
Effect of Economic Factors on Fertility in Uttar Pradesh: A Regression Analysis

Shubhagata Roy*

K.K.Singh**

Article history:

Received July 25th, 2016;
Approved July 30th, 2016;
Available online: Aug 15th, 2016.

Keyword:

Breastfeeding,
CEB,
Contraceptive,
TFR,
Under-five mortality.

Abstract

Fertility has always been compared with the socio-economic condition of people in almost every society. But, with the development of societies, high fertility became a challenge for the couples as upbringing of children incurred heavy costs. Studies suggest that the positive relationship between income and fertility is dependent on relative income (Easterlin, 1969 & 1973). The cost-benefit analysis of children suggests that the fertility decision of couples is based on the balance between advantage and disadvantage of an additional child (Leibenstein, 1953). Bongaarts (1978) had earlier talked about a set of 'proximate determinants' through which 'modernization' acts upon fertility levels. These proximate determinants include, for instance, deliberate fertility control, postpartum infecundability, waiting time to conception etc. among others. Easterlin has further added a set of 'intervening variables' between modernizations and 'proximate variables'.

In India, although child-births are declining, but level of total fertility is still on the higher side. The reasons for this decline may be attributed to change in age of marriage, mother's age at first birth, contraceptive usage, female's autonomy, breastfeeding practices etc. The present study determines the effect of various economic variables, suggested by Easterlin, viz., demand for children, supply of children and fertility regulation factors, on fertility behaviour among the females of Uttar Pradesh based on NFHS-1, NFHS-2 and NFHS-3 data. Efforts have been made to find out the most dominant factor which contributes the most towards fertility decline.

2395-7492© Copyright 2016 The Author. Published by International Journal of Engineering and Applied Science. This is an open access article under the
All rights reserved.

Author Correspondence

First Author

Research Scholar, Department of Statistics, Banaras Hindu University, Varanasi

1. Introduction

Fertility has been changing in most of the Indian states due to changing socio-economic as well as demographic conditions. The factors determining human fertility in any population are quite complex. Several explanations and theories have been postulated both in the context of

historical and contemporary population to explain the rapid decline in fertility. Still, fertility decline remains as one of the important social and historical developments in the contemporary world that is scarcely understood. There is a strong indication that the overall level of modernization, health care and education accompanied by ready access to family planning information and services play a significant role in lowering fertility in different Indian states (Amonker & Brinker, 2007). The study of all significant factors which contribute in fertility change becomes imperative as it helps policy-makers to develop suitable mechanisms which could be helpful in achieving the desired levels of fertility.

The actual level of fertility of any population is always well below its biological maximum or potential fertility (Henry, 1961). The large gap between the potential fertility and actual level of fertility is attributed to the effects of a number of biological, behavioural and socio-economic factors and several methodologies have been developed for a systematic study of such factors in the last few decades. Among them, the analytical model of Davis and Blake (1956) gives a systematic listing of intermediate variables affecting fertility. It is argued that fertility is modified by one or more intermediate variables. Bongaarts (1978) pointed out that the influence of the factors affecting fertility can be explained in terms of seven proximate determinants. He further demonstrated that 96 percent of the variations in fertility levels among societies are explained by the four proximate determinants such as the proportion of females married, the prevalence of contraceptive use, the incidence of induced abortion and the effect of breastfeeding. He has discussed extensively the methods to estimate the contributions of these factors and the possible use of the models in the study of fertility behaviour.

In India, a sharp decline in urban fertility has been observed over time and it has reached to near or below replacement level. According to NFHS-3, the urban TFR of almost all the major states have reached below replacement level barring Uttar Pradesh (2.9), Bihar (2.9), Madhya Pradesh (2.6), Rajasthan (2.2) and some states of north-east region.

2. Need of the Study

On one hand these states have certain similarities but on the other, they differ by many ways. All the three states are predominantly Hindi speaking and have similar social backgrounds but they differ by political stability and certain developmental indices which contribute profoundly in fertility transition. High fertility rate has always been a problem in these states combined with less development, lower educational levels, infrastructural issues and worsened condition of females. But in the last two decades, fertility has been changing at a considerable pace, particularly in the urban areas, among educated families and those who have a high standard of living. This change appears to have been driven by the use of modern contraceptives, changing patterns of marriage, changing educational levels, improving status of females, good healthcare facilities, etc. Therefore a holistic study is imperative to examine the biological, socio-economic, political and psychological factors which are bringing in contradictory changes in Uttar Pradesh. The present study observes the effect of major economic factors proposed by Easterlin (1975) such as natural fertility, demand for children and fertility regulation variables on fertility behaviour of females in Uttar Pradesh.

