

Has the Use of Contraceptive Helped in Averting Births? An Analysis of Births Averted in 21 Major States of India

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Has the use of contraceptive helped in averting births? An analysis of births averted in 21 major states of India

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Background: In a highly populated country like India, family planning plays a major role in controlling population growth. Estimation of births averted helps in assessing the effectiveness of contraceptive methods. Since the 1950s, different strategies of family planning have been adopted to curb fertility rates by expanding the use of modern contraception among couples. As a result, there has been a steady increase in the users of family planning methods to curb their family sizes. However, there is variation in the adoption of contraceptive methods across the states. From earlier researches, it is established that the permanent modern methods like female sterilization, male sterilization, and IUCD are almost 100 percent effective methods to prevent pregnancy. This study, therefore, is a worthy attempt to estimate the births averted using modern contraception at present for Indian states with the help of the latest available data, by using the method suggested by Liu and others (2008)[11].

Results: The results of the analysis show that births averted were highest in Uttar Pradesh and Maharashtra. However, the percentage reduction in births by the contraceptive method is highest in Punjab indicating the effectiveness of modern contraception use.

Conclusions: The analysis of births-averted estimation not only shows the state-level variations but also its significant impact on reducing TFR. Further, female sterilization has the highest prevalence rate among the contraceptive method and averting the highest number of births.

Keywords: Births Averted, Modern Contraception use, Family Planning

Introduction

It was in 1952, India became the first country in the developing world to create a state-sponsored family planning program, the National Family Planning Program. The program's

primary objectives were to lower fertility rates and slow population growth as a means to propel economic development. In developing countries fertility has played a greater role in a population explosion, because of demographic transition, high life expectancy was achieved but delay in replacement level fertility. Principle determinants of population growth are fertility, mortality, and migration, which are further influenced by various socio-economic factors. Several initiatives have taken place both at the national and international levels to improve and enhance the use of family planning methods. One such international milestone is the International Conference on Population Development (ICPD) held in Cairo, Egypt in 1994 concerned with the area of reproductive and child health. India was highly responsive towards population growth and became the first country to adopt a family planning program. Since then various policies and programs have been implemented to curb fertility rates and control population growth. It was realized back then that for a country like India controlling population growth is not a desirable but necessary condition for socio-economic development. However, India is the second-most populous country and on the verge of surpassing china by 2027 raises concern regarding the effectiveness of population policies and programs. According to the Ministry of Health and Family Welfare, India houses 17.3% of the world's protected couple and 20% of the world's eligible couples with the unmet need for family planning. Therefore, the large population size of India not only affects its own but also global health indicators. In recent times there is an increase in the number of couples using family planning to control their family sizes. However, there is variation in states in adoption and effective use of family planning methods, leading to variation in fertility indicators. The goal of the family planning program is not just to distribute contraceptives, train workers, and distribute funds but rather to prevent births from occurring. The estimation of births averted is the standard procedure to analyse the effectiveness of family planning methods and further enlightens about the requirement of family planning methods to achieve the targeted decline in fertility level.

The experts of fertility study focused on the estimation of births averted for the first time in the 1960s. The researchers focused on the estimation of Births Averted by family planning methods by using standard methods. There are three standard approaches to estimate births averted by family planning programs: (1) selected rules of thumb; (2) Potter's and Wolfers' approach using couple years of effective contraception; and (3) various age-specific fertility rate approaches (Kelly 1971) [1]. Kelly (1971) modified the ASFR approach and developed a new approach called the "Parity Approach". This approach was widely used by researchers to estimate the ASFR indirectly. Elena (1975) used this method to estimate births averted by a

