Decline
	Meghalaya	3.7	4.6	3.8	3.0	-17.4	-21.1	-2.2	-1.9	Decline	Decline
	Mizoram	2.3	**2.9**	**2.9**	2.3	**0.0**	-20.7	**0.0**	-1.9	**stall**	Decline
	Nagaland	3.3	3.8	3.7	2.7	-2.6	-27.0	-0.3	-2.5	Decline	Decline
	Sikkim		2.8	2.0	1.2		-40.0		-3.6		Decline
	Tripura	2.7	**1.9**	**2.2**	1.7	**15.8**	-22.7	**2.0**	-2.1	**stall**	Decline
West	Goa	1.9	**1.8**	**1.8**	1.7	**0.0**	-5.6	**0.0**	-0.5	**stall**	Decline
	Gujarat	3.0	2.7	2.4	2.0	-11.1	-16.7	-1.4	-1.5	Decline	Decline
	Maharashtra	2.9	2.5	2.1	1.9	-16.0	-9.5	-2.0	-0.9	Decline	Decline
South	Andhra Pradesh	2.6	2.2	**1.8**	**1.8**	-18.2	**0.0**	-2.3	**0.0**	Decline	**stall**
	Karnataka	2.9	**2.1**	**2.1**	1.8	**0.0**	-14.3	**0.0**	-1.3	**stall**	Decline
	Kerala	2.0	2.0	1.9	1.6	-5.0	-15.8	-0.6	-1.4	Decline	Decline
	Tamil Nadu	2.5	2.2	1.8	1.7	-18.2	-5.6	-2.3	-0.5	Decline	Decline

Source - Own calculation using NFHS data during 1992/93 to 2015/16

to 2005/06 and 2005/06 to 2015/16 showed declining fertility during 1992/93 to 1998/99 except Mizoram, observed increasing trend of fertility between this study period at mid transition level. In the state of Arunachal Pradesh (2.5%), Tripura (20%) and Bihar (1.1%) experienced huge annual increase in TFR during the study period. In the result of fertility analysis among all stall states in between 2^{nd} and 3^{rd} survey observed a unique similarities. All the states started to transition after experienced stalled once for example states like Bihar, West Bengal, Arunachal Pradesh etc. after positive increase of TFR between 2^{nd} to 3^{rd} survey started to decline in next survey (3^{rd} to 4^{th}) at an annual rate of -1.4, -2.0, -2.7 respectively. .

3.4.2. Testing fertility by slope estimate method

Table 3 represents the trend of average number of children ever born per woman over the period in different states of India. In the analysis testing the fertility trend through slope of an individual state. The demographic approach based on logistic regression indicates changes or no change of cumulative fertility in different states by reproductive age over the period of time. The slope of fertility transition categorize into three-phase, more than -0.01 slope considers as the first decline, the second one is slow decline indicate lower than -0.01 slope and stall consider either zero or positive slope. Like Table 2, each of the states is categorized into different regions for better understanding.

In the Northern region, fertility continues to decline in all states except Himachal Pradesh and Rajasthan. In the states of Delhi, fertility started with a slow decline and later increased the declining rate. The change in slope was significant before 1992 to 1998 at the 0.05 level and after that, the difference was not significant. The co-efficient of fertility declining rate very high throughout the period in the states of Punjab and Haryana. Fertility stalls were observed between 1992 to 1998 in Rajasthan and 2005 to 2016 in Himachal Pradesh. Central Indian states fertility decline in all period, only in UP from 1992 to 1998 found fertility stall. The eastern region of India experienced fertility stall in two states, one in Bihar, where a positive slope was observed from 1998 to 2005 at +0.02436, and in West Bengal from 1992 to 2005. Ramingining state of this region (Orissa) fertility grows with a negative slope in all NFHS periods. In the north-eastern region stall have been documented in the states where estimated the slope negative to nil or positive these are Arunachal Pradesh in 1998-2005 (-0.0182 to 0.0594), Assam 1998-2005 (-0.0335 to 0.0754), Tripura 1998 to 2005 (-0.089 to 0.0447). After started fertility transition (negative slope) observed positive slope in the following: western states like Goa from 1998 to 2005 (-0.028 to 0.023), Maharashtra from 1992 to 1998 (-0.0459 to 0.0258), and in all the Sothern states like Andhra Pradesh 2005 to 2016 (-0.08006 to 0.00179), Karnataka 1998 to 2005 (-0.0088 to 0.0603), Kerala 1992 to 1998 (-0.0375 to 0.0498) and Tamil Nadu 1992 to 1998. The remaining states of this region estimated slope are negative (fertility decline) in all surveys.

Table 3.2 Testing fertility stall by logistic method

Region	States	Year	Slope	Std.error	change P value	Fertility Trend
North	Delhi	1983-1992	-0.01773	0.007049		Slow decline
		1992-1998	-0.04214	0.011957	7.86E-02	Fast decline
		1998-2005	-0.06405	0.0107	1.72E-01	Fast decline
		2005-2016	-0.0505	0.005408	2.58E-01	Fast decline
	Haryana	1983-1992	-0.03122	0.00707		Fast decline
		1992-1998	-0.05209	0.011245	1.16E-01	Fast decline
		1998-2005	-0.05528	0.010435	8.35E-01	Fast decline
		2005-2016	-0.03738	0.002974	9.89E-02	Fast decline
	Himachal Pradesh	1983-1992	-0.03495	0.006331		Fast decline
		1992-1998	-0.0098	0.012015	6.41E-02	Slow decline
		1998-2005	-0.04043	0.01121	6.23E-02	Fast decline
		2005-2016	**0.00648**	0.004929	5.56E-03	**stal**l
	Jammu & Kashmir	1983-1992	-0.05278	0.004079		slow decline
		1992-1998	-0.04102	0.002754	1.69E-02	slow decline
		1998-2005	-0.0748	0.006465	1.53E-06	slow decline
		2005-2016	-0.04393	0.003192	1.85E-05	Fast decline
	Punjab	1983-1992	-0.04636	0.007362		Fast decline
		1992-1998	-0.03564	0.011641	4.36E-01	Fast decline
		1998-2005	-0.05877	0.010245	1.36E-01	Fast decline
		2005-2016	-0.02552	0.002432	1.59E-03	Fast decline
	Rajasthan	1983-1992	-0.06165	0.00425		Fast decline
		1992-1998	**0.017447**	0.007382	0.00E+00	**stall**
		1998-2005	-0.07253	0.007682	0.00E+00	Fast decline
		2005-2016	-0.05819	0.002005	7.09E-02	Fast decline
Central	Madhya Pradesh	1983-1992	-0.04027	0.004032		Fast decline
		1992-1998	-0.00833	0.007001	7.70E-05	Slow decline
		1998-2005	-0.06024	0.006294	3.52E-08	Fast decline
		2005-2016	-0.0375	0.001765	5.05E-04	Fast decline
	Uttar Pradesh	1983-1992	-0.03031	0.003055		Fast decline
		1992-1998	**0.004685**	0.005761	8.03E-08	**stall**
		1998-2005	-0.0733	0.004478	0.00E+00	Fast decline
		2005-2016	-0.06343	0.001271	3.39E-02	Fast decline
East	Bihar	1983-1992	-0.04917	0.004711		Fast decline
		1992-1998	-0.03739	0.007276	1.74E-01	Fast decline
		1998-2005	**0.02436**	0.007169	2.02E-01	**stall**
		2005-2016	-0.04135	0.001888	2.19E-02	Fast decline

	Orissa	1983-1992	-0.0476	0.005917		Fast decline
		1992-1998	-0.03604	0.009297	2.94E-01	Fast decline
		1998-2005	-0.06365	0.0084	2.76E-02	Fast decline
		2005-2016	-0.02564	0.002419	1.37E-05	Fast decline
	West Bengal	1983-1992	-0.04178	0.005279		Fast decline
		1992-1998	**0.00006**	0.009445	1.10E-04	**Stall**
		1998-2005	**0.044589**	0.007152	1.71E-04	**Stal**l
		2005-2016	-0.02806	0.003248	0.00E+00	Fast decline
North-east	Arunachal Pradesh	1983-1992	-0.03368	0.011739		Fast decline
		1992-1998	-0.01821	0.015909	4.34E-01	Slow decline
		1998-2005	**0.05947**	0.012714	4.28E-02	stall
		2005-2016	-0.06374	0.003818	7.48E-01	Fast decline
	Assam	1983-1992	-0.06376	0.005498		Fast decline
		1992-1998	-0.03357	0.010078	8.56E-03	Fast decline
		1998-2005	**0.07548**	0.008955	1.88E-03	stall
		2005-2016	-0.04345	0.002472	5.67E-04	Fast decline
	Manipur	1983-1992	-0.03155	0.011251		Fast decline
		1992-1998	-0.04865	0.013761	3.36E-01	Fast decline
		1998-2005	-0.05287	0.009029	7.98E-01	Fast decline
		2005-2016	-0.00523	0.003381	7.76E-07	Slow decline
	Meghalaya	1983-1992	-0.01422	0.011378		Slow decline
		1992-1998	-0.06092	0.01482	1.24E-02	Fast decline
		1998-2005	-0.03611	0.010727	1.75E-01	Fast decline
		2005-2016	-0.03371	0.003769	8.33E-01	Fast decline
	Mizoram	1983-1992	-0.02441	0.01203		Slow decline
		1992-1998	-0.0164	0.016938	7.00E-01	Slow decline
		1998-2005	-0.03778	0.013217	3.20E-01	Slow decline
		2005-2016	-0.02747	0.004123	4.56E-01	Fast decline
	Nagaland	1983-1992	-0.02654	0.011539		Fast decline
		1992-1998	-0.02641	0.014857	9.95E-01	Fast decline
		1998-2005	-0.06479	0.008822	2.63E-02	Fast decline
		2005-2016	-0.04709	0.003769	6.49E-02	Fast decline
	Sikkim	1989-1998	-0.05252	0.005575		Fast decline
		1998-2005	-0.04471	0.01501	6.26E-01	Fast decline
		2005-2016	-0.03708	0.006515	6.41E-01	Fast decline
	Tripura	1983-1992	-0.05954	0.011553		Fast decline
		1992-1998	-0.03891	0.018364	3.42E-01	Fast decline
		1998-2005	**0.04471**	0.01501	8.07E-01	**stall**
		2005-2016	-0.03708	0.006515	6.41E-01	Fast decline
West	Goa	1983-1992	-0.028	0.007398		Fast decline
		1992-1998	-0.02849	0.016066	9.78E-01	Fast decline
		1998-2005	**0.02346**	0.012514	8.05E-01	**stall**
		2005-2016	-0.01653	0.009215	6.56E-01	Slow decline
	Gujarat	1983-1992	-0.04191	0.006629		Fast decline
		1992-1998	-0.01931	0.010468	6.81E-02	Slow dwcine
		1998-2005	-0.04917	0.009258	3.26E-02	Fast decline

		2005-2016	-0.02249	0.002913	5.98E-03	Slow decline
	Maharashtra	1983-1992	-0.04959	0.005275		Fast decline
		1992-1998	**0.025837**	0.008507	4.86E-14	**Stall**
		1998-2005	-0.07059	0.00657	0.00E+00	Fast decline
		2005-2016	-0.01603	0.002592	1.11E-14	Slow decline
South	Andhra Pradesh	1983-1992	-0.04573	0.005428		Fast decline
		1992-1998	-0.04821	0.009487	8.20E-01	Fast decline
		1998-2005	-0.08006	0.007555	8.64E-03	Fast decline
		2005-2016	**0.001793**	0.004295	0.00E+00	**Stall**
	Karnataka	1983-1992	-0.05808	0.005141		Fast decline
		1992-1998	-0.00889	0.00952	5.45E-06	Slow decline
		1998-2005	**0.06036**	0.007908	3.20E-05	**stal**l
		2005-2016	-0.01154	0.002959	7.40E-09	Slow decline
	Kerala	1983-1992	-0.03735	0.006089		Fast decline
		1992-1998	**0.049852**	0.011814	5.35E-11	**Stall**
		1998-2005	-0.06069	0.008297	1.91E-14	Fast decline
		2005-2016	-0.04466	0.00453	8.99E-02	Fast decline
	Tamil Nadu	1983-1992	-0.03604	0.005735		Fast decline
		1992-1998	**0.102346**	0.010017	0.00E+00	**Stall**
		1998-2005	-0.04817	0.008086	0.00E+00	Fast decline
		2005-2016	-0.00462	0.002888	3.93E-07	Slow decline

Source - Own calculation using NFHS raw data during 1992/93 to 2015/16

3.4.3 Checking for undocumented stalls

In the fertility transition study, different researchers used various methods to test fertility stall, but it has been observed that one author has tried to refute others (Van de well E, Knodel J, 1980). Previous literature on fertility stall observed that researchers mainly use two methods for testing fertility stall, one is the periodic method and another slope estimation method. Data related to the periodic method estimated from the Demographic and Health Survey report book. On the other hand, the slope estimation method has two types of analysis one is linear regression and other logistic regression methods. First time Garrine in 2011 used both methods to estimate fertility slope in different countries, and he found out almost the same type of output regarding fertility stall and two equivalent slope and confidence interval. But the preferable method of testing considers the logistic regression method. According to the author, the logistic regression method tends to provide lower P- values that suggested analysis of fertility stall more sensitive (Garenne

M., 2011), as this causes this study to select the periodic method and logistic regression method for slope analysis.