3. Data for the Study

The data for this study has been taken from three National Family Health Surveys (for Uttar Pradesh) carried out jointly International Institute of Population Studies, Mumbai and ORC Macro (USA) in 1992-93, 1998-99 and 2005-06 respectively. The National Family Health Surveys are large-scale, multi-round surveys conducted in a representative sample of households throughout India and funded by GOI, MoHFW, USAID, UNICEF, The Bill and Melinda Gates Foundation, etc. The NFHS surveys were carried out as a means of obtaining information on reproductive issues, family planning, mortality, maternal and child health, nutrition, healthcare facilities etc. Here, the NFHS data were used to evaluate the impact of various proximate determinants and economic factors on fertility.

4. Methodology:

Easterlin's Economic Factors Model:

Majority of theoretical works on the economics of fertility derived have been from studies by Harvey Leibenstein (1957) and Gary S. Becker (1960) in which the economic theory of consumer behavior was applied to childbearing decisions (Robinson and Horlacher, 1971). Easterlin (1975) proposed a holistic framework of fertility determinants which acknowledges that a couple's reproductive capacity is a condition beyond the control of the family as it is governed by some economic factors. The determinants of fertility are seen as working through one or more of the following:

- i. The demand for children (C_D), the number of surviving children parents would want if fertility regulation were costless;
- ii. The potential supply of children (C_N), the number of surviving children parents would have if they did not deliberately limit fertility; and
- iii. The costs of fertility regulation (R_C), including both subjective and objective costs, the time and money required to learn about and use specific techniques.

Hence, the fertility model can be expressed as,

$$F = f(C_D, C_N, R_C, E); \text{ where } E \text{ is the error term.}$$

Here F denotes Children Ever Born (CEB) to a female aged 15-49 years and is one of the most reliable measures of fertility. It is dependent on demand for children (C_D), supply of children (C_S) and fertility regulation (R_C) variables. These variables are described as under:

Demand for Children Variables (C_D)

- a. **Wanted Fertility Rate:** The number of children who would be born per woman if she were to pass through the reproductive years bearing children according to a current schedule of age-specific fertility rates if only "desired" or "wanted" births occurred. Wanted fertility rate is an estimate of what the total fertility rate would be if all unwanted births were avoided.
- b. **Work Participation:** Female work participation gauges their financial independence in the society. In general, females who are engaged in full time or part time work tend to limit their family size due to physical, psychological and financial constraints.

**Research Scholar, Department of Statistics, Banaras Hindu University, Varanasi*

***Professor, Department of Statistics, Banaras Hindu University, Varanasi*

- c. **Under-Five Mortality:** Under-five mortality or U5M refers to the death of infants and children under the age of five per 1000 live births. Under-five mortality also affects fertility behaviour of couples directly as their family remains incomplete due to the untimely death(s) of children.
- d. **Exposure to Mass Media:** Exposure to mass media and to family planning messages through the media has a strong impact on reproductive attitudes and behaviors among females. Women, in general, who regularly watch television and those who have been exposed to explicit family planning messages are more likely than other women to approve family planning.
- e. **Female Literacy:** Women's education certainly has the most powerful effect on fertility. Studies have shown a strong negative relationship between female's education and fertility levels. Here, ever married females, who have completed at least primary level of education, are considered.

Supply of Children Variables (C_N)

- a. **Mean Age at Marriage:** The average age at which women are married assumes importance because early marriage carries with it the enhanced possibility of early pregnancy and attendant complications, which in turn affect the health of both mother and child.
- b. **Interval between Births:** The level of fertility in a society is established by its tempo of reproduction, i.e., spacing between successive births. This interval plays an important role in future fertility behaviour of females.
- c. **Mean Reproductive Span:** A woman's reproductive span is significant in understanding the fertility levels of a society as well as a woman's or couple's reproductive planning, allocation of time for childbearing and decision to end reproduction. These reproductive decisions are socially and culturally influenced.
- d. **Age at First Birth:** It is the age at which a female gives birth to her first child. This is very important as far as the level of fertility is concerned. Age at first birth and fertility are inversely related; lower the age, higher will be the fertility.