family planning clinic in Cambodia by using a sample of around 4000 in 1969 [2]. Several developments took place in the 1970s in the field of estimating fertility indicators indirectly, Rele (1967) estimated TFR indirectly by using stable population method [3], further, Brass (1968) developed P/F ratio method to estimate TFR using the data of vital registration system [4] the Proximate determinants model given by Bongaart (1978) [5]. The UN reports 1978 [6], 1979 [7], 1982 [8] accounted for further development on methods as birth averted was considered as an important indicator to assess the impact of family planning programs on fertility. An extensive study was done by Mauldin et. al (1978) using multiple and partial regression analyses documented the linear relationship between fertility indicators (CBR, GFR, and TFR) and contraceptive prevalence [9]. In the Indian context, a model was developed by Venkatacharya (1971) to estimate births averted due to IUCDs and Sterilization [10]. As a recent development in the estimation of Births Averted Liu et al (2008) have suggested three methods of estimation using contraceptive prevalence and fertility indicators. Recent works have been done by researchers using the Liu et al (2008) method [11].

This study is focused on the estimation of births averted in 21 major states of India and efficiency in the use of contraceptive methods. Estimation of Birth Averted is useful for the policymakers and family planning program managers to assess the success of any family planning program and to take further decisions regarding modification and further implementation. Being a quantitative measure, the estimates provide a comparative framework across different regions and to assess the success of any family planning program. A country like India with a large population, it has diversity in social, cultural, economic, and demographic characteristics of the population leading to the difference in contraceptive behaviour across the regions. An effective family planning program leads to a decrease in infant and maternal mortality. With the increase in the effective use of contraception unmet need for family planning reduces, as a result, women of reproductive age group are not exposed to unwanted pregnancy and risk of mortality. Further, effective contraceptive use leads to a decrease in fetal wastage and a lack of spacing between children, which not only beneficial for the health of women and children but also prevents economic burden.

Objectives

The objectives of the study are as follows:

1. Estimate the number of births averted and reduction in the percentage of births due to the use of contraceptive methods and specifically for sterilization and IUCD.
2. Estimation of births averted if the demand for family planning is satisfied.

Methodology

The required data for the analysis is from secondary source i.e. the report of the fourth round of the National Family and Health Survey (2015-16) [25]. It is a large-scale, multi-round survey conducted in a representative sample of the household throughout India, which provides information on fertility, infant and child mortality, the practice of family planning, maternal and child health, reproductive health, nutrition, anaemia, utilization, and quality of health and family planning services at the state and national levels. The Ministry of Health and Family Welfare, Government of India designated International Institute for Population Sciences (IIPS) as the nodal agency, responsible for providing coordination and technical guidance for the survey. To date four rounds of NFHS have been conducted; NFHS-I in 1992-93, NFHS-II in 1998-99, NFHS-III in 2005-06, and NFHS-IV in 2015-16. In the interviewed households, 723,875 eligible women age 15-49 were identified for individual women's interviews. Interviews were completed with 699,686 women, for a response rate of 97 percent. In all, there were 122,051 eligible men age 15-54 in households selected for the state module. Interviews were completed with 112,122 men, for a response rate of 92 percent.

The projected population for the states has been taken from the Population Projection Report (2019) [26] issued by the Registrar General of India. Component Method is the universally accepted method of making population projections because the growth of population is determined by fertility, mortality, and migration rates. The Twenty-one States and one UT have been considered and applied the Component method. The data used are the 2011 Census and Sample Registration System (SRS) SRS provides time-series data of fertility and mortality, which has been used for predicting their future levels. The figures for the year 2011 are the actual Census figures.

For the analysis, the TFR method suggested by Liu et al. (2008) [11] has been used. Similar techniques have been adopted for 21 major states of India. At first linear regression has been carried out to see the effect of CPR on TFR. However, the quadratic term of CPR has been added in the equation for better estimation as the R^2 value improved. The Births Averted is the total number of births which is avoided by using contraception thus the potential TFR is the

actual number of births that the women (currently in union) of reproductive age group would have experienced if she (or her partner) has not adopted any family planning method.

