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Original Research Paper

District-Level Scenario of Fertility in India: Levels and Differentials

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ABSTRACT:
The districts in India are the lower administrative units next to the states; considered as the basis for the implementation of any developmental plan and programme. The fertility estimates are often required for effective planning and program implementation. Most studies on fertility analysis in India mainly focused on the national and state level and were based on census data. Using the data from District Level Household Survey-3 (DLHS-3), 2007-08 this paper assessed the levels and differentials in total fertility rate (TFR) at the district level in India. The TFR for each district of India was estimated based on birth order statistics through regression method. Results indicate that there was wide variation in the levels of TFR among districts of India. The estimated TFR ranges from a highest of 6.1 in the district of Shahjahanpur of Uttar Pradesh to a lowest of 1.3 in the district of Mahe of Pondicherry. Remarkable differences in the levels of TFR were also observed between the districts of northern and southern states. While majority of the districts of three southern states (Andhra Pradesh, Kerala and Tamil Nadu) had TFR of replacement level or below replacement level (TFR of less than or equal to 2.1), the majority of the districts in northern states (mainly in Bihar and Uttar Pradesh) had TFR of more than 4.

Key words: Levels, Differentials, Total Fertility Rate, Districts, India

INTRODUCTION:

In 1952, India was the first country to launch the family welfare programme with the objective of controlling birth rates and thereby stabilizing the population (MOHFW, 2000). During the last five decades of twentieth century (1952-1994/1950s-1990s), the family welfare programme of India underwent several changes along with changes in targets, family planning methods and implementation strategies (Srinivasan, 1998). Additionally, the National Population Policy 2000 was introduced by the Government with its medium term objective of achieving replacement level fertility by 2010 and long term objective to achieve the population stabilization by 2045 (MOHFW, 2000). However, despite several efforts and reduction in growth rate of population, the actual population size of India is increasing rapidly. According to 2011 census of India, during last six decades (1951-2011), the India's population has increased by more than three threefold; from 361 million in 1951 to 1210 million in 2011. Though the level of fertility is declining rapidly in India, the there are considerable variation in fertility level among the states of India. Some states such as Bihar, Rajasthan, Uttar Pradesh, Madhya Pradesh and Assam continue to have high fertility. More than half of the states of India have fertility above the replacement level (TFR of 2.1). Moreover, there is considerable variation in fertility levels even among all districts of India and among the districts within different states of India (Mohanty *et al.*, 2012). The districts of two larger states of India, namely Uttar Pradesh and Bihar continue to have relatively higher fertility (Das and Mohanty, 2012). The high fertility may not only affect the average progress at the household and individual level but also affect the average progress at the macro level (Das and Mohanty, 2012). Without the faster decline in fertility across the districts of India, the population stabilization in India can never be achieved.

In India, the districts are considered as the basis for the implementation of any developmental plan and programme. The fertility estimates are often required for

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effective planning and program implementation. It may be mentioned that most studies on fertility analysis in India were mainly pertained to the national- and state level analyses. Though, in the recent past, few studies have been carried out to provide the district level estimates of fertility in India, most of them were based on census data (Registrar General of India, 1989; 1997; Bhat, 1996; Prakasam et al., 2000; Guilmoto and Irudaya Rajan, 2002; Ram *et al*., 2005; Das and Mohanty, 2012; Mohanty *et al*., 2012). In this context, the present paper aimed at examining the levels and differentials in fertility among the districts of India using population-based survey data, considering the districts as the units of analysis.

DATA AND METHODS:

Data:

