RETURNS OF FERTILITY DECLINE IN INDIA:
Health and development contributions of uneducated women using contraception

By
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Abstract

India's fertility transition is apace since early 1990s driven by major fertility declines among uneducated women. Consequently the common emphasis on development indicators as determinants of fertility decline is shifting to the study of reciprocally initiated positive contributions of fertility decline in the improvement of health of women and children. Analysis indicates that uneducated women and their children are the greatest recipients of benefit of health and socioeconomic advancement. The standardized percentages of uneducated women who received full antenatal care, whose children received full immunization are steeply higher for women with two and less than two parities compared to those with more than 2 parities. Child mortality reductions for women of lower parities are also steeply higher for uneducated women compared to educated women. Evidence of higher rates of female work participation and improved nutritional status are also found for women with lower parities.

Research Problem

Fertility transitions in the Indian states are apace since the 1990s. A major part of this transition was driven by the increasing contraceptive prevalence rates among uneducated women (Bhat, 2002; McNay, Arokiasamy, and Cassen, 2003). This contrasts with the main focus of previous studies, which have tried to assess the contributions of increasing female education and socioeconomic conditions on fertility reduction. The fertility reduction among uneducated women is now viewed as complimentary to the early phase of fertility decline among educated women. (McNay, Arokiasamy, and Cassen, 2003, 2003; Arokiasamy, McNay and Cassen, 2004).

Consequently, the common emphasis on development indicators as determinants of fertility decline is shifting towards the reciprocally initiated positive contributions of fertility decline among uneducated women. Such contributions include major health improvements of women and children, educational development of children and economic condition of families.

Recent studies of effects of demographic change on growth help explain the past experience of different countries and regions; slow growth in Africa versus the burst of growth in East Asia, 1960-1995 (Merrick, 2002). The demographic experience of East Asia, now is a close replication in the Indian states.

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The long-term policy rationale of fertility reduction has been to promote health of women and children and achieve faster improvement in socioeconomic conditions. Previous studies dealt with the subject based on a general framework where there was significant fertility reduction among educated and socioeconomically advanced women. This is a unique case of fertility transition, and it is now increasingly recognized that it is important to assess the reverse causation of fertility reduction among uneducated women. Uneducated women who are adopting contraception are making major contribution for the improvement of health of women and children and socioeconomic conditions of their families.

Given this background, the main aims of this study are:

1) To examine systematic linkages between levels of fertility reduction among uneducated women and the pace of development amongst the states of India.
2) To study women and children's health and quality of life indicators for sterilized women with 2 and less than 2 children compared to those with more than two children.

Both macro and micro-level health and development contributions of fertility decline among uneducated women are assessed in this analysis:

Macro level impact of fertility decline

i) Whether states with higher fertility reduction among uneducated women have experienced a faster rate of increase in school enrolment, literacy and reduced gender gaps in literacy.

ii) Whether states with greater fertility reduction among uneducated women have achieved higher rates of economic growth, poverty and infant mortality reduction, and increase in women's work participation rates.

Household level impact of fertility decline

Whether low fertility among uneducated sterilized women compared to those with high fertility:

iii) Contributed to reduction in infant and child mortality.

iv) Resulted in higher utilization of health care services for their children (immunization and medical treatment of illness)

v) Contributed to increased schooling of children (enrollment and progression to higher classes).

vi) Contributed to improved health of women (in terms of increase in health care utilization and reduction in anemia and morbidity reduction)

vii) Resulted in improved social position of women (in terms of women's status indicators)

viii) Contributed to a rise in living conditions (in terms of standards of living indicators).

Data sources
Data from Census, Sample Registration System (SRS), Center for Monitoring Indian Economy (CMIE) are used for state level analysis. The National Family Health Survey-2, (NFHS-1998-99) data is used to examine micro level hypotheses.

Methods of analysis
Comparative analysis, decompositional procedures and panel data regression analysis are used to assess *macro level impact*.

Multivariate analyses are used for analysis of *micro (household) level impact* based on NFHS-2 data set.

Measurements
Comparative analysis is performed between those sterilized women with 2 and less than 2 children and those women with greater than 2 children and between educated and uneducated women. Adjusted percentages are generated based on multivariate regression analysis.

Women and nutrition indicators: antenatal care utilization, and prevalence of anaemia.

Child health and nutrition indicators: Anaemia, utilization (vaccination), medical consultation (curative care), child survival (neonatal, infant and child mortality).