The total number births averted and percentage decrease in births in the absence of family planning can be estimated by using the following formula

$$\text{Births Averted (BA)} = \left(\frac{TFR_{potential_i}}{TFR_{actual_i}} - 1 \right) * \text{Births}/1000$$

$$\text{Percent Reduced (PR)} = \left(\frac{ABS(TFR_{actual_i} - TFR_{potential_i})}{TFR_{potential_i}} \right) * 100$$

$$TFR_{potential_i} = TFR_{actual_i} - b_1 * CPR_i - b_2 * CPR_i^2$$

$TFR_{potential_i}$ = The average number of birth the women of the reproductive age group of i^{th} state of India would have experienced in the absence of using current level of contraceptive prevalence rate

TFR_{actual_i} = The actual number of births the women of the reproductive age group of i^{th} state of India would experience at the current level of contraceptive prevalence rate

CPR_i = Contraceptive Prevalence Rate experienced by the women of the reproductive age group of i^{th} state of India

CPR_i^2 = Quadratic term of CPR experienced by the women of the reproductive age group of i^{th} state of India

b_1 = coefficient of the linear term of CPR

b_2 = coefficient of the quadratic term of CPR

The Births averted and the percentage decrease in births by using contraception has been obtained by using the indicators like CPR and TFR of respective states. The total births are estimated by multiplying the crude birth rate (CBR) and the projected population of the state.

Results

Table 1 contains the initial data required for the analysis to estimate the total births averted and the percentage decrease in births by using the contraceptive methods. Bihar has the highest total fertility rate and the lowest contraceptive prevalence rate. Kerala has the lowest total fertility rate and Punjab has the highest contraceptive prevalence rate. Further, the crude birth rate is highest in Bihar and lowest in Kerala.

Table 2 is showing the number of births averted and the percentage decrease in births by using any contraceptive method and any modern contraceptive methods. Uttar Pradesh has averted the highest number of births while Uttarakhand has averted the lowest number of births. The percentage decrease in births is highest in Kerala showing the effective use of contraceptive methods, and lowest in Bihar. In Assam percentage of births averted by traditional methods is highest in Assam.

Table 3 is showing the numbers of births averted and percentage reduction in by specific modern contraceptive methods like female sterilization, male sterilization, and IUCD. Maharashtra has averted the highest number of birth and Uttarakhand has averted the lowest number of births. The contraceptive prevalence rate is highest in Andhra Pradesh but the percentage reduction in births is highest in Kerala, while Assam has the lowest contraceptive prevalence rate and lowest percentage reduction in births by female sterilization. Births Averted by male sterilization is highest in Telangana with the highest contraceptive prevalence rate and highest effectiveness. In Bihar and Tamil Nadu, the contraceptive prevalence rate of male sterilization is zero. In the case of IUCD, Uttar Pradesh has averted the highest number of births by using while Andhra Pradesh has averted the lowest number of births. The contraceptive prevalence rate of IUCD and Percentage reduction in births is highest in Punjab, while Andhra Pradesh has the lowest prevalence rate and efficiency.

Table 4 is showing the level births averted at the current level of unmet need for family planning and the level of births averted if the demand for family planning is fulfilled. Bihar has the highest unmet need for family planning while Andhra Pradesh has the lowest need for family planning. The proportion of extra births averted if the demand is satisfied is highest for the states having high unmet for family planning.

Discussion

The number of births averted is highest in Uttar Pradesh (2588000) followed by Maharashtra (1790000) and West Bengal (1545000), these states are also the most populous state of India during the reference period 2015-16. In case of Bihar, births averted (830000), although