Fertility Regulation Variables (R_c)

- a. **Use of Contraceptives:** Contraceptives play an important role in restricting child births. Couples, who use contraceptives from early days of marriage, have lesser chances of large families. Here those ever married females have been taken who have used any method of contraception, be it modern or traditional.
- b. **Duration of Breastfeeding:** Breastfeeding is an important indicator of fertility behaviour. Prolonged breastfeeding usually results in longer postpartum amenorrhea period.

4.1 The Multiple Regression Model

The multiple regression model which has been used to establish the relationship between dependent and independent variables is described as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_m X_m + \epsilon$$

where,

- i. Y is the dependent variable,
- ii. X_i 's ($i = 1, 2, 3, 4, \dots, m$) are independent variables, β_i 's are the regression coefficients and ϵ is the error term, and
- iii. Regression coefficient $\beta = [\beta_0, \beta_1, \beta_2, \beta_3, \dots]^T$.

5. Results and Discussion:

Tables-1 gives an idea about the various explanatory variables such as dependent variable, demand for children variables, supply of children variables and fertility regulation variables of Uttar Pradesh (UP) in NFHS-1 (1992-93), NFHS-2 (1998-99) and NFHS-3 (2005-06) respectively. As per the table, the dependent variable Children Ever Born (CEB) of UP has decreased by 24.65% (from 3.57 to 2.69) from 1992-93 to 2005-06. In case of supply of children variables, the mean age of marriage has changed from 15.87 years to 17.10 years (increased by 7.75%), the mean interval between births has changed from 32.12 months to 29.81 months (reduced by 7.19%), the mean reproductive span of females has changed from 14.05 years to 12.54 years (reduced by 10.74%) and the mean age of females at the time of their first delivery has changed from 18.18 years to 19.11 years (increased by 5.11%). So far as the demand for children variables are concerned, the wanted fertility rate has changed from 3.64 to 2.38 (decline of 34.62%), work participation of females has changed from 17.38% to 32.81% (increased by 88.78%), the under-five mortality has changed from 142.49 children to 98.05 children (declined by 31.19%), the exposure to mass media has changed from 34.58% to 51.44% (increased by 48.76%) and the female literacy rate has changed from 25.15% to 51.82% (increased by 106.04%). The tables also reveal changes in the fertility regulation variables where the contraceptive usage has increased from 21.42% to 45.23% and the duration of breastfeeding has changed from 24.92 months to 25.42 months (an increase of 2.01%) from 1992-93 to 2005-06.

Tables-2, 3 & 4 represent the regression analyses of factors of fertility change in Uttar Pradesh from NFHS-1, NFHS-2 & NFHS-3 respectively. The analyses show the effect of covariates associated with supply for children variables, demand for children variables and fertility regulation variables on fertility behaviour of women through different models. In **Table-2**, the results demonstrate that most of the covariates in Model-1 are significantly affecting fertility except age at first birth, work participation ratio, effect of mass media and contraceptive use. Here the R^2 value is 0.842, which shows that the various independent variables explain about 84 percent change in the dependent variable (CEB). The model also describes that factors like age at marriage, interval between births and female literacy were negatively affecting the fertility of women and were statistically highly significant ($p < 0.01$). On the other hand, reproductive span, wanted fertility rate, U5M and breastfeeding duration were positively associated with fertility behaviour of women and these factors were statistically highly significant ($p < 0.01$). In Model-2, when some of the factors like mean age at first birth, mass media exposure and female literacy are dropped, the R^2 value remains almost unchanged (0.841), showing that these variables are not very important from the point of view of being determinants of fertility in UP. Here it is observed that the mean age at marriage and mean interval between births are negatively

affecting fertility and significance is also high ($p < 0.01$). The other variables such as mean reproductive span, wanted fertility rate, U5M and duration of breastfeeding have a positive and significant influence on fertility. In Model-3, apart from the dropped variables in Model-2, a fertility regulation variable (use of contraceptive) is also dropped. The impact of the various independent variables on fertility remained same as in both Model-1 & Model-2 so far as the degree and nature of association is concerned. It could also be seen that R^2 value did not change much as compared to the previous two models and the independent variables explain about 84 percent variation in the dependent variable. But in Model-4, as we dropped the variable 'duration of breastfeeding', it not only impacted the association of remaining independent variables with the dependent variable, but also changed the value of R^2 which dropped from 0.840 to 0.787. This model explains 78.7 percent variation in the dependent variable due to the independent variables considered which shows that the duration of breastfeeding, though a significant covariate, has a modest effect on fertility change and explains about 5.3 percent variation in CEB when other variables were controlled.