3.4.4 Common value of fertility stall in both method

In table 4 compare the time of stall fertility through different method. In the view of fertility stall definition, the first method (periodic method) considers stall in between 2nd to 3rd and 3rd to 4th survey. In the second method, the slope testing includes all point over the period covered, ten years before each survey. This causes the fertility stall considers between 1992 to 1998, 1998 to 2005 and 2005 to 2016. In slope estimate stall in fertility observed in Rajasthan, Uttar Pradesh,

3.3 Common value of fertility stall in both method

Region	States	Fertility st all in periodic method		Fertility stall in slope estimate method	
		1998/99 to 2005/06	2005/06 to 2015/16	1998 to 2005	2005 to 2016
North	Himachal Pradesh		stall		stall
	Rajasthan				
Central	Uttar Pradesh				
	Bihar	Stall		stall	
East	West Bengal	Stall		stall	
	Arunachal Pradesh	Stall		stall	
	Assam	Stall		stall	
North-east	Mizoram	Stall			
	Tripura	Stall		stall	
West	Goa	Stall		stall	
	Maharashtra				
South	Andhra Pradesh		stall		stall
	Karnataka	Stall		stall	
	Kerala				
	Tamil Nadu				

West Bengal, Maharashtra, Kerala and Tamil Nadu in between 1992 to 1998. There was no stalling period in point estimate measure between 1992 to 1998. So in this work, mainly compare the fertility stall condition between the common period (1998 to2015/16). The analysis of both the method come almost a similar result for all states.

3.5 Discussion

In this exercise, it is observed that two different analysis methods led to basically a similar conclusion concerning the fertility stall in the states of India. This is reassuring since the first method the NFHS project handlers using the total fertility rate definition of an average number of children of women would have by the end of her childbearing years to analysis fertility estimate. In the 2^{nd} method, the cumulative period of fertility is considered a synthetic cohort or as a sum of age-specific fertility rates with an estimated slope using the binary model. This finding also indicates that the basic assumption underlying both methods are likely to be fulfilled, namely the well prepared of NFHS raw data and the equivalent of period and cohort and the constant age pattern of fertility at the time of the process of fertility change. This chapter can be discussed endlessly about what is the preferable method of testing fertility stall. Garenne (2011) concludes that the logistic method for slope estimate of fertility stall is more sensitive than other (linear regression) models. However, in this analysis, compare the more applicable model (logistic regression) in slope estimation with the point estimate result of NFHS. Though the way of calculating fertility stall was different, but in both models led to the same conclusion in most instances. This happened may be due to the well precise way of birth-related information collected in NFHS data; otherwise, the probability of mismatch of the result was relatively high between this model. From the above discussion can be concluded that both the model for calculating fertility stall are given satisfactory result. Whereas, here provided more advantage to point estimate of NFHS raw data for testing fertility stall, due to easily understanding with non-statistic or demographic people. In the next chapter (Chapter 4) measures the “causes of fertility stall” based on the point estimate model.

In another work, authors using poison regression or negative binomial regression to testing fertility slope. But there is not much comparative benefit to using these models when calculating annual fertility rates. Because most women only have one delivery in one year (12 months) period. At this causes, a good outcome of 0/1 as used in logistic regression seems to be more appropriate (Gerinne, 2011). Sophisticated statistical method have been developed before two decades for testing changing of slope of a response variable in a variety of situation. These models are like “switching regression” or “change point regression.” However, in the work of We Y. (2005) attempt to estimate fertility trend from DHS using those methods but could not generate a satisfactory result.

Another way to possibly estimate the fertility trend,for instance, the age pattern of fertility in each situation may be estimated more precisely of fertility transition. But this likes to be very difficult. Few researchers also proposed a definition of fertility stall, but in this analysis, these are undocumented. This is because of differences in definition, statistical tasting and not much applicable to estimate fertility stall

3.6 Conclusion

In the previous literature estimate, fertility stall appears uncommon in India (Bongarts, 2006). So in this study estimated at the state level for tasting fertility stall. Out of the 26 states examine that only eight states exhibit fertility stall in 2nd to 3rd survey and two states in 3rd to 4th survey; and the stalling states experienced fertility stall only for a shorter duration that means experienced stall in 2nd to 3rd survey after that it started to fall. According to Howse 2015, fertility stall of Argentina is called formal stall, due to stall for about 30 years (over entire generation). So the stall condition of Indian states could not compare with this formal stall. However, if they last longer, they could have serious consequences for long term demographic dynamics, especially when they occur at high rate of fertility. A study on Pacific Island highlighted that new forms of fertility stalls or of fertility reversals could happen due to the deliberate reproductive planned of couples. This happens may be from the thinking of couples regarding the benefits or financial advantage to produced more children, such as they send their children to other places from where children brought money for the family (Rallu JL., 2010). Many studies conducted by previous research to understand the rationale for this well documented stall. An earlier studies of fertility stalls in sub-Saharan Africa found out that country situation was highly diverse, and one could use various factors to explain them without any fixed pattern (Garenne M., 2009). Many research could also be conducted to understand the causes of fertility stalls in different countries. Various research work provided distinct result regarding this, such as some authors have suggested that reduce financing for family planning services could explain fertility stalls (Sinding S., 2008). Some authors did not agree with this result; they give a different explanation for fertility stall. This could be the further analysis, case by case, discussed in the next chapter.

CHAPTER 4

Determinants of fertility stall and fertility transition

4.1 Introduction

One of the major objective of this study is to identify the causes of fertility stalls in India. The analysis in this chapter intended to highlight the idea concerning the causes of fertility stalls in different states of India. For that purpose several rounds of NFHS data is examined to fulfill this objective by comparing the status of progress in drivers of fertility in the fertility stalling states with that in the fertility declining states of India. This chapter also discusses whether the responsible factors of fertility stalls in different states is universal or specific to region. Along with that the third objective has also been examined in this chapter, i.e., the causes of fertility transition in the stalls states.

The socio-economic and demographic indicators in different states of India during this decade point to the fact that, some states (Bihar, UP) are approaching the second stage of demographic transitions, some states are in the third stage and a few states (Kerala) have reached the fourth stage of demographic transition. Socio-demographic experience from different countries and observations from numerous articles have highlighted that there is a general coherence between socio-economic development, use of family planning method, reproductive preference and fertility change (Caldwell et al., 1999; Alila, 1990; Blacker, 2002). Therefore, at present, it is widely recognized that the main reasons for fertility change or stall stem from the various aspects of socio-economic and programmatic factors. In the last two decades, fertility has declined rapidly in most of India's economically developing states. The decline has been most rapid in some of the eastern states (West Bengal), one Northern State (Punjab), and the Western States where socio-economic development has also been relatively rapid. South Indian states have socio-economically improved over the periods. Similarly, the fertility rate reaches at replacement level (TFR 2.1) much earlier in those areas than other parts of India (Chapter 3 Fig.1).

India is the seventh-largest country in the world, holding 3.2 million sq. km. area (2.4% of world land) with 1.3 billion population (18% of the world population), has become 2nd most populous country in the world and is one of the crowded countries in Asia because of its rapid population growth (UN, 2017). India is a country that experienced a fertility decline over some decades.

Nevertheless, the country has not experienced fertility stall in previous periods (Shapiro 2010). Although at the state level analysis (Chapter 3) one can observe fertility stalls in different states at different points and times. India is a country with 28 states and 8 union territories. The Demographic characteristics of these states are distinctive from one another. As of the 2011 census, India's most populous state is Uttar Pradesh contributing 16.51 % of India's total population, followed by Maharashtra, Bihar and West Bengal contributing 9.28%, 8.6% and 7.54%, respectively. According to the NFHS-4 report, the fertility rate in more than 75 percent of India's states has reached the replacement level, in spite of the high population growth at the aggregate level. This happens due to high fertility in most populous states like Uttar Pradesh, Bihar and the level of or increase in fertility in deferent states at below or above replacement level.

Fertility transition is a continuous process; it started to fall in eighteenth century in developed countries and in the middle of the twentieth century in the developing countries. So high fertility was a big issue in developing countries. Pioneer researcher Bongaarts, in 2006 assumed that the fertility level in most of the developing countries reached replacement level at the end of the twentieth century or beginning of the twenty-first century. But it was not happened in real scenario, many developing countries from sub-Saharan Africa, Asia and Latin America experienced constant fertility rates or increased fertility rates after 1980s. Fertility stall is a newly emerging issue in the last two decades and most of the studies have been conducted in African countries. From these articles, one can conclude that the different types of demographic factors were to be associated with the fertility stall in this region include stall or increase in an additional child, son preference and increase in a number of eventual birth, and decline in contraceptive use, age at marriage (Bongaarts, 2006; Garenne, 2009; Westoff and Cross, 2006). Some other studies conducted in different areas found that the attributes of fertility stall to the stall or near stall in contraceptive use, decline in median age at marriage, duration of breastfeeding, and increase in the number of unmet need for family planning (Gendell, 1985; Bongaarts, 2006; Kumr, 2016).

4.2 Data and Methodology

This chapter is based on secondary data from the fourth round of National Family and Health Survey conducted from 1992/93 to 2015/16. The survey was conducted under the Demographic and Health Survey (DHS) program, briefly discussed in the previous chapter (Chapter 2). The data and methodology section of this chapter has also been briefly discussed in chapter 2. However, this section elaborates the overall analytical concept of methodology. Descriptive and multivariate analytical techniques have been used to understand the responsible factors for fertility stall. Univariate and bivariate analysis used as descriptive statistics, and multivariate analysis is done through probit regression model.

To understand the likelihood of experiencing fertility stall by selected background characteristics, each predictor has been classified in terms of its trend during the NFHS rounds as either "progressed" or "progressed stalled." This variable is said to be progressed if they changed in the expected direction during the study period or progressed stall if the variable fails to change in between the survey period. For example, no significant change or a significant decline in achieving certain level of education, or no significant change or significant increase in adolescent childbearing may contribute to the stall or

Table 4.1: Basis of classification of trend as Progressed or Progressed stall

Predictors	**Classified in terms of trend**	
	stalled if variable were	Progressed if variable were
Women with secondary education, women in paid employment, Used institutional facilities for delivery, Modern contraception, heard saw FP on TV/radio/newspaper,	No significant change, or significant decline	Significant increase
Poor household, under-five mortality. Infant mortality, Age at marriage, son preference, desire family size, unintended birth, adolescent childbearing, unmet need for family planning, Women in union	No significant change, or significant increase	Significant decline

rise in fertility, thus such courses of development of those predictors are termed as “progress stalled or stalled”. Whereas, if those variables have changed to the expected direction so that as an effect the fertility level can decline, this is termed as” progress”. For the purpose of analysis, the progress predictor is coded as 0 and progressed stalled variable is code as 1.

4.3 Analysis of Fertility Stall

4.3.1 Descriptive analysis of fertility stall in the states and transition in stalling states

The result briefly discusses the pattern of change in the predictor variable in the states. In this analysis predictor variable is considered as changed if the value alters from one survey year to another survey year at a five percent level of significance. In contrast, the values that are constant at a fixed rate are termed unchanged. The detailed description of percentage of fertility changes affected variable in the stalling and non-stalling states have been discussed in the following sections.

4.3.1.1 Socio-economic factors

4.3.1.1.1 Change in Education qualification

It is seen from table 4.2 that the proportion of women with secondary and higher education in all Indian states significantly increases irrespective of fertility stalling status. The change in proportion

Table 4.2 Percentage change women with secondary and higher education in different states of India

States experienced fertility stall			
Region		**Region**	
States	**NFHS - 2 to 3**	**States**	**NFHS - 3 to 4**
North		*North*	
		Himachal Pradesh	15.34 ***
East		*East*	
Bihar	61.96 ***		
West Bengal	13.95 ***		
North-East		*North-East*	
Arunachal Pradesh	-0.5		
Assam	26.63 ***		
Mizoram	12.26 ***		
Tripura	19.19 ***		

West		*West*	
Goa	20.98***		
South		*South*	
		Andhra Pradesh	4.5 ***
Karnataka	21.79 ***		
States experienced fertility decline			
North		*North*	
Delhi	-4.22	Delhi	19.42 ***
Haryana	27.65 **	Haryana	44.90***
Himachal Pradesh	30.19 ***		
Jammu & Kashmir	37.53 ***	Jammu & Kashmir	29.66 ***
Punjab	5.44*	Punjab	32.98 ***
Rajasthan	34.33 ***	Rajasthan	66.27 ***
Central			
Madhya Pradesh	94.35 ***	Madhya Pradesh	3.15
Uttar Pradesh	54.17 ***	Uttar Pradesh	30.75 ***
East		*East*	
		Bihar	16.81 ***
Odisha	38.1 3 ***	Odisha	35.99 ***
		West Bengal	15.93 ***
North-*East*		North-*East*	
		Arunachal Pradesh®	40.13 ***
		Assam	21.87 ***
Manipur	27.96 ***	Manipur	20.54 ***
Meghalaya	54.63 ***	Meghalaya	13.86 ***
		Mizoram	7.31 ***
Nagaland	36.33 ***	Nagaland	9.42 ***
		Sikkim©	21.54 ***
		Tripura	29.75***
West		*West*	
		Goa	14.84 ***
Gujarat	18.95***	Gujarat	18.33***
Maharashtra	25.33 ***	Maharashtra	6.97 ***
South		*South*	
Andhra Pradesh	78.16 ***		
		Karnataka	22.58 ***
Kerala	12.94 ***	Kerala	13.79 ***
Tamil Nadu	21.85 ***	Tamil Nadu	27.62 ***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

of women with secondary and higher education were stalled in only one state (Arunachal Pradesh) out of eight during NFHS 2 to 3, though the change process was insignificant. All the state that experienced stall, as well as progress observed increase in the level of education between NFHS 3 to 4.

The proportion of women with secondary and higher education increases significantly between NFHS – 3 to 4 survey in all eight states (Bihar, West Bengal, Arunachal Pradesh, Assam, Mizoram, Tripura, Goa, Karnataka), which had experienced stalle between 2nd and 3rd NFHS survey.