The purpose of this paper was to assess the levels of and differentials in fertility at the district level in India for which the district-level estimates of total fertility rate (TFR) for the period 2007-2008 were considered. District Level Household Survey data of 2007-08 (DLHS-3) has been used to estimate the TFR. The estimates of TFR were derived for 587 districts of the 33 states of India (except for the districts of Jammu and Kashmir, and Nagaland). The TFR for each district was estimated using birth order statistics. The DLHS under the Reproductive and Child Health (RCH) project has been designed by the Government of India to provide data on key RCH indicators at the district level. Additionally, the DLHS also intended to provide the information on facilities available in government health institutions and information on household assets and amenities. In DLHS-3, the data were collected from 7, 20,320 households covering 601 districts from 34 states (except Nagaland) of India. In DLHS-3, the individual level information was collected from ever married women aged 15-49 years (N=6, 43,944) and unmarried women aged 15-24 years (N=1, 66,260). The individual level information for ever married women in DLHS-3 were collected on women's characteristics, maternal care including antenatal and post natal care, child health care including immunization of children, use of contraception including knowledge about available contraceptive methods, children ever born and children surviving, fertility preference, reproductive health including awareness of RST/STI and HIV/AIDS, etc. Beside these, the DLHS-3 collected the detailed information on live births such as birth order, date of birth, surviving status and age at death of live born children etc. under all pregnancies occurred to all ever married women aged 15-49 years (excluding women whose gauna was not performed) since January 1, 2004. However, the estimates of TFR were confined to the live births taking place in three years preceding the date of survey. It may be mentioned that, the estimates for the districts of Jammu and Kashmir were not reliable and, therefore, the state of Jammu and Kashmir is exempted from the analysis.

Method of estimating TFR:

In this paper, the TFR at the district level in India has been estimated through regression based method. First, the regression coefficients have been obtained on regressing birth order with TFR for states of India. Ram *et al.* (2005) had used regression methods (both linear and exponential) to estimate TFR for districts of India. They have used the combined percentage of first and second order births as independent variable and the TFR as dependent variable from census in order to compute the values of regression coefficients. The similar procedure has been followed here to estimate the TFR for all districts of India. The following regression equations have been used to compute the regression coefficients.

$TFR = a + b*BOD3^{+}$ ------------------------- (1)

$TFR = e^{(a + b*BOD3+)}$ --------------------------- (2)

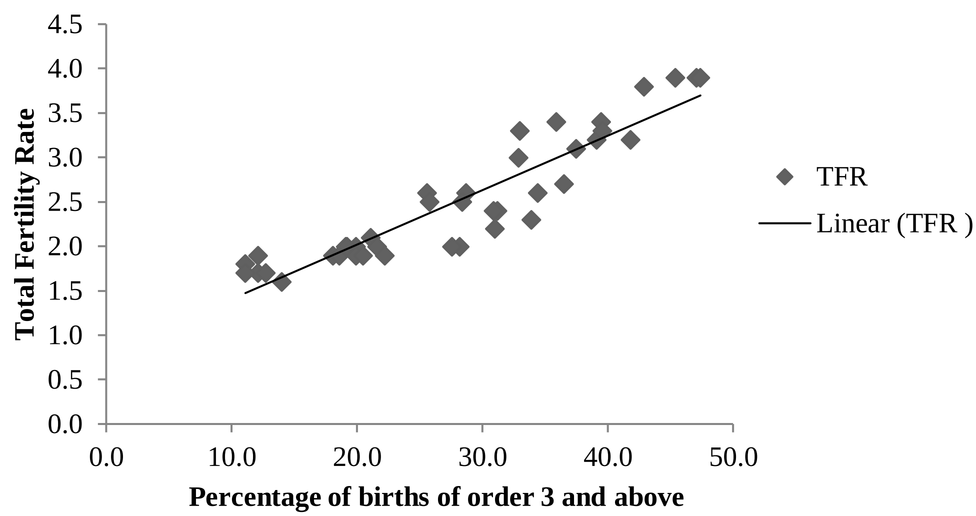
Where, 'a' is the intercept, 'b' is the regression coefficient and BOD3+ is the percentage of births of order 3 and above.