Table-3 shows the regression analysis of factors affecting fertility in NFHS-2. Model-1 demonstrates a significant association of fertility with interval between births, reproductive span, age at first birth, wanted fertility rate and under-five mortality. The covariate 'interval between births' is negatively affecting fertility, which is highly statistically significant ($p < 0.01$), whereas, the covariates like reproductive span, wanted fertility rate and U5M are positively affecting the fertility behaviour in UP and the association is highly significant ($p < 0.01$). The R^2 value in this model is 0.861, which shows that the independent variables explain around 86 percent variation in the dependent variable (CEB). In model-2, after dropping few insignificant variables, it is observed that the covariates like interval between births, reproductive span, wanted fertility rate and under-five mortality are affecting fertility and the association is highly significant ($p < 0.01$). Here also, the covariate 'interval between births' is negatively associated while reproductive span, wanted fertility rate and under-five mortality are positively associated with fertility. Here, the R^2 value comes out to be 0.860, which is almost the same as which is obtained by model-1 and it explains about 86 percent variation in CEB. In model-3, some more insignificant variables have been dropped and the relationships remain almost unchanged but in model-4, after dropping the covariate 'duration of breastfeeding', the relationships change to a large extent. This model shows an association of fertility with age at marriage, interval between births, reproductive span, wanted fertility rate and under-five mortality and the significance is also very high ($p < 0.01$). While the covariates age at marriage and interval between births show a significantly high ($p < 0.01$), but negative association with CEB, at the same time the other covariates like reproductive span, wanted fertility rate and under-five mortality demonstrate a significantly high ($p < 0.01$) and positive association with the dependent variable. Here the R^2 value is 0.859 which shows that the independent variables explain 86 percent variation in the dependent variable (CEB). A comparison of all the models reveals that the effects of all significant covariates on CEB remain almost unchanged.

Table-4 depicts the regression analysis of major factors affecting fertility in UP in NFHS-3. Model-1 shows a highly significant association of fertility with age at marriage, interval between births, reproductive span, age at first birth, wanted fertility, under-five mortality, female

literacy and use of contraceptive. The covariates interval between births, age at first birth and female literacy are negatively affecting fertility, which is highly statistically significant ($p < 0.01$), whereas the covariates like age at marriage, reproductive span, wanted fertility rate, U5M and use of contraceptive are positively affecting the fertility behaviour in UP and the association is highly significant ($p < 0.01$). The R^2 value in this model is 0.820, which shows that the independent variables explain around 82 percent variation in the dependent variable (CEB). In model-2, after dropping few significant and insignificant variables, it is observed that the covariates like age at marriage, interval between births, reproductive span, wanted fertility rate, under-five mortality and use of contraceptive are affecting fertility and the association is highly significant ($p < 0.01$). Here also, the covariates like age at marriage and interval between births are negatively associated while reproductive span, wanted fertility rate, under-five mortality and use of contraceptive are positively associated with fertility. Here, the R^2 value is 0.818, which indicates that independent variables explain around 82 percent variation in CEB. In model-3, some more variables have been dropped and the relationships remain almost unchanged ($R^2 = 0.817$) but in model-4, after dropping the covariate 'duration of breastfeeding', the relationships changed slightly. The model shows an association of fertility with age at marriage, interval between births, reproductive span, wanted fertility rate and under-five mortality and the significance is also very high ($p < 0.01$). The covariates such as age at marriage and interval between births show a significantly high ($p < 0.01$), but negative association with CEB. Other covariates like reproductive span, wanted fertility rate and under-five mortality demonstrate a significantly high ($p < 0.01$) and positive association with the dependent variable. After controlling the insignificant covariate 'duration of breastfeeding' we get the R^2 value as 0.813 which shows that the significant independent variables, together, explain about 81 percent variation in the dependent variable (CEB).