4.3.1.1.2 Percentage of change in poor household

Table 4.3 shows that the proportion of poor households is declining insignificantly in two fertility stalling states (Arunachal Pradesh and Assam) and in one fertility declining state (Maharashtra) from NFHS 2 to 3, and five fertility declining states insignificantly declined in their proportion from NFHS 3 to 4. The share of poor people significantly decline

Table 4.3 Percentage change of poor households in different states of India

	States experienced fertility stall		
Region		**Region**	
States	**NFHS - II to III**	**States**	**NFHS - III to IV**
North		*North*	
		Himachal Pradesh[1]	12.42
East		*East*	
Bihar	- 13.35 ***		
West Bengal	- 6.88 ***		
North-East		*North-East*	
Arunachal Pradesh	- 17.92		
Assam	- 3.0		
Mizoram[1]	9.97		
Tripura[1]	29.72 *		
West		*West*	
Goa[1]	14		
South		*South*	
		Andhra Pradesh	- 26***

Karnataka[1]	0.18		
States experienced fertility decline			
North		*North*	
Delhi	637.21 ***	Delhi	- 27.44
Haryana	74.85 ***	Haryana	- 43.39 ***
Himachal Pradesh	77.3 ***		
Jammu & Kashmir	42.64 ***	Jammu & Kashmir	68.32***
Punjab	181.76 ***	Punjab	- 37.29 ***
Rajasthan	10.49 ***	Rajasthan	- 1.44
Central		Central	
Madhya Pradesh	30.31 ***	Madhya Pradesh	11.75 ***
Uttar Pradesh	- 4.64 ***	Uttar Pradesh	2.37 **
East		*East*	
		Bihar	24.13 ***
Odisha	20.89 ***	Odisha	- 4.72 *
		West Bengal	9.45***
North-East		*North-East*	
		Arunachal Pradesh	1.68
		Assam	24 ***
Manipur	12.33	Manipur	109.55 ***
Meghalaya	- 30.58 ***	Meghalaya	37.57 ***
		Mizoram	103.7 *
Nagaland	0.48	Nagaland	46.95***
		Sikkim©	5.05
		Tripura	56.25 ***
West		*West*	
		Goa	- 35.46
Gujarat	1.93	Gujarat	16.18***
Maharashtra	-3.26	Maharashtra	- 2.64
South		*South*	
Andhra Pradesh	- 24 ***		
		Karnataka	- 19.33 ***
Kerala	- 54.35***	Kerala	- 46.71
Tamil Nadu	4.92 ***	Tamil Nadu	12.08***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

in two fertility stalling states from 2nd to 3rd survey and one in 3rd to 4th survey. The percentage of change of poor people declined significantly in four fertility declining states in both the surveys. On the other hand, the proportion of poor households increases significantly in one stalling states (Tripura) and increases insignificantly in three states (Mizoram, Goa, Karnataka) from NFHS 2 to 3. Between NFHS 3 and 4 only one stalling state has observed increases the share of poor household which, nonetheless remained insignificant.

It is observed from table 4.3 that the proportion of poor households significantly decline in one stalled transition state (Karnataka) and insignificantly decline in Goa. Whereas, the remaining stall transition states (Bihar, WB, Assam, Mizoram, Tripura) from NFHS 3 to 4 significantly increased the proportion of poor household, except Arunachal Pradesh where insignificantly increases this rate

4.3.1.1.3 Percentage of change women in paid employment

Table 4.4 shows the proportion of women in paid employment in different states of India. The proportion of women with paid employment declined in all stalling states in NFHS 2 to 3 except in Goa and Karnataka. Whereas the changes were significant only in the states from eastern region, other regions did not show any significant decline. On the other hand, the proportion of women in paid employment increases in both stalling states from NFHS 3 to 4. Out of the 17 fertility declining states in 1998/99 to 2005/06 only five has significant decline in proportion of women in paid work and the decline observed in Himachal Pradesh remained insignificant.

Table 4.4 Percentage change of women in paid employment in different states of India

Region States	NFHS - 2 to 3	Region States	NFHS - 3 to 4
States experienced fertility stall			
North		*North*	
		Himachal Pradesh	62.83 ***
East		*East*	
Bihar	- 21.51 ***		
West Bengal	- 1.43 ***		
North-East		*North-East*	
Arunachal Pradesh	51.7		
Assam	- 2.59		

Mizoram	- 16.14		
Tripura	- 4.21		
West		*West*	
Goa	22.43		
South		*South*	
		Andhra Pradesh	10.69 ***
Karnataka	7.49 ***		
States experienced fertility decline			
North		*North*	
Delhi	0.53 ***	Delhi	2.14 *
Haryana	- 29.15 ***	Haryana	- 33.37 ***
Himachal Pradesh	-22.22		
Jammu & Kashmir	- 22.22 ***	Jammu & Kashmir	62.83 ***
Punjab	- 16.38 ***	Punjab	21.18 ***
Rajasthan	69.65 ***	Rajasthan	29.07 ***
Central		*Central*	
Madhya Pradesh	13.88 ***	Madhya Pradesh	21.72 ***
Uttar Pradesh	10.87 ***	Uttar Pradesh	39.29 ***
East		East	
		Bihar	17.83 ***
Odisha	- 9.85 ***	Odisha	9.36 ***
		West Bengal	11.47 ***
North-East		*North-East*	
		Arunachal Pradesh	31.87
		Assam	5.1 ***
Manipur	46.32 ***	Manipur	2.68 ***
Meghalaya	- 22.04 ***	Meghalaya	57.21 ***
		Mizoram	3.32*
Nagaland	11.14*	Nagaland	44.28 *
		Sikkim©	25.75
		Tripura	5.68
West		*West*	
		Goa	7.11
Gujarat	5.17 *	Gujarat	29.81 ***
Maharashtra	18.16 ***	Maharashtra	9.73 ***
South		*South*	
Andhra Pradesh	15.86 ***		

		Karnataka	12.72 ***
Kerala	1.5	Kerala	5.63 ***
Tamil Nadu	6.6 ***	Tamil Nadu	31.54 ***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

The remaining states in the same period have observed significant increase in the percentage of women in paid employment.

All fertility stall transition states from NFHS 3 to 4 increase the percentage of women in paid employment. In the north-eastern states such as Arunachal Pradesh, Mizoram, Tripura, and one western state, i.e., Goa, insignificantly increase the employment rate. On the other hand, two eastern states – Bihar, West Bengal, one north-eastern state – Assam and one southern state-Karnataka significantly increase in percentage ofwomen in paid employment.

4.3.1.1.4 Percentage of change in proportion marrying below 18 years

Table 4.5 represent the percentage of change in the proportion of marrying below 18 years in different states of India at different NFHS survey period.. One high fertility state Bihar has experienced fertility stall during NFHS 2 to NFHS 3 observed insignificant change in the proportion marrying below legal age. The other two states, one from the eastern region (West Bengal) and the North-eastern region (Arunachal Pradesh) have observed, significant increase in the proportion. However, all the stalling states from NFHS 2 to 3 or NFHS 3 to 4 decreases

Table 4.5 Percentage change of women marrying before 18 years in different states of India

Region		**Region**	
States	**NFHS - 2 to 3**	**States**	**NFHS - 3 to 4**
States experienced fertility stall			
North		*North*	
		Himachal Pradesh	- 27.84 ***
East		*East*	
Bihar	0.0		
West Bengal	0.39*		
North-East		*North-East*	
Arunachal Pradesh	36.03 ***		

Assam	- 37.43 ***		
Mizoram	50.98 ***		
Tripura	-0.26		
West		*West*	
Goa	- 2.31		
South		*South*	
		Andhra Pradesh	- 10. 11 ***
Karnataka	- 12.1 ***		
States experienced fertility decline			
North		*North*	
Delhi	21.08 ***	Delhi	- 24.24 ***
Haryana	6.06***	Haryana	- 38.92***
Himachal Pradesh	2.86		
Jammu & Kashmir	- 19.68 ***	Jammu & Kashmir	- 30.59 ***
Punjab	63.36 ***	Punjab	- 49.07 ***
Rajasthan	67.27***	Rajasthan	- 28.69 ***
Central		*Central*	
Madhya Pradesh	- 21.03 ***	Madhya Pradesh	- 11.81 ***
Uttar Pradesh	- 16.86 ***	Uttar Pradesh	- 23.74 ***
East		*East*	
		Bihar	- 25.24 ***
Odisha	- 4.44 *	Odisha	- 32.56 ***
		West Bengal	- 3.52*
North-East		*North-East*	
		Arunachal Pradesh	-27.95 ***
		Assam	- 15.28 ***
Manipur	0.69	Manipur	- 23.89 ***
Meghalaya	- 9.75***	Meghalaya	-13.17 ***
		Mizoram	- 14.1 **
Nagaland	14.1*	Nagaland	- 24.85 ***
		Sikkim©	20.09 ***
		Tripura	- 20.97 ***
West		*West*	
		Goa	- 16.04 *
Gujarat	- 2.80***	Gujarat	- 17.46***
Maharashtra	- 15.96 ***	Maharashtra	- 14.18 ***
South		*South*	
Andhra Pradesh	- 20.26 ***		
		Karnataka	- 27.19 ***

Kerala	-6.46**	Kerala	- 32.11 ***
Tamil Nadu	-0.73*	Tamil Nadu	- 17.09***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

Significantly in the proportion marrying below 18 years, except Goa and Tripura, where insignificant decline in the age at marriage is observed. Fertility declined significantly in six states from different regions during 2^{nd} to 3^{rd} survey and two states among them have recorded insignificant increase in the percentage marrying below 18 years. Whereas, seven fertility decline states significant change the percentage of legal age at marriage in betweet 2^{nd} to 3^{rd} survey..

Table 4.5 shows the percentage change age at marriage in stall fertility transition states. The result shows in all eight stall fertility transition states significantly declined the legal age at marriage.

4.3.1.1.5 Percentage change in institutional birth

Table 4.6 shows that the institutional birth increases in all the stalling states except Arunachal Pradesh irrespective of the survey period. But the increase is not significant in all the states. Like Bihar, Assam and Karnataka the increase is significant. But in the remaining states the improvement is statistically significant at less than 0.1 significance level between the 2nd and 3^{rd} survey. On the other hand, in Himachal Pradesh and Andhra Pradesh the increase was significant between 3rd and 4^{th} surveys. Out of the seventeen states only three states, namely Delhi, Nagaland (insignificant) and Meghalaya (significant)

Table 4.6 Percentage change of women used institutional facilities for birth in different states of India

<u>*Region*</u>		<u>*Region*</u>	
States	NFHS - 2 to 3	States	NFHS - 3 to 4
	states experienced fertility stall		
North		*North*	
		Himachal Pradesh	77.1***
East		*East*	
Bihar	36.31 ***		
West Bengal	4.16		
North-East		*North-East*	

Arunachal Pradesh	-3.89		
Assam	27.29 ***		
Mizoram	3.51		
Tripura	4.64		
West		*West*	
Goa	1.45		
South		*South*	
		Andhra Pradesh	41.36***
Karnataka	27.41 ***		
states experienced fertility decline			
North		*North*	
Delhi	-2.14	Delhi	43.39***
Haryana	59.54 ***	Haryana	125.42 ***
Himachal Pradesh	48.95 ***		
Jammu & Kashmir	38.86***	Jammu & Kashmir	70.73***
Punjab	37.24***	Punjab	76.04***
Rajasthan	35.96***	Rajasthan	183.59***
Central		*Central*	
Madhya Pradesh	29.28***	Madhya Pradesh	205.89***
Uttar Pradesh	30.93***	Uttar Pradesh	228.74***
East		*East*	
		Bihar	215 .46 ***
Odisha	57.75***	Odisha	137.05***
		West Bengal	79.06***
North-East		*North-East*	
		Arunachal Pradesh	74.66***
		Assam	214.86 ***
Manipur	33.2	Manipur	51.2***
Meghalaya	- 49.81***	Meghalaya	78.31***
		Mizoram	33.77**
Nagaland	-3.21	Nagaland	180.43***
		Sikkim©	99.18***
		Tripura	69.03***
West		*West*	
		Goa	4.77
Gujarat	14.33***	Gujarat	67.81***
Maharashtra	22.9***	Maharashtra	39.33***

South		*South*	
Andhra Pradesh	29.80 ***		
		Karnataka	44.88***
Kerala	5.97***	Kerala	0.48***
Tamil Nadu	10.24***	Tamil Nadu	12.6***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

recorded decline the proportion of institutional delivery. All other states have observed increase (13 states significant and 1 non-significant) in the percentage of institutional delivery.

Table 4.6 shown institutional delivery in the decline in fertility stall states from the successive surveys, from the NFHS-3 to NFHS-4 . The percentage of institutional birth increases in all states irrespective of fertility stall or stall transition characteristics between the 3rd and 4th survey. It is noticed that in all eight stall transitioning states (Bihar, West Bengal, Arunachal Pradesh, Assam, Mizoram, Tripura, Goa and Karnataka) women in 2015/16 used more public or government hospital for delivery than it was in 2005/06.