being the third most populous state, the number of births averted is comparatively low because of the low contraceptive prevalence rate. Therefore, we can say that the number of births averted is being affected by both the total population size and contraceptive prevalence rate. However, the effectiveness of using any contraceptive methods for states can be assessed by the percentage reduction in births by that method. On an average 44% births have been averted in the major states of India. Among which Punjab has averted highest percentage of births (52%) followed by Kerala (50%) and West Bengal (50%). In terms of contraceptive prevalence rate highest in Punjab (75.8%) followed by West Bengal (70.9%), Andhra Pradesh (69.5%). Instead of having a comparatively low contraceptive prevalence rate (53%), Kerala is the second most effective state in averting births. Comparatively better effectiveness in terms of percentage reduction in births has been shown by Karnataka, Tamil Nadu, Telangana, so on as the contraceptive prevalence rate is comparatively low in these states. However, states like Haryana (63.7%), Rajasthan (59.7%), Chhattisgarh (57.7%) instead of having a high contraceptive prevalence rate have comparatively low percentage reduction in births i.e. 45%, 42%, and 41% respectively. Haryana being the 5th state from top in terms of contraceptive prevalence rate has declined to 10th position in terms of percentage reduction in births, similarly, Rajasthan and Chhattisgarh have also declined from 6th and 7th position in terms of Contraceptive prevalence rate to 14th and 17th position in terms of effectiveness. The reason for comparatively low effectiveness in reducing births can be because of inefficient quality of care in family planning services. Further, in Assam the percentage reduction in births by traditional methods is highest than in other states as the gap between percentage reduction in births by any contraceptive method and percentage reduction in any method is wider than any other states. Therefore, it can be said that Assam has used traditional method efficiently, similar results have been observed in states like Uttar Pradesh and Uttarakhand. These states should be encouraged to keep using these methods, however, because of high fertility these states should be encouraged to adopt modern contraceptive methods for better results. The states with high efficiency in reducing births are also the states with the lowest fertility rate in the country. Modern contraceptive methods have reduced 33% births on average, which shows the dominance of the methods in terms of effectiveness. Specific methods like female sterilization, male sterilization, and IUCD are 100% effective in averting births if used effectively. The contraceptive prevalence rate of female sterilization is highest in Andhra Pradesh (68.3%) however, in terms of percentage reduction in births the most efficient state is Kerala with a contraceptive prevalence rate of 45.8%. Kerala reduces 30% births from occurring while Andhra Pradesh reduces 27% births.

However, in the case of Chhattisgarh percentage reduction in births is 23% with contraceptive prevalence rate 46% showing comparative inefficiency in using female sterilization. Similarly, poor results can be seen in states like Madhya Pradesh, Rajasthan, Haryana, Jharkhand, and so on. Further, the contraceptive prevalence rate of male sterilization is less than 1% in all the states except Telangana. However, male sterilization is highly efficient in averting births as in Telangana the percentage reduction in births is 19% by 1.6% contraceptive prevalence rate. Similarly, Uttarakhand and Chhattisgarh have reduced 7% and 6% births by just 0.7% contraceptive prevalence rate. Therefore, we can say that this method is highly effective in averting births if used efficiently. Further, IUCD is the most popular spacing method used by couples. The most efficient use of IUCD can be seen in Punjab as with a 7% contraceptive prevalence rate 14% births have been averted. Effective use can also be seen in Delhi, Haryana, Gujrat, and Jammu & Kashmir, however, comparatively poor results can be seen in Assam, Chhattisgarh, Rajasthan, and so on. Broadly it can be said that efficiency in use of contraceptive methods has highly affected the fertility level of the states. Further, the unmet need for family planning is also affected by fertility level. Unmet need for family planning is the difference between reproductive intentions and reproductive behaviour of the couple. The states with high unmet needs have the potential to avert high numbers of births with effective family planning.

Conclusion

The analysis of birth averted estimation not only shows the state-level variations but also its significant impact on reducing TFR. Further, female sterilization has the highest prevalence rate among the contraceptive method and averting the highest number of births. However, it also goes through the problem of effective use in some states like Chhattisgarh, Rajasthan, Jharkhand, Odisha, Uttarakhand, Bihar, etc. The reason can be, compromises done in the quality of care in the provided services. The contraceptive methods like male sterilization and IUD instead of being effective in averting births least popular among the states because of various socio-cultural stigma, awareness should be spread for the adoption of such a contraceptive method. The focus should be paid on encouraging people of reproductive ages to adopt family planning and use effectively. Further, the analysis shows that a large number of births can be averted if the unmet need for family planning is satisfied.