6. Summary and Conclusion:

The study attempts to understand the vital economic factors affecting fertility in Uttar Pradesh based on NFHS-1, NFHS-2 and NFHS-3 data. A multiple regression model has been used to see the effect of various explanatory variables viz. supply of children variables, demand for children variables and fertility regulation variables on the dependent variable, i.e., Child Ever Born. As the initiating step, the dependent variable and various independent variables were measured and it was observed that the CEB was reduced by about 0.88 children from NFHS-1 to NFHS-3. Primarily the decline seems to be an outcome of change in number of supply of children, demand for children and fertility regulation variables such as increased age of marriage, decreased reproductive span, increased age at first birth, decreased wanted fertility rate, increased work participation of females, reduced under-five mortality, increased exposure to media, increased literacy ratio and increased usage of contraceptives.

Regression analysis of NFHS-1 data revealed a significant association between fertility and age at marriage, interval between births, reproductive span, wanted fertility rate, under-five mortality, female literacy and duration of breastfeeding. Age at marriage, interval between births and female literacy showed a negative association, implying that fertility can be controlled with late marriage, longer interval between births and increased female literacy. The other factors showed a positive association with fertility, indicating that a strong motivation for small family, better medical facilities for mother and child, female education, prolonged breastfeeding

and early sterilization can be helpful in reducing fertility. The influences of other factors were not found significant in this study but they are equally importance. Late child births, increased work participation of females, exposure to mass media and higher use of contraceptives can also help in reducing fertility.

Regression analysis of NFHS-2 data showed a negative association of fertility rate with interval between births, age at first birth and literacy rate, whereas, a positive association was observed with reproductive span, wanted fertility rate and under-five mortality. The results were almost same in case of NFHS-3 data except for a significant positive association between fertility and contraception. This clearly reveals that prolonged use of various methods of contraception leads to controlling fertility.

Table-1: Description of Explanatory Variables for Uttar Pradesh from NFHS-1 (1992-93), NFHS-2 (1998-99) & NFHS-3 (2005-06) data.

Explanatory Variables	NFHS-1	NFHS-2	NFHS-3	% age change from NFHS-1 to NFHS-3
Total Fertility Rate (15-49)	4.66	3.83	3.82	-18.08
Children Ever Born (15-49)	3.57	3.54	2.69	-24.65
Supply of Children Variables				
Mean Age at Marriage	15.87	16.19	17.10	7.75
Mean Interval between Births	32.12	29.87	29.81	-7.19
Mean Reproductive Span	14.05	13.39	12.54	-10.74
Mean Age at First Birth	18.18	18.73	19.11	5.11
Demand for Children Variables				
Wanted Fertility Rate	3.64	2.69	2.38	-34.62
Percentage Work Participation	17.38	22.57	32.81	88.78
Under-five Mortality	142.49	122.73	98.05	-31.19
Percentage Exposure to Mass Media	34.58	43.65	51.44	48.76
Percentage Female Literacy	25.15	33.69	51.82	106.04
Fertility Regulation Variables				
Use of Contraceptive	21.42	35.68	43.23	101.82
Duration of Breastfeeding	24.92	25.83	25.42	2.01

Table-2: Regression Analysis of Factors of Fertility Change in Uttar Pradesh from NFHS-1 (1992-93) data, CEB being dependent variable.

Independent Variables	Model-1	Model-2	Model-3	Model-4
Mean Age at Marriage	-0.013*** (-2.316)	-0.020*** (-4.537)	-0.019*** (-4.417)	-0.035*** (-8.853)
Mean Interval between Births	-0.052*** (-60.163)	-0.052*** (-60.571)	-0.052*** (-60.675)	-0.042*** (-52.051)
Mean Reproductive Span	0.363*** (167.330)	0.364*** (169.161)	0.364*** (169.730)	0.307*** (160.449)
Mean Age at First Birth	-0.005 (-0.927)	-	-	-
Wanted Fertility Rate	0.052*** (6.971)	0.055*** (7.561)	0.053*** (7.440)	0.161*** (24.552)
Percentage Work Participation	-0.024 (-0.830)	-0.021 (-0.729)	-	-
Under-five Mortality	0.300*** (7.892)	0.305*** (8.057)	0.303*** (8.011)	0.536*** (18.969)
Percentage Exposure to Mass Media	-0.003 (-0.135)	-	-	-
Percentage Female Literacy	-0.083*** (-2.620)	-	-	-
Use of Contraceptive	0.057 (1.631)	0.041 (1.196)	-	-
Duration of Breastfeeding	0.002** (2.212)	0.002** (2.383)	0.002** (2.467)	-
Constant	3.029*** (32.255)	3.004*** (34.713)	3.001*** (34.754)	3.730*** (47.296)
R-square	0.842	0.841	0.840	0.787