4.3.1.1.6 Percentage of change in infant mortality

Percentage of change in infant mortality at state level in different survey periods is presented in table no 4.7. The infant mortality declined significantly in four fertility stall states (Bihar, Assam, Goa, Karnataka) and ten fertility declining states. On the other hand, insignificant fall is observed in two fertility stall states (West Bengal, Mizoram) and five fertility decline states (Delhi, Punjab, Rajasthan, Odisha, Manipur, Nagaland) from 2nd to 3rd survey. In the same survey period, only one stalling state (Arunachal Pradesh) observed significant increases and in one state (Mizoram) observed non-significant increases

Table 4.7 Percentage change of Infant mortality Rate *in different states of India*

Region States	**NFHS - 2 to 3**	**Region** States	**NFHS - 3 to 4**
	states experienced fertility stall		
North		*North*	

		Himachal Pradesh	- 5.26***
East		*East*	
Bihar	- 15.36**		
West Bengal	- 1.44		
North-East		*North-East*	
Arunachal Pradesh	68.61***		
Assam	- 4.89**		
Mizoram	- 7.86		
Tripura	16.29		
West		West	
Goa	- 58.31***		
South		*South*	
		Andhra Pradesh	- 34.64***
Karnataka	- 16.15**		
States experienced fertility decline			
North		*North*	
Delhi	- 15.17***	Delhi	- 21.41**
Haryana	26.63***	Haryana	21.39***
Himachal Pradesh	5.25		
Jammu & Kashmir	- 31.12***	Jammu & Kashmir	- 27.52***
Punjab	- 26.97*	Punjab	- 29.98**
Rajasthan	- 18.68**	Rajasthan	- 36.75
Central		*Central*	
Madhya Pradesh	- 19.19***	Madhya Pradesh	- 26.47
Uttar Pradesh	- 16.26***	Uttar Pradesh	- 12.53***
East		*East*	
		Bihar	- 31.49***
Odisha	- 20.02	Odisha	- 38.79***
		West Bengal	- 42.59
North-East		*North-East*	
		Arunachal Pradesh	- 62.27
		Assam	- 27.99***
Manipur	- 19.51	Manipur	- 26.94
Meghalaya	- 49.94***	Meghalaya	- 33.03***
		Mizoram	17.94***
Nagaland	- 9.26	Nagaland	- 22.77
		Sikkim©	- 12.2**

		Tripura	- 48.25***
West		*West*	
		Goa	- 16.34
Gujarat	- 20.77***	Gujarat	- 31.25***
Maharashtra	- 14.19***	Maharashtra	- 37.07***
South		*South*	
Andhra Pradesh	- 18.84***		
		Karnataka	- 37.82***
Kerala	- 6.13***	Kerala	- 67.32***
Tamil Nadu	- 37.01***	Tamil Nadu	- 33.33***

®: stall states started to transition in next survey

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

infant mortality rate. In the second transitional period (NFHS 3 to 4) infant mortality rate mostly declines in all states irrespective of status of stalling or progressed states.

Table 4.7 showed the infant mortality rate (IMR) from the successive survey, from 3rd to 4th survey period in different stall fertility transition states. The trend of IMR is downward in all progressive states except Mizoram. But all states have obserd insignificant decline. However, Bihar, Assam, Tripura Karnataka have observed significant decline in IMR, and West Bengal, Arunachal Pradesh, Goa have observed decline which is insignificant.

4.3.1.1.7 Percentage of change in under-5 mortality

Table 4.8 Presents the under 5 mortality at the time of the onset of the NFHS 2nd survey to 3rd survey and NFHS 3rd survey to 4th survey for the 26 states. This table's first raw shows the stall fertility states and the lower row indicate fertility decline states, under-five mortality did not change significantly in six stalling states from NFHS 2 to 3 and two states from NFHS 3 to 4. Two states (Bihar, Karnataka) from 2nd to 3rd survey significant decline observed in under 5 mortality rate. In all fertility

Table 4.8 Percentage change of under-5 mortality Rate *in different states of India*

Region		**Region**	
States	**NFHS - 2 to 3**	**States**	**NFHS - 3 to 4**
States experienced fertility stall			
North		*North*	
		Himachal Pradesh	- 9.4
East		*East*	
Bihar	- 19.24**		
West Bengal	- 11.98		
North-East		*North-East*	
Arunachal Pradesh	- 10.51		
Assam	- 4.92		
Mizoram	- 3.30		
Tripura	15.63		
West		*West*	
Goa	- 56.84		
South		South	
		Andhra Pradesh	- 35.50
Karnataka	- 21.52*		
States experienced fertility decline			
North		*North*	
Delhi	- 15.55	Delhi	- 9.64***
Haryana	- 31.81**	Haryana	- 21.41
Himachal Pradesh	- 2.12		
Jammu & Kashmir	- 36**	Jammu & Kashmir	- 26.56***
Punjab	- 27.88*	Punjab	- 36.15***
Rajasthan	- 25.67***	Rajasthan	- 40.75
Central		*Central*	
Madhya Pradesh	- 31.54***	Madhya Pradesh	- 31.42
Uttar Pradesh	- 21.39***	Uttar Pradesh	- 19**
East		*East*	
		Bihar	- 31.49
Odisha	- 12.98	Odisha	- 46.96*
		West Bengal	- 46.55***
North-East		*North-East*	
		Arunachal Pradesh	- 62.6
		Assam	- 33.65
Manipur	- 25.49	Manipur	- 38.04
Meghalaya	- 42.25**	Meghalaya	- 43.75

		Mizoram	- 13.07***
Nagaland	1.41	Nagaland	- 42.19
		Sikkim©	- 19.7**
		Tripura	- 44.93
West		*West*	
		Goa	- 36.63**
Gujarat	- 28.35**	Gujarat	- 28.74
Maharashtra	- 19.66*	Maharashtra	- 38.63**
South		*South*	
Andhra Pradesh	- 26.11**		
		Karnataka	- 42.6***
Kerala	- 13.83	Kerala	- 56.79
Tamil Nadu	- 43.92***	Tamil Nadu	- 24.79***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

decline states drop sharply or slowly under 5 mortality rate. In eleven states from 2nd to 3rd survey change child mortality rate significant way, remaining states shows insignificant changes of child mortality.

In all stall fertility transitions states child mortality declines from NFHS 3 to 4. Under-five mortality rates decline in NFHS 3 to 4 from 85 to 58 in Bihar, 60 to 32 in West Bengal, 88 to 33 in Arunachal Pradesh, 85 to 56 in Assam, 53 to 46 in Mizoram, 59 to 33 in Tripura, 20 to 13 in Goa and 55 to 31 Karnataka with per 1000 live birth. Among these declining trends, three states decline with less than 0.1 significant level, and five states decline with more than 0.1 significant level.

4.4.1.2 Reproductive preference

4.4.1.2.1 Percentage change in women having son preference

Table 4.9 estimates proportion change of women with son preference compared to the no preference for 26 states of India. The proportion decreases sharply or slowly in all stalling states, except two (Mizoram, Andhra Pradesh) where son preference increases in the second to third survey. In same survey period, all fertility decline states observed significant decline the preference of sons among women. In the next survey period, decline substantially the demand for son in one stalling state (Himachal Pradesh)

Table 4.9 Percentage change of son preference *in different states of India*

Region states	NFHS - 2 to 3	**Region** States	NFHS - 3 to 4
States experienced fertility stall			
North		*North*	
		Himachal Pradesh	- 49.24
East		*East*	
Bihar	- 23.48 ***		
West Bengal	- 26.84***		
North-East		*North-East*	
Arunachal Pradesh	- 34.29***		
Assam	- 41.49 ***		
Mizoram	19.78***		
Tripura	- 36.21***		
West		*West*	
Goa	- 48.33***		
South		*South*	
		Andhra Pradesh	7.18 ***
Karnataka	5.22**		
Statesexperienced fertility decline			
North		*North*	
Delhi	- 47.1***	Delhi	- 24.55***
Haryana	- 46.55***	Haryana	- 21.57***
Himachal Pradesh	- 52.5***		
Jammu & Kashmir	- 37.64***	Jammu & Kashmir	- 3.11
Punjab	- 40.11***	Punjab	- 23.66***
Rajasthan	- 27.98***	Rajasthan	- 44.65***
Central		*Central*	
Madhya Pradesh	- 38.63***	Madhya Pradesh	- 26.38***
Uttar Pradesh	- 38.14***	Uttar Pradesh	4.67**
East		*East*	
		Bihar	8.05 ***
Odisha	- 38.17***	Odisha	- 26.96***
		West Bengal	2.26
North-East		*North-East*	
		Arunachal Pradesh	- 2.26*

		Assam	- 13.97 ***
Manipur	- 23.63***	Manipur	- 7.94***
Meghalaya	- 45***	Meghalaya	29***
		Mizoram	-1.15*
Nagaland	- 31.7*	Nagaland	- 7.34***
		Sikkim©	- 58.21***
		Tripura	- 33.68***
West		*West*	
		Goa	- 38.91 ***
Gujarat	- 34.17***	Gujarat	- 40.15***
Maharashtra	- 43.66***	Maharashtra	- 14.25***
South		*South*	
Andhra Pradesh	- 41.76***		
		Karnataka	- 2***
Kerala	- 19**	Kerala	7
Tamil Nadu	- 30.38***	Tamil Nadu	192.2***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

from 11.19 percent to 5.68 percent and in another state (Andhra Pradesh) slightly increases its percentage from 9.19 to 9.85. Similarly, some fertility transition states observed significant declined, and some observed increase in the proportion of son preference rates between the third to fourth surveys.

Table 4.9 indicates the distinct demand for son among ever-married women in stall transition states. In the eastern states (Bihar, West Bengal) increases the demand of male child from 35.01 to 37.83 percent (significantly) and 14.15 to 14.47 percent (insignificantly), respectively, whereas in the remaining six states (decline in fertility stall states, NFHS 3 to 4) observed increase in the proportion of no-preference.

4.4.1.2.2 Percentage change in desired family Size

Table 4.10 shows that the desire for more children decreases in almost all states in India with time. The desire for more than mean family size significantly declining in five stalling states from NFHS 2 to 3 , and the remaining two stalling states (Arunachal Pradesh, Goa) changes are insignificant.

In the 2nd to 3rd survey, only one state (Mizoram) there is no demand for more than mean family size among the couples from NFHS 2 to3. Almost all states (15 out of 17) that had experienced fertility decline have observed significantly decrease

Table 4.10 Percentage change of desire family size *in different states of India*

Region States	NFHS - 2 to 3	Region States	NFHS - 3 to 4
States experienced fertility stall			
North		*North*	
		Himachal Pradesh	- 51.99***
East		*East*	
Bihar	- 25.85***		
West Bengal	- 41.8***		
North-East		*North-East*	
Arunachal Pradesh	- 3.76		
Assam	- 34.42***		
Mizoram	0		
Tripura	- 33.03***		
West		*West*	
Goa	- 28.4		
South		*South*	
		Andhra Pradesh	- 28.72***
Karnataka	- 61.58***		
Statesexperienced fertility decline			
North		*North*	
Delhi	- 37.2***	Delhi	- 10.46*
Haryana	- 24.47***	Haryana	- 38.97***
Himachal Pradesh	- 58.95*		
Jammu & Kashmir	- 26.71***	Jammu & Kashmir	18.82***
Punjab	- 26.99***	Punjab	-55.74***
Rajasthan	- 13.24***	Rajasthan	- 42.03***
Central		*Central*	
Madhya Pradesh	- 25.62***	Madhya Pradesh	- 39.41***
Uttar Pradesh	- 26.59***	Uttar Pradesh	- 3.21***
East		*East*	
		Bihar	1***
Odisha	- 27.31***	Odisha	- 43.74***

		West Bengal	- 36.78***
North-East		*North-East*	
		Arunachal Pradesh	- 8.9
		Assam	- 26.47***
Manipur	- 19.47***	Manipur	- 10.11***
Meghalaya	- 13.69***	Meghalaya	1.57
		Mizoram	- 1**
Nagaland	- 8.37	Nagaland	- 7.68
		Sikkim©	- 54.42
		Tripura	- 42.07***
West		*West*	
		Goa	- 51.89***
Gujarat	- 22.69***	Gujarat	- 44.99***
Maharashtra	- 37.01***	Maharashtra	- 25.22***
South		*South*	
Andhra Pradesh	- 55.3***		
		Karnataka	- 28.99***
Kerala	37.11***	Kerala	- 16.24***
Tamil Nadu	- 42.12***	Tamil Nadu	76.5***

®: stall states started to transition in next survey

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

in desired family size. Other two states which have observed changes in between 2nd and 3rd survey are Kerala and Himachal Pradesh. Kerala has observed significant increase and Himachal Pradesh has observed decline which is not significant. In the next transitional period (NFHS-3 to 4), the desire for large family size among the 15 to 49 age group of women declines in both fertility stall states.

Reproductive women's demand for desire family size is not similar for all fertility transition states. Out of the eight decline in fertility stall states, five states observed to significant decline and two north-eastern states (Arunachal Pradesh, Mizoram) insignificant decline in desire for more than mean family size. The remaining one state (Bihar) significanty increase the deman of family at a very slow rate from 55.03 percent to 55.58 percent in ten years.

4.4.1.2.3 Percentage change in unwanted pregnancy

It is seen from table 4.11 that one high fertility stall state of eastern region (Bihar) and two states from the north-east region (Arunachal Pradesh, Assam), one each from west (Goa) and south region (Karnataka) observed decline which is insignificant and another state from eastern part (west Bengal) experienced significnant decline in percentage of unwanted fertility. In the Same survey period, two states from the north-eastern region (Assam, Tripura) substantially increases the rate of unwanted pregnancy. In NFHS 3 to 4, one stalling state (Himachal Pradesh) is almost constant at a

Table 4.11 Percentage change of unwanted pregnancy *in different states of India*

Region **states**	**NFHS - 2 to 3**	**Region** **States**	**NFHS - 3 to 4**
	States experienced fertility stall		
North		*North*	
		Himachal Pradesh	0**
East		*East*	
Bihar	- 11.25		
West Bengal	- 18.01*		
North-East		*North-East*	
Arunachal Pradesh	- 9.33		
Assam	- 13.81**		
Mizoram	95.9		
Tripura	13.19*		
West		*West*	
Goa	- 52.42		
South		*South*	
		Andhra Pradesh	- 90.5 ***
Karnataka	- 8.8		
	States experienced fertility decline		
North		*North*	
Delhi	-38.49	Delhi	-14.24
Haryana	- 46.28***	Haryana	-23.1
Himachal Pradesh	- 31.05**		
Jammu & Kashmir	- 11.14*	Jammu & Kashmir	_66.5***
Punjab	- 1.46	Punjab	_61.66***
Rajasthan	0.86	Rajasthan	_57.41***

Central		*Central*	
Madhya Pradesh	- 2.83	Madhya Pradesh	_47.78***
Uttar Pradesh	9.67	Uttar Pradesh	_42.77***
East		*East*	
		Bihar	_ 42.78 ***
Odisha	1.69	Odisha	_57.64***
		West Bengal	_53.1***
North-East		North-East	
		Arunachal Pradesh	-43.82
		Assam	_ 60.25***
Manipur	- 46.04*	Manipur	_44.94***
Meghalaya	35.16	Meghalaya	_88.48***
		Mizoram	-71.05**
Nagaland	- 55.98	Nagaland	-62.92
		Sikkim©	-89.93*
		Tripura	_86.98***
West		West	
		Goa	_74.01
Gujarat	93.83***	Gujarat	_82.66***
Maharashtra	- 46.03***	Maharashtra	_46.85***
South		*South*	
Andhra Pradesh	- 22.5 ***		
		Karnataka	_82.69***
Kerala	- 2.23	Kerala	_56.8***
Tamil Nadu	- 37.09**	Tamil Nadu	_84.22***

®: stall states started to transition in next survey

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

specific rate of 16.8 and 16.6 percentage. Andhra Pradesh experienced sharp decline in their rate of unwanted percentage from 18.3 to 1.7. Four fertility declining states have significantly fallen and seven declining states have non-significantly dropped in the percentage of unwanted pregnancy among ever-married women. Remaining fertility decline states from 2nd to 3rd survey had insignificant increases in the percentage of unwanted pregnancy.