The regression analysis has been carried out using the percentage of births of order 3 and above as independent variable and the estimated TFR as dependent variable based on 20 states of India. The state level estimates of TFR and percentage of births of order 3 and above have been taken from SRS statistical reports 2007 and 2008 (Registrar General of India, 2008; 2009a). Both linear and exponential regression analysis have been carried out separately for the periods 2007, 2008, pooled rural and urban 2008 and pooled data from 2007 and 2008. The pooled data were used to minimize the standard error by increasing the number of observations. Both linear and exponential regression analyses were carried out separately for the data of each case. It was found thatthe values of regression coefficient (b) were appeared to be positive for all regressions, which implies that there is positive relationship between the TFR and the percentage of births of order 3 and above. The higher the percentage of births of order 3 and above, the higher will be the TFR. The t-values are found to be more than 1.96 for all regressions, which implies that the coefficients are statistically significant at 95% level of confidence interval which, in turn, implies that the TFR is significantly associated with percentage of births of order 3 and above. The values of regression coefficient (b) are almost similar or stable for all exponential regressions. The value of R^2 for exponential regression is higher than linear regression for almost all cases except regressions for urban data of 2008 and pooled rural and urban data of 2008. Moreover, it is to be noted that the value of R^2 for exponential regression for pooled data from 2007 and 2008 is found to be higher (R^2=0.878) than that for all other exponential regressions except exponential regression for 2008 (R^2=0.883). However, the standard error for exponential regression for pooled data from 2007 and 2008 is found to be minimum (0.001). This implies that the association between the TFR and the percentage of births of order 3 and above is much stronger for exponential regression for pooled data from 2007 and 2008 than that of all other cases.

Furthermore to understand the relationship of TFR and percentage of births of order 3 and above, a scatter diagram is drawn using pooled data from 2007 and 2008 for 20 states of India (Figure 1). It is observed that the TFR is not linearly associated with percentage of births of order 3 and above but the relationship between these two is found to be curvilinear. Thus, the coefficient values derived from exponential regression for pooled data from 2007 and 2008 had been used for estimating district-level TFR. The exponential regression equation used to estimate the district-level TFR is:

$TFR = e^{(0.216 + 0.024*BOD3+)}$ ------------------------- (3)

Figure 1: Scatter diagram of TFR and percentage of births of order 3 and above using pooled data from 2007 and 2008 for 20 states of India.



RESULTS:

Reliability of the district level estimates of TFR in India:

In order to understand the reliability of the district level estimates of TFR in India, the state level estimates of TFR derived from DLHS-3 are compared with that of SRS 2006 (Registrar General of India, 2007) (Table 1). In addition, the correlation coefficient between the state level estimates of TFR derived from DLHS-3 and the state level estimates of TFR from SRS 2006 is examined. The estimates of TFR derived from DLHS-3 can be referred to that of 2006. This is because the percentage of BOD3+ was computed from the births that took place in 3 years preceding the date of survey. Therefore, the estimates of TFR may be referred to that of 2006. It was observed that the estimated TFR for India derived from DLHS-3 was very close to that from SRS 2006. The TFR of India derived from DLHS-3 was 3.1 and that from SRS 2006 was 2.8.

Table 1: Comparison of estimated TFR derived from DLHS-3 with that of SRS 2006 in states of India.				
States/Union territories	Total fertility rate		Actual Difference	Percentage of births of order 3 & above (DLHS-3)
	DLHS-3	SRS 2006 (2)	col.1-col.2	
Andaman & Nicobar Islands	1.9	--	--	16.9
Andhra Pradesh	1.9	2.0	-0.1	18.1
Arunachal Pradesh	2.9	--	--	35.0
Assam	2.9	2.7	0.2	35.8
Bihar	4.5	4.2	0.3	54.0
Chandigarh	2.0	--	--	19.4
Chhattisgarh	3.4	3.3	0.1	41.6
Dadra & Nagar Haveli	3.3	--	--	40.4
Daman & Diu	2.5	--	--	29.9
Delhi	2.6	2.1	0.5	30.6
Goa	1.9	--	--	17.8
Gujarat	2.8	2.7	0.1	33.3
Haryana	2.8	2.7	0.1	34.0
Himachal Pradesh	2.1	2.0	0.1	22.1
Jammu & Kashmir[@]	--	--	--	--
Jharkhand	3.9	3.4	0.5	47.5
Karnataka	2.6	2.1	0.5	31.3
Kerala	1.8	1.7	0.1	15.7
Lakshadweep	3.2	--	--	39.0
Madhya Pradesh	2.7	3.5	-0.8	32.8
Maharashtra	2.4	2.1	0.3	26.8
Manipur	3.3	--	--	40.9
Meghalaya	3.7	--	--	45.0
Mizoram	2.7	--	--	32.1
Nagaland[#]	--	--	--	--
Odisha	2.7	2.5	0.2	32.2
Pondicherry	1.5	--	--	8.7
Punjab	2.2	2.1	0.1	24.6
Rajasthan	3.2	3.5	-0.3	39.4
Sikkim	2.6	--	--	31.1
Tamil Nadu	1.9	1.7	0.2	17.3
Tripura	2.5	--	--	28.5
Uttar Pradesh	4.6	4.2	0.4	54.8
Uttarakhand	2.9	--	--	35.1
West Bengal	2.4	2.0	0.4	27.8
All India*	**3.1**	**2.8**	**0.3**	**37.9**