t-statistics in parentheses, and

*** p<0.01, ** p<0.05, *p<0.1

Table-3: Regression Analysis of Factors of Fertility Change in Uttar Pradesh from NFHS-2 (1998-99) data, CEB being dependent variable.

Independent Variables	Model-1	Model-2	Model-3	Model-4
Mean Age at Marriage	0.005 (0.728)	-0.009 (-1.532)	-0.008 (-1.367)	-0.048*** (-10.443)
Mean Interval between Births	-0.048*** (-47.466)	-0.048*** (-47.785)	-0.048*** (-47.802)	-0.041*** (-44.080)
Mean Reproductive Span	0.374*** (132.299)	0.375*** (134.384)	0.375*** (135.214)	0.304*** (142.131)
Mean Age at First Birth	-0.013** (-2.137)	-	-	-
Wanted Fertility Rate	0.034*** (3.649)	0.038*** (4.165)	0.038*** (4.098)	0.144*** (19.674)
Percentage Work Participation	-0.054 (-1.495)	-0.041 (-1.159)	-	-
Under-five Mortality	0.180*** (3.479)	0.188*** (3.628)	0.186*** (3.594)	0.574*** (17.453)
Percentage Exposure to Mass Media	-0.041 (-1.359)	-	-	-
Percentage Female Literacy	-0.055 (-1.516)	-	-	-
Use of Contraceptive	0.033 (0.890)	0.020 (0.544)	-	-
Duration of Breastfeeding	-0.003 (-0.352)	-0.003 (-0.285)	-0.002 (-0.268)	-
Constant	2.671*** (23.428)	2.616*** (23.937)	2.596*** (24.000)	4.009*** (46.015)
R-square	0.861	0.860	0.860	0.859

t-statistics in parentheses, and

*** p<0.01, ** p<0.05, *p<0.1

Table-4: Regression Analysis of Factors of Fertility Change in Uttar Pradesh from NFHS-3 (2005-06) data, CEB being dependent variable.

Independent Variables	Model-1	Model-2	Model-3	Model-4
Mean Age at Marriage	0.019*** (2.776)	-0.012*** (-2.805)	-0.012*** (-2.641)	-0.045*** (-10.484)
Mean Interval between Births	-0.050*** (-51.365)	-0.051*** (-52.406)	-0.051*** (-52.621)	-0.038*** (-42.523)
Mean Reproductive Span	0.361*** (141.614)	0.365*** (145.733)	0.366*** (146.812)	0.321*** (140.829)
Mean Age at First Birth	-0.030*** (-4.718)	-	-	-
Wanted Fertility Rate	0.074*** (6.112)	0.092*** (7.836)	0.090*** (7.680)	0.180*** (16.747)
Percentage Work Participation	-0.004 (-0.141)	0.010 (0.364)	-	-
Under-five Mortality	0.401*** (9.147)	0.412*** (9.391)	0.417*** (9.501)	0.618*** (17.028)
Percentage Exposure to Mass Media	-0.038 (-1.452)	-	-	-
Percentage Female Literacy	-0.153*** (-5.236)	-	-	-
Use of Contraceptive	0.031*** (3.552)	0.031*** (3.549)	-	-
Duration of Breastfeeding	0.002 (0.477)	0.002 (0.732)	0.001 (0.916)	-
Constant	3.105*** (30.831)	2.942*** (30.732)	2.952*** (31.024)	3.782*** (42.415)
R-square	0.820	0.818	0.817	0.813

t-statistics in parentheses, and

*** p<0.01, ** p<0.05, *p<0.1

References

1. Amonker, R.G. and Brinker, G. 2007. "Reducing Fertility in India", *International Journal of Sociology of the Family*, 33(2), pp. 327-348.
2. Bhattacharya, B., Singh, K.K. and Singh, U. 1995. "Proximate determinants of fertility in Eastern Uttar Pradesh", *Human Biology*, 67(6), pp. 867-886.
3. Bongaarts, J. 1978. "A Framework for Analysing the Proximate Determinants of Fertility", *Population and Development Review*, 4(1), pp. 105-132.
4. Bongaarts, J. and Potter, J. 1983. "Fertility, Biology and Behavior: An analysis of the Proximate Determinants", *Academic Press*, New York, USA.