Table 4.11 shows the percentage of change in unwanted pregnancy decline in fertility stall states from NFHS 3 to 4. The percentage of women in unwanted pregnancy declines in all eight fertility decline states (stall in NFHS 2 to 3) from NFHS 3 to 4. Out of eight declines in fertility stall states observed six significant declines and two states from north-eastern region (Arunachal Pradesh, Mizoram) decrease insignificantly

4.4.1.3 Use of Family Planning

4.4.1.3.1 Percentage change in use of modern contraceptive

Table 4.12 shows the percentage change in modern contraception use among ever-married women for each of the last three surveys. The prevalence of women using the modern method increases in most of the states in all surveys. In all the fertility stall states irrespective of survey year, proportion of use of modern method increase with less than 0.01 significant level in Bihar, West Bengal, Karnataka (NFHS 2 to 3), Andhra Pradesh (NFHS 3 to 4).. On the other hand Arunachal Pradesh, Assam, Mizoram,

Table 4.12 Percentage change used of modern contraceptive use in different states of India

Region states	NFHS - 2 to 3	Region States	NFHS - 3 to 4
	States experienced fertility stall		
North		*North*	
		Himachal Pradesh	- 26.64***
East		*East*	
Bihar	29.06 ***		
West Bengal	5.65***		
North-East		*North-East*	
Arunachal Pradesh	13.53		
Assam	1.4		
Mizoram	4.47		
Tripura	3.15		
West		*West*	
Goa	3.74		
South		*South*	
		Andhra Pradesh	3.54 ***
Karnataka	10.61***		

States experienced fertility decline			
North		*North*	
Delhi	0.2	Delhi	- 14.01***
Haryana	9.6***	Haryana	1.87**
Himachal Pradesh	16.87***		
Jammu & Kashmir	7.65	Jammu & Kashmir	2.74***
Punjab	4.12	Punjab	18.36***
Rajasthan	16.74***	Rajasthan	20.48**
Central		*Central*	
Madhya Pradesh	23.73***	Madhya Pradesh	- 6.08***
Uttar Pradesh	33.5***	Uttar Pradesh	8.08***
East		*East*	
		Bihar	- 19.47 ***
Odisha	10.71***	Odisha	1.72
		West Bengal	14.14***
North-East		*North-East*	
		Arunachal Pradesh	- 28.61*
		Assam	36.85 ***
Manipur	-8.89	Manipur	- 46.16***
Meghalaya	19.61***	Meghalaya	18.23
		Mizoram	- 40.92***
Nagaland	- 7.13	Nagaland	-5.64
		Sikkim©	-5.65
		Tripura	- 4.57
West		*West*	
		Goa	- 33.47 **
Gujarat	5.85**	Gujarat	- 23.73***
Maharashtra	8.45***	Maharashtra	- 3.68***
South		*South*	
Andhra Pradesh	13.88 ***		
		Karnataka	- 18.04***
Kerala	3.24	Kerala	- 13.17***
Tamil Nadu	19.38***	Tamil Nadu	- 12.36***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

Tripura, Goa increased significantly the use of modern contraception in between 2^{nd} to 3^{rd} survey. Percentage of change in the use of modern method increases very slowly in Assam from 2^{nd} to 3^{rd} survey period. On the other hand, only Himachal Pradesh has observed significant decrease in the use of modern method in the last health survey. Among the fertility declining states between 2^{nd} to 3^{rd} NFHS eleven states observed significant increase and four states experienced insignificant increase in the rate of modern contraceptive use. In the same survey, only two states (Manipur, Nagaland) have recorded a decline in the percentage of use of modern contraceptive methods among married women, but both are statistically insignificant.

The high fluctuations in the use of modern methods have been observed in all fertility stall transition states. Out of eight states (NFHS 3 to 4), five have observed significant decline, and one state observed insignificant decline in the use of modern contraception. Only two states have reported (West Bengal and Assam) an increase the percentage of modern contraceptive use in between 3^{rd} to 4^{th} survey.

4.4.1.3.2 Percentage change in Adolescent childbearing

Table 4.13 analyzes the trend of adolescent childbearing (15 to 19 age). Only two stall states from the eastern region (West Bengal, Bihar) significantly increases the proportion of childbearing among adolescent women and from the north-eastern region, only two stall states (Arunachal Pradesh and Tripura) observed an insignificant increase in this percentage in 2^{nd} to 3^{rd} survey. Other stalling states in both surveys observed decline in their proportion

Table 4.13 Percentage change of adolescent child bearing *in different states of India*

Region		**Region**	
States	**NFHS - 2 to 3**	**States**	**NFHS - 3 to 4**
Statesexperienced fertility stall			
North		*North*	
		Himachal Pradesh	-31.85
East		*East*	
Bihar	8.31***		
West Bengal	10.65***		
North-East		*North-East*	
Arunachal Pradesh	25.95		
Assam	-29.65**		

Mizoram	-14.44		
Tripura	36.82		
West		*West*	
Goa	-10.44		
South		*South*	
		Andhra Pradesh	-42.16***
Karnataka	-37.89***		
States experienced fertility decline			
North		*North*	
Delhi	39.23	Delhi	-68.25***
Haryana	-21.48***	Haryana	-58.66***
Himachal Pradesh	-21.89**		
Jammu & Kashmir	-29.48***	Jammu & Kashmir	-45.31
Punjab	-28.07*	Punjab	-55.28**
Rajasthan	9.58	Rajasthan	-64.21***
Central		*Central*	
Madhya Pradesh	-55.06***	Madhya Pradesh	-49.32***
Uttar Pradesh	-34.84***	Uttar Pradesh	-76.81***
East		*East*	
		Bihar	-60.18***
Odisha	-13.67**	Odisha	-51.18***
		West Bengal	-30.54***
North-East		*North-East*	
		Arunachal Pradesh	-41.21
		Assam	-23.28***
Manipur	-27.27	Manipur	-18.75***
Meghalaya	-27.51**	Meghalaya	-13.61
		Mizoram	-23.93**
Nagaland	-31.86	Nagaland	-22.87***
		Sikkim©	-71.58**
		Tripura	-58.30***
West		*West*	
		Goa	-15.34
Gujarat	-30.81**	Gujarat	-47.08***
Maharashtra	-41.93***	Maharashtra	-48.54***
South		*South*	
Andhra Pradesh	-41.61***		
		Karnataka	-66.96***
Kerala	-27.20***	Kerala	-35.71

Tamil Nadu	-58.28***	Tamil Nadu	-33.44***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

either significant or insignificantly. Almost all the states (15 out of 17) that experienced fertility decline had observed significant (8 states) or insignificant (7 states) decline in the proportion of adolescent childbearing between NFHS 2 and NFHS 3.

All states of NFHS 3 to NFHS 4 had a decline in the proportion of adolescent childbearing irrespective of fertility stalling status. Among all decline in fertility stall states observed significant decline in adolescent childbearing in four states i.e. Bihar, West Bengal, Assam, Karnataka and insignificant decline in Arunachal Pradesh, Mizoram, Tripura and Goa.

4.4.1.3.3 Percentage change in proportion of women in union

It is seen from Table 4.14 that the percentage of women in union in the 2nd to 3rd NFHS observed significant decline in three states (Bihar, Goa, and Tripura) and one state (West Bengal) insignificantly declined. Simultaneously, two states (Arunachal Pradesh, Mizoram) observed significant increase, and two states (Assam, Karnataka) observed insignificant increase in the proportion of currently married women.

Table 4.14 Percentage change of women in union *in different states of India*

Region States	NFHS - 2 to 3	**Region** States	NFHS - 3 to 4
	States experienced fertility stall		
North		*North*	
		Himachal Pradesh	5.37*
East		*East*	
Bihar	- 1.86*		
West Bengal	- 0.78		
North-East		*North-East*	
Arunachal Pradesh	6.95**		
Assam	2.09		
Mizoram	13.59***		

Tripura	- 24.7**		
West		*West*	
Goa	- 34.15 ***		
South		South	
		Andhra Pradesh	0.58
Karnataka	1.10		
States experienced fertility decline			
North		*North*	
Delhi	0.36	Delhi	-1.71**
Haryana	9.59***	Haryana	-1.45*
Himachal Pradesh	16.78***		
Jammu & Kashmir	7.67**	Jammu & Kashmir	0.96
Punjab	4.28	Punjab	-1.16
Rajasthan	16.54***	Rajasthan	- 5.28***
Central		*Central*	
Madhya Pradesh	23.94***	Madhya Pradesh	- 4.54***
Uttar Pradesh	33.18***	Uttar Pradesh	- 9.47***
East		*East*	
		Bihar	- 4.45***
Odisha	10.92***	Odisha	- 1.43
		West Bengal	1.65***
North-East		*North-East*	
		Arunachal Pradesh	3.78
		Assam	4.47 ***
Manipur	- 8.88	Manipur	8.89***
Meghalaya	19.35*	Meghalaya	5.75
		Mizoram	- 9.82**
Nagaland	-7.02	Nagaland	1.36
		Sikkim©	- 2.4*
		Tripura	8.11
West		*West*	
		Goa	6.3
Gujarat	6.0*	Gujarat	- 2.10**
Maharashtra	8.35***	Maharashtra	- 0.11
South		*South*	
Andhra Pradesh	13.75 ***		
		Karnataka	0.64***

Kerala	- 20.88***	Kerala	0.6
Tamil Nadu	22.07***	Tamil Nadu	3.6***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

Similarly, in the fertility declining states between the 2nd and 3rd NFHS, 12 have observed significant increase, 2 have observed insignificant increase and 1 has observed significant and 2 have observed insignificant decline in the proportion of currently married women. In the next survey (NFHS III to IV), both stalling states (Andhra Pradesh and Himachal Pradesh) increase their proportion rate, though one significant and another not.

The percentage of women in union observed significant increased in three stall fertility decline state (West Bengal, Assam, Karnata) and insignificant increase in three states (Arunachal Pradesh, Tripura, Goa) out of total eight stall fertility transition states. The remaining two stall transition states (Bihar, Mizoram) insignificantly declined the percentage of women in union.

4.4.1.3.4 Percentage change in unmet need for family planning

Table 4.15 presents the unmet need for family planning in India's different states between 2nd to 3rd and 3rd to 4th Nantional Family Health Survey. This variable shows that in maximum states, the unmet needs for family planning decrease from the previous survey to the next survey. All the stalling states in NFHS 2 to 3 observed significant decline in the unmet need for family planning except for Mizoram, which has increase in unmet need, though insignificant. The next survey observed a very high increase

Table 4.15 Percentage change of unmet need of family planning *in different states of India*

Region		**Region**	
states	**NFHS - 2 to 3**	**States**	**NFHS - 3 to 4**
	States experienced fertility stall		
North		*North*	
		Himachal Pradesh	116.64***
East		*East*	
Bihar	- 7.21 ***		
West Bengal	- 37.3***		
North-East		*North-East*	

Arunachal Pradesh	- 27.95***		
Assam	- 39.53***		
Mizoram	7.96		
Tripura	- 44.12***		
West		*West*	
Goa	- 24.75 **		
South		*South*	
		Andhra Pradesh	- 3.26
Karnataka	- 16.31***		
States experienced fertility decline			
North		*North*	
Delhi	- 43.54***	Delhi	94.45***
Haryana	8.24***	Haryana	14.47***
Himachal Pradesh	- 15.73**		
Jammu & Kashmir	- 28.99***	Jammu & Kashmir	- 13.39***
Punjab	- 1.84	Punjab	- 16.74***
Rajasthan	- 19.43	Rajasthan	- 14.31
Central		*Central*	
Madhya Pradesh	- 31.07***	Madhya Pradesh	17.88***
Uttar Pradesh	- 18.03***	Uttar Pradesh	- 14.43***
East		*East*	
		Bihar	0.51 ***
Odisha	- 2.95	Odisha	- 10.18***
		West Bengal	9.13***
North-East		*North-East*	
		Arunachal Pradesh	12.58
		Assam	41.97***
Manipur	- 49.57***	Manipur	146.86***
Meghalaya	- 3.01***	Meghalaya	- 43.35***
		Mizoram	21.53*
Nagaland	- 14.53*	Nagaland	- 14.79***
		Sikkim©	27.55*
		Tripura	7.13
West		*West*	
		Goa	52.55 ***
Gujarat	- 4.36*	Gujarat	118***
Maharashtra	- 27.87***	Maharashtra	2.75*

South		South	
Andhra Pradesh	- 39.66 ***		
		Karnataka	9.46***
Kerala	- 25.16***	Kerala	59.85***
Tamil Nadu	- 34.52***	Tamil Nadu	21.45***

®: stall states started to transition in next survey

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

in unmet need for family planning in one stalling state, i.e., Himachal Pradesh (6.91 in NFHS 3 to 14.97 in NFHS 4) and another stall state (Andhra Pradesh) observed insignificant decline unmet need for family planning.. All of the declining states from second to the third survey observed decline in the proportion of unmet needs for family planning except Haryana. Among these declining states, some experienced very marginal decline like in Punjab (7.06% to 6.93%), Odisha (14.58% to 14.15), Meghalaya (31.56% to 30.61%) and Gujarat (8.02% to 7.67%).