***Excluding Jammu & Kashmir, and Nagaland. [@]Not considered in the analysis. [#]Not covered by DLHS-3. -- Not available. actual differences between the state level estimates of TFR derived from DLHS-3 and that of SRS 2006 were marginal. In other words, the state level estimates derived from DLHS-3 were close to that of SRS 2006. The correlation coefficient of state level estimates of TFR derived from DLHS-3 and the state level estimates of TFR from SRS 2006 was estimated to be 0.926. This suggests that the estimates derived from DLHS-3 can be satisfactory and acceptable.**

Distribution of districts by levels of TFR in India and states:

In order to see the distribution of districts by levels of TFR in India and states, the districts were classified into four categories- districts with TFR of less than or equal to 2.1, with TFR of 2.2-3.0, with TFR of 3.1-4.0, and with TFR of more than 4.0. It was observed that out of 587 districts of the 33 states and union territories of India, 37.8 percent (222 districts) had TFR in the range of 2.2-3.0, 20 percent (118 districts) had TFR in the range of 3.1-4.0 and 19.3 percent (113 districts) had TFR above 4.0. However, only 22.8 percent districts (134 out of 587) had replacement level or below replacement level fertility (TFR of ≤2.1). Near about 40 percent districts (231 out of 587) had TFR of more than 3.

The pattern of distribution of the districts by levels of TFR was not similar across the states (Table 2). For example, in Andhra Pradesh, 21 out of 23 districts had TFR at replacement level or below replacement level and the remaining 2 districts had TFR in the range of 2.2-3.0. Similarly, in Tamil Nadu, 26 out of 30 districts had TFR at replacement level or below replacement level and the remaining 4 districts had TFR in the range of 2.2-3.0. On the contrary, majority of the districts in Uttar Pradesh and Bihar (57 out of 70 districts in Uttar Pradesh and 33 out of 37 districts in Bihar) had TFR of more than 4 and none of the districts of these states had reached replacement level of fertility.

Inter-district differentials in TFR in India:

The inter-district differentials in TFR were examined with respect to the estimated TFR of 2006. The estimates of TFR, as of 2006, indicate that the level of TFR largely varies across the districts of India. The level of TFR, as of 2006, ranges from a lowest of 1.3 in the six districts of Jammu and Kashmir, namely Palwama, Anantanag, Srinagar, Barmula, Badgam, and one district of Pondicherry, namely Mahe followed by Guntur of Andhra Pradesh, Pathanamthitta, Idukki and Kollam of Kerala, and Erode, Kanniyakumari and Coimbatore of Tamil Nadu (1.4) to a highest of 6.1 in Shahjahanpur of Uttar Pradesh followed by Mewat of Haryana (5.9). It was also evident, the majority of the districts in India reaching below replacement level fertility (TFR of less than 2.1)

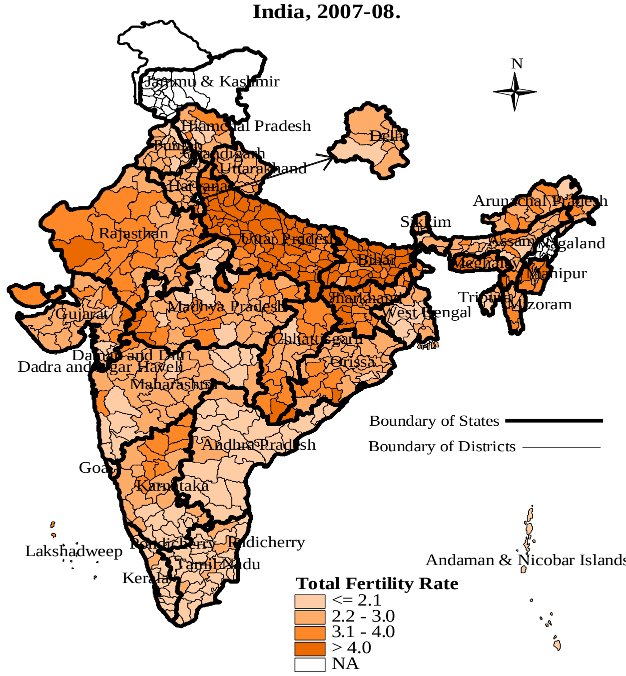
Table 2: Distribution of districts by levels of total fertility rate and states, India, 2006.