The results obtained from the study will be useful for the policymakers and family planning program managers to assess the success of any family planning program and to take further

decisions regarding modification and further implementation. Lower performing regions can be focused to improve the quality of care in providing family planning services. The efficiency in averting births should be checked in the states having high contraceptive prevalence.

There are certain drawbacks in the paper as the total number of births have been estimated by using the projected population report, 2019 issued by RGI because of the unavailability of data. The estimation of births averted can be done by other methods to check the consistency of results.

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DECLARATION

• Ethics approval and consent to participate.

Our study is based on a secondary dataset with no identifiable information on the survey participants. This dataset is available in public domain for research use and hence, no approval was required from any institutional review board.

• Consent for publication

All the 3 authors have given consent for publication and I have authority over manuscript preparation and decisions to submit the manuscript for publication.

• Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study. Data from the reports have been used for analysis.

1. National Family Health Survey (NFHS-4) (2015-16)
Retrieved from: <http://www.rchiips.org/nfhs>
2. Population Projection Report (2019) issued by the Registrar General of India
Retrieved from: https://nhm.gov.in/New_Updates_2018

• Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Jyoti Das conceived the idea. S.K. Singh and Bidhubhushan Mahapatra designed the research. Jyoti Das analyzed the data, interpreted the results and drafted the first manuscript. S.K Singh and Bidhubhushan revised the manuscript. All the authors read and approved the final manuscript.

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Table 1. Input data for the estimation of Births Averted and Percentage reduce in Births by the use of contraceptive method.

STATE	TFR	CBR	CPR Any method	CPR Any modern method	Total birth ('000)
Andhra Pradesh	1.83	16.1	69.5	69.4	824
Assam	2.21	19.5	52.4	37	643
Bihar	3.41	27	24	23.2	3056
Chhattisgarh	2.23	20.7	57.7	54.5	567
Delhi	1.78	16.4	54.8	48.6	303
Gujarat	2.03	16.7	46.9	43.1	1080
Haryana	2.05	18.7	63.7	59.4	509
Jammu	2.01	17.7	57.1	46	227
Jharkhand	2.55	21.7	40.3	37.4	771
Karnataka	1.8	15.9	51.8	51.3	1016
Kerala	1.56	11.2	53.1	50.3	386
Madhya Pradesh	2.32	20.2	51.3	49.5	1579
Maharashtra	1.87	16.6	64.7	62.5	1960
Odisha	2.05	18.1	57.3	45.4	779
Punjab	1.62	13.8	75.8	66.3	400
Rajasthan	2.4	20.8	59.7	53.5	1532
Tamil Nadu	1.7	15.5	53.2	52.6	1153
Telangana	1.78	17.1	57.2	56.9	621
Uttar Pradesh	2.74	22.6	45.5	31.7	4847
Uttarakhand	2.07	19	53.4	49.3	203
West Bengal	1.77	16.6	70.9	57	1572

Table 2. Estimated number of Births Averted (BA) and Percentage Reduce (PR) in births by use of for any contraceptive method and only modern contraceptive method.

States	any method		any modern method	
	BA ('000)	PR	BA ('000)	PR
Andhra Pradesh	781	48.7	510	38.2
Assam	459	41.6	245	27.6
Bihar	830	21.4	531	14.8
Chhattisgarh	418	42.4	267	32.1
Delhi	274	47.5	170	35.9
Gujarat	792	42.3	495	31.4
Haryana	423	45.3	270	34.7
Jammu	185	44.9	109	32.5
Jharkhand	411	34.8	257	25.0
Karnataka	885	46.5	578	36.2
Kerala	392	50.4	251	39.4
Madhya Pradesh	1062	40.2	684	30.2
Maharashtra	1790	47.7	1160	37.2
Odisha	623	44.4	364	31.9
Punjab	432	51.9	278	40.9
Rajasthan	1063	41.0	666	30.3
Tamil Nadu	1077	48.3	702	37.8
Telangana	572	47.9	374	37.6
Uttar Pradesh	2588	34.8	1338	21.6
Uttarakhand	156	43.4	98	32.6
West Bengal	1545	49.6	952	37.7

Table 3. Contraceptive prevalence, birth averted and percent reduce in birth by some specific methods of contraception.