In all stall fertility decline states observed interestingly similar kinds of results. All states increased the proportion of unmet need for family planning in between NFHS 3 to 4. Though Bihar, West Bengal, Assam, Mizoram, Goa and Karnataka observed significant increase, and the remaining two states Arunachal Pradesh and Tripura observed insignificant increase.

4.4.1.3.5 Percentage change in proportion have media exposure

To understand the effect of media exposure proportion of women who have heard or seen any family planning message on TV, Radio or newspaper has been considered. That has been referred as media exposure in the following section. Changes in the media exposure have been presented in table 4.16. The states have observed significant or insignificant decline or increase in media exposure. Proportion that heard or saw family planning messages on TV or radio or newspaper during the stalling period significantly increases in the two eastern states (Bihar and West Bengal) and insignificantly decline in five states namely, Arunachal Pradesh, Assam, Mizoram, Tripura,Goa and significantly declined in one state Karnataka

Table 4.16 Percentage of change have media exposure in different states of India

Region		**Region**	
states	**NFHS - 2 to 3**	**States**	**NFHS - 3 to 4**

States experienced fertility stall			
North		*North*	
		Himachal Pradesh	5.15
East		*East*	
Bihar	54.45 ***		
West Bengal	6.84***		
North-East		*North-East*	
Arunachal Pradesh	-11.26		
Assam	- 4.49		
Mizoram	- 8.21		
Tripura	- 2.69		
West		*West*	
Goa	- 3.07		
South		*South*	
		Andhra Pradesh	- 23.89 ***
Karnataka	- 29.36***		
States experienced fertility decline			
North		*North*	
Delhi	4.56***	Delhi	- 10.92***
Haryana	- 16.48***	Haryana	31.34***
Himachal Pradesh	- 25.09***		
Jammu & Kashmir	- 21.44***	Jammu & Kashmir	43.96***
Punjab	- 17.06***	Punjab	25.12***
Rajasthan	14.57***	Rajasthan	55.88***
Central		*Central*	
Madhya Pradesh	15.98***	Madhya Pradesh	20.76***
Uttar Pradesh	22.44***	Uttar Pradesh	- 0.36**
East		*East*	
		Bihar	- 11.08 ***
Odisha	-3.24	Odisha	35.26***
		West Bengal	- 4.61***
North-East		*North-East*	
		Arunachal Pradesh	- 5.31
		Assam	18.78***
Manipur	18.82***	Manipur	- 31.61***
Meghalaya	- 17.53***	Meghalaya	13.84
		Mizoram	- 32.47**

Nagaland	- 43.93***	Nagaland	- 10.48
		Sikkim©	58.19***
		Tripura	- 20.76***
West		*West*	
		Goa	13.39 ***
Gujarat	8.03***	Gujarat	- 9.29***
Maharashtra	3.95***	Maharashtra	20.31***
South		*South*	
Andhra Pradesh	- 16.05 ***		
		Karnataka	27.97***
Kerala	- 10.11***	Kerala	13.19***
Tamil Nadu	19.94***	Tamil Nadu	- 2.62***

©: state were not present in the first NFHS survey

*: Reference category; P value: ***=<0.01, **=<0.05,*=<0.1

Source - Own calculation using NFHS data during 1992/93 to 2015/16

in between the 2nd to 3rd NFHS survey. In this survey, eight fertility transition states significantly and one insignificantly declines in the proportion having media exposure. The remaining fertility decline states from NFHS 2 to 3 substantially increases in the proportion of watching or seeing or reading mass media. In the same period, one stalling state (Andhra Pradesh) observed significant decline in the proportion and another state Himachal Pradesh observed an insignificant increase.

The percentage of change in media exposure in different stall fertility decline states is observed in table 4.16. The result shows that in the state of Bihar, West Bengal, Mizoram, Tripura significantly declined, and Arunachal Pradesh insignificantly declined the the percentage of having media exposure in 3rd to the 4th survey. Similarly, in Assam, Goa and Karnataka observed significant increase in reading or watching family planning on mass media.

4.4.2 Distribution of stall states by stall or progress status

Table 4.17 presents the percentage of states that experienced fertility stall by progress status of different variables in India. State that did not have any progress in secondary and higher education are more likely to experience fertility stall than those recorded progress. India's 50.0 percent of states (1 out of 2) with insignificant change or significant decline in secondary and higher educated women experienced fertility stall. Whereas, 31 percent of states (7 out of 23) with significantly increase in secondary and higher education rate experienced fertility stall. Among the fertility stall states less likely to be experiencing stall in the percentage of change in poor households than the progress. States where percentage of poor women insignificantly change or significantly increases (stall) is 31.58 percent. On the other hand, the stall state that experienced a decline substantially in the percentage of poor women is 33.33. A total of 50 percent of states (7 out of 14) with stall (decline or unchanged) in women's paid employment experienced fertility stalls. In contrast, only 9.09 percent of fertility stall state recorded progress in the women in paid employment. Forty-six percent of states with insignificant change or increases in the age at marriage experienced fertility stall,

Table 4.17 Distribution of states have fertility stall by progress in indicators during the 2nd to 3rd and 3rd to 4th NFHS

Characteristics	**NFHS- 2 to 3** States experience fertility stall			**NFHS- 3 to 4** States experience fertility stall		
	Number	Percentage	Total 25	Number	Percentage	Total 26
Secondary and higher education						
Stall	1	50.00	2	0	0.0	1
Progressed	7	30.43	23	2	8.0	25
Poor household						
Stall	6	31.58	19	1	4.8	21
Progressed	2	33.33	6	1	20.0	5
Women in paid employment						
Stall	7	50.00	14	0	0.0	5
Progressed	1	9.09	11	2	9.5	21
Proportion of marriage before 18						
Stall	6	46.15	13	0	0.0	0
Progressed	2	16.67	12	2	7.7	26
Used institutional facilities for birth						
Stall	5	55.56	9	0	0.0	1
Progressed	3	18.75	16	2	8.0	25
Infant mortality rate						
tall	4	44.44	9	0	0.0	8
Progressed	4	25.00	16	2	9.1	18
Under 5 mortality						
Stall	6	50.00	12	2	14.3	14

Progressed	2	15.38	13	0	0.0	12
Son preference						
Stall	2	100.00	2	2	25.0	8
Progressed	6	26.09	23	0	0.0	18
Desire family size						
Stall	3	60.00	5	0	0.0	6
Progressed	5	25.00	20	2	10.0	20
Unwanted pregnancy						
Stall	6	37.50	16	1	16.7	6
Progressed	2	22.22	9	1	5.0	20
Used modern contraceptive						
Stall	5	45.45	11	1	5.6	18
Progressed	3	21.43	14	1	12.5	8
Adolescent childbearing						
Stall	6	60.00	10	1	16.7	6
Progressed	2	13.33	15	1	5.0	20
Women in Union						
Stall	5	23.81	21	2	11.8	17
Progressed	3	75.00	4	0	0.0	9
Unmet need for FP						
Stall	1	20.00	5	1	5.3	19
Progressed	7	35.00	20	1	14.3	7
Media exposure for family planning						
Stall	5	35.71	14	2	14.3	14
Progressed	2	18.18	11	0	0.0	12

while 16.6 percent of the states experienced a significant decline in the proportion of women married before legal age at marriage experienced fertility stall. Out of eight stalled states, five recorded a decrease in institutional birth among ever-married women, whereas three stalling states observed an increase in this rate. Infant and under-five mortality analysis in stall states provided almost similar kind of results. States with insignificant change or significant increases in infant mortality experienced fertility stall 44 percent. and under-five mortality experienced 50 percent (6 states out of 12). In comparison, the state where infant mortality significantly decline experienced fertility stall 25 percent and under-five mortality states with significantly declined experienced fertility stall 15 percent (2 out of 13). The result of son preference concerning progress or stall

condition finds an exciting scenario. Table 4.17 shows that 100 percent of the states (2 out of 2) with increasing or unchanged son preference experienced fertility stall, while only 26 percent of the states (6 out of 23) with declining demand for son preference experienced fertility stall. Desired family size also more likely to experience fertility stall, here stall revealed greater impact. Sixty percent of the states that did not have any progress (no change or increases) in desire for more than the mean size of the family experienced fertility stall. This is more than the proportion (25%) of fertility stall among the states where the desire for more family size declined significantly. The next variable shows that 37 percent of the states with an increasing rate or unchanged unwanted pregnancy observed fertility stall; on the other hand, 22 percent of the states with a significant decline in unwanted pregnancy experienced fertility stall. Fertility stall states experienced a constant rate of significant decline in the proportion of modern contraception use was 45 percent. In contrast, the percentage of states that experienced significant rises in modern contraception use and experienced fertility stall was 21 percent. 60 percent of the states (6 out of 10) with increasing or unchanged adolescent childbearing experienced fertility stall, while only 13 percent of the state with significant decline adolescent childbearing among women experienced fertility stall. Besides this, the state of progress in women in union and unmet needs for family planning marginally more likely to experience fertility stall than those that experienced fertility transition in these factors. States with insignificant change or decline in exposure to mass media experienced fertility stall 36 percent. In contrast, the states where exposure to mass media significantly decline experienced fertility stall 18 percent.

4.4.3 The scenario of decline in fertility stall states by progress status

Fig 1 (table 4.18) represents the percentage of states that experienced fertility stall transition by progress status of different variables from NFHS 3 to 4. All the decline in fertility stall states (8 out of 8) where a significant increase in the proportion of secondary and higher education and substantial increases in age at marriage experienced fertility transition in between 3rd to 4th survey. The stall states with a significant decline in unwanted pregnancy experienced decline in fertility 88 percent (7 out of 8 states) and significant increases in institutional delivery experienced decline in fertility (88 percent) between NFHS 3 to 4. Desired family size, adolescent childbearing, and son preference also play an essential role in the fertility transition in the stall states between the 3rd to 4th NFHS . Here 6 out of 8 of stall transition states significantly

Table 4.18 Distribution of decline in fertility stall states by progress in indicators during the 3rd to 4th NFHS

Characteristics	NFHS- 3 to 4 Stall transition states		
	Number	Percentage	Total 25
secondary and higher education			
Progressed	8	100	25
stall	0	0	1
Poor household			
Progressed	1	13	5
stall	7	88	21
Women in paid employment			
Progressed	5	63	21
stall	3	38	5
Proportion of marriage before 18			
Progressed	8	100	26
stall	0	0	0
Used institutional delivery for birth			
Progressed	7	88	25
stall	1	13	1
Infant mortality rate			
Progressed	3	38	18
stall	5	63	8
Under 5 mortality			
Progressed	4	50	12
stall	4	50	14
Son preference			
Progressed	6	75	18
stall	2	25	8
Desire family size			
Progressed	6	75	20
stall	2	25	6
Unwanted pregnancy			
Progressed	7	88	20
stall	1	13	6
Used modern contraceptive			
Progressed	2	25	8
stall	6	75	18

Adolescent childbearing			
Progressed	6	75	20
stall	2	25	6
Women in union			
Progressed	2	25	9
stall	6	75	17
Unmet need for family planning			
Progressed	0	0	7
stall	8	100	19
Media exposure for family planning			
Progressed	3	38	12
stall	5	63	14

decline the Desired family size, adolescent childbearing and son preference. The stall states that experienced fertility decline in NFHS 3 to 4 and experienced significant increases in the proportion of women in paid employment is 63 percent (5states out of 8). The remaining predictors are not much influence on fertility stall transition.

4.4.4 Multivariate Analysis

In the binary outcome of probit regression model the association of fertility stalled states with the stall in the progress of using different characteristics from socio-economic, reproductive preference and family planning variables . The binary value is used in both independent and dependent variables. The cut-off level for significant association is considered in between $p \geq 0.001$ to 0.01. The main analysis using fifteen factors to explore more consistent factors. But in the probit model, three variables (out of fifteen) are excluded at the time of analysis. The first one is son preference, where a hundred percent stall states come under stall Condition. Another variable used is modern contraceptive, where all progress stalls value falls under progressive conditions. Because at the time of analysis in this variable, coefficient value 0 is omitted. Besides this, regression analysis could not be performed for the proportion value of NFHS 3 to 4 due to small number of stall states (only two). In the multinomial analysis using four different models, the first three are individual model for socio-economic status, reproductive preference and family planning, and the last one (4^{th} model) is represent overall probit analysis.