5. Davis, K. and Blake, J. 1956. "Social Structure and Fertility: An Analytic Framework", *Economic Development and Cultural Change*, 4(3), pp. 211-235.
 6. Dreze, J. and Murthy, M. 2001. "Fertility, Education and Development: Evidence from India", *Population and Development Review*, 27(1), pp. 33-63.
 7. Dyson, T. 2001. "A Partial Theory of World Development: The Neglected Role of the Demographic Transition in the Shaping of Modern Society", *International Journal of Population Geography (Chichester)*, 7(2), pp. 67-90.
 8. Easterlin, R.A. 1975. "An Economic Framework of Fertility Analysis", *Studies in Family Planning*, 6(3), pp. 54-63.
 9. Ghosh, R. 2012. "Child Mortality in India: A Complex Situation", *World Journal of Pediatrics*, 8(1), pp. 11-18.
 10. Henry, L. 1961. "Some Data on Natural Fertility", *Eugenics Quarterly*, 8(2), pp. 81-91.
 11. IIPS. 1995. National Family Health Survey (Uttar Pradesh), 1992-93, *International Institute for Population Sciences, Mumbai*.
 12. IIPS. 2000. National Family Health Survey (Uttar Pradesh), 1992-93, *International Institute for Population Sciences, Mumbai*.
 13. IIPS. 2007. National Family Health Survey (Uttar Pradesh), 1992-93, *International Institute for Population Sciences, Mumbai*.
 14. Jejeebhoy, S.J. 1991. "Women's Status and Fertility: Successive Cross-sectional Evidence from Tamil Nadu", *Studies in Family Planning*, 22(4), pp. 217-230.
 15. Laing, J. 1978. "Estimating the Effects of Contraceptive use on Fertility", *Studies in Family Planning*, 9(1), pp. 150-175.
 16. Leibenstein, H. 1974. "An Interpretation of the Economic Theory of Fertility: Promising Path or Blind Alley?", *Journal of Economic Literature*, 12(2), pp. 457-479.
 17. Majumder, N. and Ram, F. 2015. "Explaining the Role of Proximate Determinants on Fertility Decline among Poor and Non-Poor in Asian Countries", *PLOS One*, DOI: [10.1371/journal.pone.0115441](https://doi.org/10.1371/journal.pone.0115441).
 18. Mari Bhat, P. N. 1998. "Demographic Estimates for Post-independence India: A New Integration", *Demography India*, 27(1), pp. 23-57.
 19. Mohanty, S.K., Fink, G., Chauhan, R.K. and Canning, D. 2016. "Distal Determinants of Fertility Decline: Evidence from 640 Indian Districts", *Demographic Research*, 34(13), pp. 373-406.
 20. Ram, U., Jha, P., Ram, F., Kumar, K., Awasthi, S., Shet, A., and Kumar, R. 2013. "Neonatal, 1-59 month and Under-five mortality in 597 Indian Districts, 2001 to 2012: Estimates from National Demographic and Mortality Surveys", *Lancet Global Health*, 1(4), pp. 219-226.
 21. Singh, K.K., Singh, K., Singh, B.P. and Pathak, A.K. 2002. "Impact of Education and Autonomy on Fertility of Women in Eastern Uttar Pradesh", *Demography India*, 31(2), pp. 223-233.
 22. Singh, S., Casterline, J.B. and Cleland, J. 1985. "The Proximate Determinants of Fertility: Sub-national Variations", *Population Studies*, 39, pp. 113-115.
 23. Tripathy, P.K. and Sarangi, P.K. 2004. "Proximate Determinants of Fertility in India", *The Journal of Family Welfare*, 50(2), pp. 22-29.
 24. Unisa, S. and Bhagat, R.B. 2000. "Social Dimension of Fertility in India: Insights from a Regional Study", *International Journal of Anthropology*, 15(1-2), pp. 361-374.
-