State	Female sterilization			Male sterilisation			IUD		
	CPR	BA ('000)	PR	CPR	BA ('000)	PR	CPR	BA ('000)	PR
Andhra Pradesh	68.3	312.0	27.5	0.6	52.0	5.9	0.2	3.0	0.4
Assam	9.5	61.0	8.6	0.1	5.0	0.8	2.2	22.0	3.4
Bihar	20.7	365.0	10.7	0.0	0.0	0.0	0.5	15.0	0.5
Chhattisgarh	46.2	171.0	23.2	0.7	34.0	5.7	1.6	14.0	2.4
Delhi	19.8	67.0	18.1	0.2	6.0	2.0	5.4	36.0	10.6
Gujarat	33.6	305.0	22.0	0.1	10.0	0.9	3.0	57.0	5.1
Haryana	38.1	153.0	23.1	0.6	29.0	5.3	5.6	55.0	9.7
Jammu	24.3	52.0	18.6	0.4	8.0	3.6	2.8	11.0	4.7
Jharkhand	31.0	165.0	17.6	0.2	11.0	1.4	1.0	10.0	1.3
Karnataka	48.6	386.0	27.5	0.1	10.0	1.0	0.8	15.0	1.5
Kerala	45.8	166.0	30.1	0.1	4.0	1.1	1.6	14.0	3.4
Madhya Pradesh	42.2	441.0	21.8	0.5	65.0	3.9	0.5	11.0	0.7
Maharashtra	50.6	726.0	27.0	0.4	79.0	3.9	1.6	57.0	2.8
Odisha	28.2	194.0	20.0	0.2	14.0	1.8	1.1	14.0	1.8
Punjab	37.5	151.0	27.4	0.6	28.0	6.6	6.6	66.0	14.2
Rajasthan	40.7	407.0	21.0	0.2	23.0	1.5	1.2	26.0	1.7
Tamil Nadu	49.4	466.0	28.8	0.0	0.0	0.0	1.9	45.0	3.7
Telangana	54.2	245.0	28.3	1.6	119.0	16.0	0.4	5.0	0.7
Uttar Pradesh	17.3	622.0	11.4	0.1	32.0	0.7	1.2	71.0	1.5
Uttarakhand	27.4	49.0	19.5	0.7	13.0	6.2	1.6	5.0	2.6
West Bengal	29.2	466.0	22.9	0.1	16.0	1.0	1.2	36.0	2.2

Table 4. Level of Unmet Need and estimated birth averted if the demand for family planning is fulfilled.

states	Unmet Need (%)	Extra BA in the absence of UN ('000)	total births averted ('000)
Andhra Pradesh	4.6	53	834
Assam	14.1	90	548
Bihar	21.1	360	1190
Chhattisgarh	11.1	65	483
Delhi	15	55	329
Gujarat	17	187	979
Haryana	9.3	55	477
Jammu	12.3	31	216
Jharkhand	18.4	112	523
Karnataka	10.4	137	1022
Kerala	13.7	75	467
Madhya Pradesh	12.1	187	1249
Maharashtra	9.7	240	2030
Odisha	13.6	114	737
Punjab	6.2	38	470
Rajasthan	12.3	177	1240
Tamil Nadu	10.1	161	1237
Telangana	7.4	63	635
Uttar Pradesh	18	646	3234
Uttarakhand	15.5	32	188
West Bengal	7.5	163	1708