Table 4.18 represents the probit analysis of socio-economic condition, reproductive preference and family planning individually with controlling the other variables. The result of Model 1 for socio-economic variables, secondary and higher education, used the institutional facility and under-5 mortality are significantly associate with fertility stall in the presence of control effects of other socio-economic variables. In model 3 only one variable (adolescent birth, 1.24) observed significant association with the fertility stall after controlling the other variables. In Model 2, not a single factor significantly associated with the fertility stall in the states. The result of Marginal Effect (ME) from Model 1 highlighted that, the states where the secondary and higher education, and under-5 mortality is stalled, the probability of experiencing a fertility stall increased by 67 percent (secondary

Table: 4.18 Probit regression estimates of fertility stall and stall in the progress of fertility determinants at individual category in 25 states of India

Category	**Variables**	**Model 1**		**Model 2**		**Model 3**	
		B	ME	*B*	ME	*B*	ME
Socio economic factors							
	Secondary & higher education	11.41*** [8.8,14.0]	0.67	-	-	-	-
	Poor household	-0.82 [-1.9,0.3]	-0.24	-	-	-	-
	Women in paid employed	0.80 [-0.4,20.3]	0.23	-	-	-	-
	Age at marriage	0.17 [-1.1,1.4]	0.05	-	-	-	-
	Used inst facility	-10.49*** [-12.2,5.7]	-0.39	-	-	-	-
	IMR	-0.57 [-2.1,0.9]	-0.14	-	-	-	-
	U-5 mortality	6.21*** [4.9,7.5]	0.62	-	-	-	-
Reproductive preference							
	Desire family size	-	-	0.52 [-1.4,2.4]	0.20	-	-
	Unwanted pregnancy	-	-	-0.03 [-1.2,1.2]	-0.01	-	-
Used of family planning							
	Adolescent birth	-	-	-	-	1.24 ** [-0.1,2.5]	0.41
	Women in union	-	-	-	-	-0.91 [-2.1,0.3]	-0.29
	Unmet need for family planning	-	-	-	-	1.19 [-0.8,3.2]	0.36
_cons		-0.41 [-1.4,0.6]		-0.51 * [-1.1,0.1]		-0.28 [-1.3,0.8]	
Number of observation		25			25		25
LR chi2(7)		0.347			0.31		7.05
Wald chi2(3)		1586.56			0.29		7.31
Prob > chi2		0			0.8641		0.0625
Pseudo R2		0.2501			0.0097		0.225

and higher education) and 62 percent (under-5 mortality) more than the states where secondary and higher education and under-5 mortality progressed. The estimation from reproductive preference shows, the stalled states in desired family size 20 percent more likely to experience fertility stall than that have progressed but are insignificant. Estimates from Model 3 observed that the states with stall in adolescent birth are 41 percent more likely to experience a fertility stall than those that have progress in adolescent birth. The output shows that all 25 observation in this data set is used in the analysis. The likelihood ratio (LR)of chi-square of 0.347 with a p-value 0.00 in Model 1, LR of chi sq. 0.31 with p 0.8 in Model 2 and likelihood ratio of chi sq. 7.05 with 0.06 indicate that the first and third model as a whole is statistically significant, but model 2 not statistically significant.

Table 4.19 represnt the probit regression in the overall model predictor of proportion from NFHS 2 to 3. The output shows that all 25 observation in the data set used in this analysis. The likelihood ratio of chi-square of 13.02 with a P-value of 0.00 indicates that this model as a whole is statistically significant. The result shows that secondary and higher education, women in paid employment, age at marriage, institutional birth, under-5 death, adolescent birth and unmet need for family planning statistically significant; remaining variables are not significant at least 0.01 level. Among the significance variables, three are more likely to associate with fertility stall (Secondary and higher education

Table: 4.19 Probit regression estimates of fertility stall and stall in the progress of fertility determinants in 25 states of India

Category	Variables	**Model 4**	
		B	Marginal Effect
Socio-economic factor			
	secondary and Higher education	6.91*** [2.81,11.00]	0.64
	Poor household	-0.51 [-1.91,0.89]	-.011
	Women in paid employed	0.90** [-0.89,2.68]	0.20
	Age at marriage	-5.68*** [-7.74,-3.61]	-0.30
	Used inst. Facility	-5.54*** [-7.12,-3.95]	-0.34
	IMR	-0.67 [-3.82,2.48]	-0.12
	Under-5 mortality	5.28*** [2.31,8.25]	0.53
Reproductive Preference			

Desire family size	-0.66 [-3.54,2.22]	-0.12
Unwanted pregnancy	-0.17 [-1.70,1.36]	-0.03
Family planning		
Adolescent birth	5.75*** [4.05,7.46]	0.63
Women in union	-1.60 [-3.64,0.44]	-0.37
Unmet need for family planning	6.90** [2.25,11.54]	0.64
Cons	1.64 [-0.57,3.85]	
Number of observation	25	
LR chi2(12)	13.02	
Wald chi2(12)	2526.46	
Prob > chi2	0	
Pseudo R2	0.4154	

6.91, women in paid employed 0.90, Under-5 mortality 5.28 and adolescent birth 5.75), others significant variable (age at marriage -5.68, used institutional facility for birth -5.54) are less like to associate with the fertility stall. To better understand the regression table use the marginal effect of the predicted probability of the variable. The result of Marginal Effects shows that the states with stall progress in secondary and higher education are 64 percent, Women employed 20 percent, under 5 mortality 53 percent, adolescent birth 63 percent and unmet need for family planning 64 percentage points more likely to experienced fertility stall then those that have transition . Whereas, in states with progress in age at marriage (-30 percent), used institutional facilities (-30 percent) less likely to experience fertility stall.

4.5 Discussion

This study prepared a comprehensive analysis to assess the causes of fertility stall and fertility stall transition by taking different socio-economic factors, reproductive preference and practice of family planning methods. Both bivariate and multivariate analyses carried out some striking output. The findings suggest that the secondary and higher education, under-5 mortality under socio-economic variable category, son preference under reproductive preference category and adolescent birth from family planning category significantly influence the fertility stall in Indian states. After observing the bivariate and multivariate analysis, it appeared that the variables like lower level of secondary and higher education, higher under-5 mortality, higher son preference and higher proportion of adolescent childbearing are far more likely to experience fertility stall than those that recorded progress. Similarly, lower women in paid employment and higher desired family size are less likely to contribute to a stall than the fertility transition states.

Declining secondary and higher education and increases under-5 mortality significantly influenced the states from declining fertility into stalls condition. Shapiro and Gebreselassie (2008) also observed a similar link between change in women in secondary and higher education and under-5 mortality and fertility stall in sub-Saharan Africa. Proportion of change in socio-economic condition (education level, U-5 death) found a well-established link with the fertility trend in different states of India. In both variables, fifty percent of stall states experienced fertility stall. In India's stalling states, declined secondary and higher education (Arunachal Pradesh) and increased under-5 mortality (Tripura) more significant in the stall states of North-eastern region than the other part of India. In most of the fertility transition states in India significantly increases the level of higher education of women and decreases under-five death. This observation suggested that adopting policy and programmers to improve secondary and higher education and reduce U-5 death may continue the fertility transition.

The result shows that the reproductive preference is strongly influenced in the stall states, notably reflected by the increases in the son preference. Two states (Mizoram, Karnataka) from NFHS 2 to 3 and one (Andhra Pradesh) from NFHS 3 to 4 increased the rate of son preference, and surprisingly, these states are experiencing fertility stall at the same time period. After examining different work related to fertility stall from various parts of the world, maximum studies conclude that increasing demand for son preference is an essential predictor for stall in fertility transition. (Wastoff and cross, 2006; Blacker, 2002; Agwanda, and Khasakhala, 2015). Child preference is more active in India's southern region, where two states, one Karnataka from NFHS 2 to 3 and another Andhra Pradesh from NFHS 3 to 4 experienced fertility stall. Another important variable desire for more family size could not observed a significant relation with fertility stall Whereas, some previous studies observed a well-established relationship between increasing desire family size and stalled in different countries (Van de Kaa, 1998). But here are not observed similar kind of findings, in contrast, some fertility stall states significantly declined the demand for family size, and fertility transition state experienced higher desire for family size. However, the work of Van de kaa (1987) coded that the educational attainment of women, women in paid employment emancipated the European women from a passive role to the decession maker in a family, and helping them to take a decision on demand of sex of the children or have lower number of children; improvement of these factors on any site of the world may also help in reducing the total fertility rate.

In family planning and other determinants, only a significantly linked fertility stall states with increasing adolescent childbearing. The result shows it was more likely to associate with the fertility stall, than those of transition states. A similar findings was also highlighted in previous research work, where a rise in adolescent fertility plays a vital role in the fertility stall (Ezeh et al. 2009). Among the six regions in India (North, east, north-east, west, south), adolescent childbearing strengthened their effect in high fertility eastern region (Bihar, West Bengal) on fertility stall. In family planning and other variables are observed no progress in any states regardless of their fertility-stalling status. Previous work found a strong connection between the declining use of modern contraception and fertility stall in African countries (Garenne, 2009). But in this analysis not to observed any significant link between fertility stall and the use of modern contraception. In the overall model (model 4), increasing unmet needs for family planning significantly associated with the fertility stall states, but at the time of individual model it is not significantly associated with any stall states. On the other hand, most of the time trends in unmet need for family planning are not perfectly consistent with India's states' fertility trend. So here not considering this variable as an important factor for fertility stall in any states.

Along with this factor that have been discussed above, here discuss the reason behind fertility transition in all eight stalling states in between NFHS 3 to 4. The previous research paper shows that in a country like Argentina experienced fertility stall in a long period of time (Pantelides E. A., 1996). Similarly, some sub-Saharan African countries also find a long period of fertility stall condition (Bongarts, 2006; Shapiro, 2010). But in Indian states, it did not happen, not a single state experiencing stall long period of time (more than one survey period). The responsible factors behind this are increased secondary and higher education, reduced legal age at marriage, reduced unwanted pregnancy, increased institutional birth, declining desired family size and child preferences.

According to the result, increases in secondary and higher education and decline in age at marriage are most significant factors for fertility stall transitions. This study suggested that women with higher education and higher age at marriage play a vital role in the declining fertility in stall states. In history, numerous scholars find out in their research that women's education status and age at marriage have negative relations with fertility transition (Merrick., 2001; Caldwell et.al., 1999). Mother's education is the only responsible factor for fertility change irrespective of place of residence, wealth status, religion and caste. In this analysis, reduced unwanted pregnancy and increases in institutional birth play an important role (after women higher education and age at marriage) to reduce the duration of fertility stalled in Indian states. Women with higher education affect fertility by enabling women to gather more knowledge and values at variance with their traditional roles of childbearing. It also helped women to participate in the labour force and paid employment (Caldwell and Caldwell 1987). From the analysis, observed reduces unwanted pregnancy, desired family size, child preference and increases institutional birth help in fertility transition in the fertility stall states. Similar kind of findings were shown in the work of Robinson (1992) where he observed fertility decline started with declining the desire family size and changes their attitude due to high costs associated with rising many children. In a study of fertility preference in Mather Valley, Nairobi, Alila (1990) observed that couples whose fertility is high or low inconsiderably fertility transition depends on their preference behavior.

4.6 Conclusion

In concluding remarks, it can be theorised that fertility stall is associated with a stall s in secondary and higher education, U-5 mortality from socio-economic factors, son preference from reproductive preference and adolescent birth from family planning method. The variables are not influenced with equal intensity in every fertility stall state. Socio economic variables like secondary and higher education and U-5 mortality is observed to more association with the fertility stall in North-eastern region, stall in son preference more associated with the stall states of southern region, and adolescent child bearing more active in fertility stall states of eastern region. On the other hand, some important categories like wealth quintile and modern contraceptives used were highly sensible factors for fertility stall in previous studies, but in this work did not find any significant link between these variable and fertility stall.

The above discussion concludes that the causes of fertility stall varies from region to region in India. As a responsible factor for this may be due to the Indian demographic, socio-cultural and geographic diversity. As a policy response designed to address stalling fertility should be implemented from an individual region perspective. The fertility stall states (mainly north-eastern region) required further improvement women in education attainment and under-5 mortality. Along with this, intimate different programmes to increase the percentage of women in paid employment, through which they are being made economically strong; these may reduce the Son preference, desire family size and adolescent childbearing by their decision making power.

The conclusion in the second part of this chapter demonstrates that increases in secondary and higher education and age at marriage, institutional delivery, and decline in unwanted pregnancy desire family size, adolescent child bearing and son preference are major responsible factors for decline in fertility in stall states. Among these variables, education of women has greater impact on other variables also. The proportion of percentage change table show (table 4.18), in the states where women in education, age at marriage, adolescent childbearing and child preferences change with slower rate fertility transition also slow in those states. It reflected that these variables are highly influencing for changes of Indian TFR. The government of India should forcefully implement a program for mandatory education of girl up to higher secondary level. Then automatically increases the age at marriage, on the other hand higher educated women should able to implement their fertility preferences including higher degree of autonomy in reproductive decision making and also be reduced the adolescent child bearing. Moreover, special attention should be provided to the high fertility states like Bihar (women autonomy very poor) though they will not experience fertility stall any further.

CHAPTER 5

Summary and Conclusion

5.1 Introduction

Understanding the level of fertility transition their responsible factors and effect is the fundmental research theme for the field of fertility researcher in the middle to late 20th century. At present, the paradigm of fertility related research shifted towards the fertility stall analysis. This is mainly due to the policy perspective for high fertility countries (mainly developing countries) and their slow transition, and below replacement level fertility countries which strongly relate with the second demographic transitions. Different scholars are negatively assigned that the high fertility is big problem for most of the developing or underdeveloped countries. So they set different anti-natalist policies to reduce fertility level, and control the tempo of population growth. In last three to four decades, most of the researchers agree that the world population growth being under control and projected that the world population would stop growing before the end of this century (Lutz, et.al. 2001). But, according to the United Nation world fertility report 2010, world will take more time to reach zero population growth which was projected earlier, due to fertility decline has been much slower than typically experienced in the past and frequently experienced fertility stall by different countries. The frequency of experienced fertility stalls is higher in Sub-Saharan Africa and Asia countries than in the rest of the world (Shafiro, 2010; Bongarts, 2006). Moreover, in the south Indian countries like Bangladesh, Pakistan experienced fertility stall though India was not experienced fertility stall at the national level. But in this analysis observed some states experienced fertility stall at different NFHS period.

Numerous literature shows the stalling fertility condition in different countries and their various responsible factors, i.e., socio-economic, programmatic and proximate determinant factors (Gendell, 1985; Howse, 2015; Bongaarts, 2006; Blacker, 2002; Garenne, 2009; Ezeh et al. 2009; Eltigani, 2003; Wastoff and cross, 2006). Furthermore, several pieces of literature theoretically advocate that women in higher education, infant and child mortality, contraceptive prevalence and decline marriage before 18 years are responsible factors for fertility stall in Sub-Saharan Africa (Gebreselassie, 2008; Garenne, 2009; Ezeh et al., 2009). However, only few studies try to capture the scenario of fertility stall in India at national level, not in state wise analysis (Shafiro, 2010;

Bongarts, 2008). In the present study, keeping this critical research gap in mind, analysed the best fitted method for fertility stall at the state level in India and the main responsible factor for fertility stall and fertility stall transition in different states of India.