States	Total Fertility Rate				Total number of districts
	≤ 2.1	2.2-3.0	3.1-4.0	> 4.0	
Andaman & Nicobar Islands	2				2
Andhra Pradesh	21	2			23
Arunachal Pradesh	2	8	6		16
Assam	3	16	7	1	27
Bihar			4	33	37
Chandigarh	1				1
Chhattisgarh		4	11	1	16
Dadra & Nagar Haveli			1		1
Daman & Diu	1	1			2
Delhi	2	7			9
Goa	1	1			2
Gujarat	3	16	5	1	25
Haryana	1	18		1	20
Himachal Pradesh	6	5	1		12
Jharkhand		2	11	9	22
Karnataka	9	11	7		27
Kerala	12	2			14
Lakshadweep			1		1
Madhya Pradesh	9	21	13	2	45
Maharashtra	13	21	1		35

Manipur		4	3	2	9
Meghalaya		1	4	2	7
Mizoram		6	2		8
Odisha	2	21	5	2	30
Pondicherry	4				4
Punjab	6	14			20
Rajasthan		11	19	2	32
Sikkim		4			4
Tamil Nadu	26	4			30
Tripura	2	2			4
Uttar Pradesh		1	12	57	70
Uttarakhand		10	3		13
West Bengal	8	9	2		19
All India*	**134**	**222**	**118**	**113**	**587**
***Excluding Jammu and Kashmir, and Nagaland.**					

Are mainly from four southern states of India, namely Andhra Pradesh, Karnataka, Kerala and Tamil Nadu, and one western state, namely Maharashtra. The district-level variation in fertility is also evident from the mapping of districts developed based on district-level estimates of TFR (see Figure 2). From Figure 2 it is evident that the districts of northern and north-eastern India had very high fertility (TFR of more than 3) compared to the districts of other parts of India.

Figure 2: Mapping of districts based on total fertility rate, India, 2007-08.



SUMMARY AND CONCLUSION:

The purpose of this paper was to assess the levels of and differentials in fertility at the district level in India. The TFR, the well-known indicator of fertility was considered for the purpose of this paper. The findings showed that there were wide variations in TFR among districts of India. About 40% of the selected districts (231 out of 587) had TFR of more than 3, of which about 75% districts (174 out of 231) are mainly from the six of the eight Empowered Action Group states of India, namely, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan and Uttar Pradesh. On the contrary, only 23% districts (134 districts) had reached replacement level or below replacement level fertility, of which more than 50% districts (72 out of 134) are mainly from the states of Andhra Pradesh, Kerala, Maharashtra and Tamil Nadu. The TFR was highest in the district of Shahjahanpur of Uttar Pradesh (6.1), followed by Mewat of Haryana (5.9), and Bahraich (5.8) and Balrampur (5.7) of Uttar Pradesh to a lowest of 1.3 in the district of Mahe of Pondicherry, preceded by Guntur of Andhra Pradesh, three districts of Kerala namely, Pathanamthitta, Kollam, Idukki and three districts of Tamil Nadu namely, Erode, Kanniyakumari and Coimbatore (1.4 in each). The levels of fertility were found to be higher in the districts of northern states of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh, indicating that the districts in these states were lagged behind in demographic progress. These results are also similar to the findings of some previous studies (Guilmoto and Irudaya Rajan, 2002; Mohanty *et al*, 2012; Registrar General of India, 2009b). One of the possible reasons of higher fertility of the districts in northern states of India was because these districts were socio-economically backward (Das, 2013). Moreover, the incidence of higher infant mortality (Das, 2017) and lower utilization of reproductive and child health care services (Das, 2015) might be responsible for higher fertility in the districts of northern states of India.

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