5.2 Summary findings

In this dissertation, the empirical analysis are presented in two chapters particularly in chapter 3 and 4. Chapter 3 advocated to identifying the best method for testing fertility trend and stall at the state level of India, while chapter 4 shows the causes of fertility stall in different states of Inida and examine the reason for fertility decline in stall states.

In this study, the used analytical framework fully supports the overall findings. Chapter 3 analysed the fertility trend and stall in Indian states by point estimate and slope estimation method. In point estimate method using the total fertility rate definition of average number of children a women would have by the end of her childbearing years to analysis fertility estimate, in 2nd method cumulative period fertility consider as a synthetic cohort or as a sum of age-specific fertility rates with estimate slope by using binary model. Evidence shows that both the method led to basically the same conclusion, though in this analysis used the point estimator periodic method as a base analysis. Chapter 4 advocates that more than one factor responsible for fertility stall and fertility stall transition in different states of India. India's state level analysis revealed the association of at least one variable from each category (Socio-economic factors, reproductive preference and use of family planning) with the fertility stall in the region. Socio-economic factors one of the influencing characteristics to changing fertility level. For instance, socio economic factors such as increases secondary and higher education of women and under-5 death play a vital role in fertility stall. Increases secondary and higher educated women better in cost-benefit analysis of child, much aware about family planning method, which directly controls the number of birth per women and vice versa. On the other hand, with increases in the rate of U-5 mortality, couples are more interested in conceived for more child due to fewer chances of survival children and increases the chances of high number of birth. The socio-economic determinants, women in higher education and child mortality commonly influenced fertility stall in the North-eastern region. The fertility stall occurrence is considerably higher among the states where decline women in secondary and higher education (Arunachal Pradesh) and under-five mortality increase or did not change (Tripura) than among those where secondary and higher education increased or U-5 mortality rate decline. Reproductive preference is one of the important variables that control the demand for family planning for instance decline in demand for children increases the need for birth control. All the analyses of this study of reproductive preference, mostly son preference play an essential role in fertility stalling. In this study son preference is the main contributing factor for fertility stall in the southern region of India. Family planning and other determinants controlled fertility directly by preventing conception and reducing the risk of conception. For example, decline in adolescent childbearing means the conception time duration reduces; thus, chances of fertility rate also declined. Similarly, with increases or constant adolescent child bearing rises the chances of fertility stall mainly in the eastern region of India.

The second part of the analysis in chapter-4 show the causes of decline fertility in eight stall state from NFHS 3 to 4. In this study, the fertility stall is not stagnant at a long period of time; here all eight stall states (NFHS 2 to 3) surprisingly started to fallen from NFHS 3 to 4. The responsible factors behind this are secondary and higher education, reduced marrying before 18 years, reduces unwanted pregnancy, increases institutional birth, decline in desire family size and son preferences.

5.3 Policy Implication

From the policy perspective, similar to the existing literature (Ismail 2007; Shapiro and Gebreselassie 2008; Wastoff and cross 2006; Blacker 2002; Agwanda, and Khasakhala 2015; Ezeh et al. 2009) which suggested that the lower attainment of women in higher education, increases child mortality, increases adolescent childbearing and son preference are main responsible factor for fertility stall. Ismail’s (2007) work on fertility transition in the neighboring country of India (Bangladesh) stated that slow decline in child mortality was a responsible factor for fertility stall in between the period 1996 to 2000. In another study, Bongarts (2006) test fertility stall in thirty eight countries including India and out of this seven were experienced fertility stalls. From his analysis, he try to examine the responsible factor for fertility stall in seven countries but could not get any concrete conclusion reason behind the fertility stall. In contrast, this study observed strong evidence of fertility stall at the state level and come out with specific factors that find links with the fertility stall.

This study clearly showed that the fertility stall at the state level of India depends on decline in secondary and higher education, increase U-5 mortality from socio-economic factors, increased son preference from reproductive preference and increased adolescent birth from family planning method. Increases in secondary and higher education could provide information about the consequence of a large family, the benefits of using family planning methods, more awareness on health and age at marriage. The government should increase the educational budget and provide free education to all (especially women higher education) to reduce the total fertility rate. A good campaign should be allowed women in education attainment containing discussion on the aforementioned matters. The demographic history of European countries shows in low fertility level (replacement level) or just above that socio-economic development leads to massive increase in women schooling, women in employment, greater gender equity, and increases social security. Under-5 mortality is another vital factor for fertility stall during the second and third survey of NFHS. According to the NFHS report (NFHS 1 to 4), continuously decline the overall number of under-five death. The country registered a 4.5 percent annual rate of reduced in under-five deaths from the last three decades. India still needs to work towards achieving the sustainable development goal (SDG) of reducing under-5 mortality to at least below 25 per 1000 live birth by 2030. The main reason for high child mortality is that the declining rate is not equal in every state; even in some states increases this rate. To address the under-5 mortality problem require more rapid scale-up of key effective, affordable intervention: care of a newborn and their mothers, infant and young child feeding, vaccines, prevention and case management of pneumonia, diarrhea and sepsis, malaria control (WHO 2015). The major problem identified in this work and existing literature is the increase of child preference. Son are preferred due to their higher wage-earning capacity (mainly in agrarian economy), they continue the family line and as usual take responsibility of their parent in illness and old age (Hesketh, 2006). One article observed the local reason for son preference in India, mainly the expense of dowry (Das Gupta, 2003). For many decades, son preference has increased postnatal discrimination against girls; on the other hand, neglect their health care and nutrition, which may result in premature mortality (Sen, 2003). Evidence from another country, India should more support the nation that higher status for women-led to less-traditional gender attitude and lower level of son preference (Bolezendahl, 2004). The Indian government has already made significant attention to gender equity in terms of social and economic rights. But until now, the problem is not solved; as an implication, the government should be more focused on this.

This study observed that some socio-economic, reproductive preference and family planning characteristics of Indian women influenced them to have a large family and it varies from one state to another state. The characteristics of women in large families are do not have any education, lower labour force participation and experienced child mortality (Giusti and vignoli, 2006). Whereas, under-5 mortality influences women to provide more birth for replacing the dead child, holding children in anticipation of further child loses (Preston, 1978). Effort for socio economic development, mainly effort for rising women in higher education attainment and reduce under-5 mortality should be continued. The Second Demographic Transition theory emphasis that is increasing gender equity, job security and social security can help empower women in the future to enable them to implement their reproductive preference.

Implementation of the above recommendation will scientifically lead to the resumptions of momentum in fertility transition in Indian states. A continuous controlling of the affirmation factor also expected to decline the probability of occurrence of fertility stall. Further reduces in fertility indicate the lower population growth, where at present in India high population growth has become a great concern. Reduces the population growth will help the government to address the present socio-economic problems such as widespread poverty and environmental pollution at an earlier period by enabling the government to use limited resource more productively.

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Appendix 1 Data of total fertility rate (TFR) across the major states of India, 1871-2017

Period	Year	North				Central			East				West			South				
		Punjab	Haryana	Rajasthan	Avg.	M.P	U.P	Avg	Bihar	Odisha	W.B	Avg	Gujrat	Maharashtra	Avg	A.P	Karnataka	Kerala	T.N	Avg
1871-80	1876	6.5	6.2	6.4	6.4	6.5	6.0	6.3	7.0	7.4	6.1	6.8	6.5	6.1	6.3	5.4	5.4	5.3	5.1	5.3
1881-90	1886	7.3	6.8	6.4	6.8	6.5	6.1	6.3	7.0	7.1	6.5	6.9	6.4	6.8	6.6	5.6	5.5	5.3	5.4	5.5
1891-00	1896	6.7	6.4	5.2	6.1	6.1	6.0	6.1	6.7	6.6	6.6	6.6	5.5	5.5	5.5	5.5	5.6	5.4	5.5	5.5
1901-10	1906	7.1	6.5	5.9	6.5	6.1	6.1	6.1	6.9	6.7	6.7	6.8	5.9	6.4	6.2	5.4	5.2	5.3	5.2	5.3
1911-20	1916	7.7	7.6	6.9	7.4	6.6	6.4	6.5	6.9	6.3	6.4	6.5	7.0	7.1	7.1	5.4	5.6	5.4	5.1	5.4
1921-30	1926	6.8	6.6	6.1	6.5	5.8	6.2	6.0	6.7	5.8	6.1	6.2	6.0	6.5	6.3	5.5	5.7	5.7	5.2	5.5
1931-40	1936	6.8	6.4	6.4	6.5	5.7	5.8	5.8	5.9	5.1	5.6	5.5	5.8	5.8	5.8	5.5	5.7	5.7	5.4	5.6
1941-50	1946	5.6	6.4	6.0	6.0	5.7	5.8	5.8	5.7	5.1	5.5	5.4	6.0	5.6	5.8	4.8	5.4	4.9	4.5	4.9
1951-60	1956	6.4	7.3	6.1	6.6	6.2	6.0	6.1	6.2	5.8	6.2	6.1	6.6	5.9	6.3	5.7	6.0	5.6	5.0	5.6
1961-65	1963	6.0	7.2	6.6	6.6	6.6	6.3	6.5	6.3	6.1	6.7	6.4	6.5	5.7	6.1	5.5	5.9	5.0	4.8	5.3
1966-70	1968	5.3	6.6	6.4	6.1	6.3	6.4	6.4	6.3	5.9	6.1	6.1	5.7	5.3	5.5	5.4	5.6	4.4	4.5	5.0
1971-75	1973	5.0	6.3	5.7	5.7	5.7	6.5	6.1	6.1	4.7	5.3	5.4	5.3	4.3	4.8	4.5	4.0	3.7	3.8	4.0
1976-80	1978	4.2	5.0	5.2	4.8	5.4	5.9	5.7	5.6	4.3	4.2	4.7	4.8	3.6	4.2	4.1	3.7	3.1	3.6	3.6
1981-85	1983	3.9	4.9	5.5	4.8	5.1	5.8	5.5	5.6	4.2	4.0	4.6	4.1	3.7	3.9	3.9	3.7	2.6	3.2	3.4
1986-90	1988	3.3	4.2	4.7	4.1	4.8	5.1	5.0	5.2	3.8	3.5	4.2	3.6	3.5	3.6	3.4	3.4	2.1	2.5	2.9
1991-95	1993	3.0	3.8	4.5	3.8	4.3	5.1	4.7	4.5	3.2	3.0	3.6	3.2	3.0	3.1	2.8	2.9	1.7	2.2	2.4
1996-00	1998	2.6	3.3	4.2	3.4	4.0	4.7	4.4	4.4	2.9	2.5	3.3	3.0	2.6	2.8	2.4	2.5	1.8	2.0	2.2
2001-05	2003	2.3	3.0	3.8	3.0	3.8	4.4	4.1	4.3	2.6	2.3	3.1	2.8	2.3	2.6	2.2	2.3	1.8	1.9	2.1
2006-10	2008	1.9	2.6	3.3	2.6	3.3	3.8	3.6	3.9	2.4	1.1	2.4	2.5	2.0	2.3	1.9	2.0	1.7	1.7	1.8
2011-15	2013	1.7	2.3	2.8	2.3	2.9	3.2	3.1	3.4	2.1	1.6	2.4	2.3	1.8	2.1	1.8	1.9	1.8	1.7	1.8
2017	2017	1.6	2.2	2.6	2.1	2.7	3.0	2.9	3.2	1.9	1.6	2.2	2.2	1.7	2.0	1.6	1.7	1.7	1.7	1.7

Sources: Ram and. Ram (2009), Rele (1987), Office of Registrar General of India. (1871-2017)

Note: For 1961-66 and 1966-67, I have used the TFR given in Rele (1987) which he calculated using a method he developed based on the child-woman ratios from censuses. I take the TFRs for the period 1871-1961 from Ram and Ram (2009), which are also calculated using Rele's (1987) method. The SRS (1971-15) have also been average to represent 5 year, see the Figure 1.

Appendix 2 Trend in Secondary and higher education, and under-5 mortality in the states of India, 2nd, 3rd and 4th survey, NFHS program 1992/93 – 2015/16

States	secondary and Higher Education			Under-5 mortality		
	2nd survey	3rd survey	4th survey	2nd survey	3rd survey	4th survey
Andhra Pradesh	24.13	43.0	44.93	85.4	63	41
Assam	36.72	46.5	56.67	89.4	85	56
Bihar	17.48	28.31	33.07	105.0	85	58
Goa	54.9	66.42	76.28	46.8	20	13
Gujarat	38.53	45.83	54.23	85.0	61	43
Haryana	32.19	41.09	59.54	76.7	52	41
Himachal Pradesh	46.93	61.1	70.47	42	42	38
Jammu & Kashmir	26.35	36.24	46.99	80	51	38
Karnataka	36.58	44.55	54.61	70	55	31
Kerala	72.4	81.77	93.05	19	16	7
Madhya Pradesh	19.13	37.18	38.35	138	94	65
Maharashtra	48.8	61.16	65.42	58	47	29
Manipur	45.85	58.67	70.72	56	42	26
Meghalaya	30.37	46.96	53.47	122	70	40
Mizoram	59.56	66.86	71.75	55	53	46
Nagaland	42.11	57.41	62.82	64	65	37
Orissa	25.65	35.43	48.18	104	91	48
Punjab	45.92	48.42	64.39	72	52	33
Rajasthan	15.67	21.05	35	115	85	51
Sikkim	31.56	49.12	59.7	71	40	32
Tamil Nadu	41.93	51.09	65.2	63	36	27
West Bengal	38.13	43.45	50.37	68	60	32
Uttar Pradesh	20.27	31.25	40.86	123	96	78
New Delhi	60.7	58.14	69.43	55	47	42
Arunachal Pradesh	31.96	31.8	44.56	98	88	33
Tripura	38.98	46.46	60.28	51	59	33

Source: NFHS, 1992/93 – 2015/16