Results
With steeper and significant reduction in their fertility, uneducated women and their children appear to be the greatest recipients of wide range of development and health benefits. Major positive health and development contributions occur at both macro and micro levels and there are both short-term and long-term benefits. The variations in state level gains of fertility decline and the corresponding health and development gains of fertility decline are also explored. Cumulatively, the benefits to individual women make significant contributions to national health and development indicators.

Macro level impact
The macro-level impact is explored using health and development indicators for major states of India
Comparison of trends and changes in demographic and development indicators suggest that states with significant fertility reduction in the 1970s, 1980s, 1990s have correspondingly experienced remarkable progress in poverty reduction, literacy, SDP growth, maternal and child health improvement and infant mortality reduction in the following decades.

Figures 1a, 2a, 3a, 4a, 5a and 6a illustrate the rapid reduction of fertility in the south Indian states in the 1970s and 1980s and a correspondingly sharp reduction in poverty ratio and infant mortality, rise in literacy and SDP per capita and human development index in the 1980s and 1990s. In contrast, the slower pace of fertility reduction in the demographically backward large north Indian states was a major constraint in stalling improvement in health and development conditions. Notice that these bigger states had comparably similar levels of socioeconomic conditions as in southern states in the 1970s. Panel data regression analysis indicates that reduction in total fertility rates over the three decades period of 1981-2001 across the states have resulted in significant reduction in poverty ratio, infant mortality and a rise in female work participation rate. Both fixed and random effect models shows significant effect of total fertility rate on each of the above three indicators controlling for other interrelated factors such as female literacy, urban growth and nonagricultural employment.

Household level impact

The household impact of low fertility is assessed using household level health and demographic data from the national family health survey data (NFHS-2, 1998-99).

Low fertility among uneducated sterilized women is found to result in significant improvements in the health of women and children. The adjusted percent of sterilized women who received full antenatal care is significantly higher for women with two and less than two parities compared to those with greater than two parities amongst most states. This difference is steeper for uneducated women compared to educated women in most states where ANC coverage is moderate to low.

In high ANC coverage states of Kerala, Tamil Nadu, Karnataka the differences are marginal due to highly equitable access to ANC. Evidence of similar difference is demonstrated with respect to percent of children fully immunized and this relationship is consistent across the states.

The low parity effects on reduction of child mortality for uneducated women is sharply higher compared to educated women. Women's education has a strong effect on child mortality but this effect is greater for women with two and less than two parities consistently across states. Evidence of higher rates of work participation is also found for women with 2 and less parities compared to those with greater than 2 parities both for educated and uneducated women. However in both categories of low and high parities, work participation rates are higher for uneducated women. The evidence of nutritional status improvement for women with less parities is not systematically demonstrated across the states.

More importantly, the adjusted levels of health care utilization are substantially higher for uneducated women of less parities compared to educated women of higher parities.

Evidence also suggests gains in household economic condition for sterilized women with low parities compared to those with higher parities irrespective of women's educational status. A greater proportion of households of women with low parities tended to have

better economic conditions (possessed economic amenities such as electricity, access to safe water, television, radio etc., compared to women with higher parities. This proportion steadily increased for sterilized women in the past (5-10, 10-15 years ago) compared to those sterilized during last 1-5 years, suggesting a long-term improvement in economic conditions of families of women with low parities.

(sorry-interpretation of results incomplete)

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Table1Total fertility rate by women's educational level, states and India, NFHS, 1992-93 and 1998-99

Sates	Illiterate		Literate, less than middle school completed		Middle school completed		High school and above		Total	
	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2
North and central										
Bihar	4.28	3.78	3.77	2.93	2.65	2.69	2.58	2.50	4.00	3.49
Haryana	4.69	3.52	3.52	2.97	3.48	2.53	2.75	2.10	3.99	2.88
Himachal Pradesh	3.63	2.85	3.12	2.19	2.77	2.26	2.02	2.04	2.97	2.14
Jammu	3.69	3.17	3.45	2.50	2.62	1.83	2.29	1.91	3.13	2.71
Madhya Pradesh	4.31	3.78	3.17	3.20	3.47	2.34	2.47	1.92	3.90	3.31
Punjab	3.69	3.16	3.02	2.40	1.95	2.24	2.23	1.71	2.92	2.21
Rajasthan	3.88	4.29	3.33	3.08	2.41	2.41	2.32	2.15	3.63	3.78
Uttar Pradesh	5.36	4.54	4.16	3.36	3.81	3.12	2.55	2.49	4.82	3.99
East										
Assam	4.51	2.83	3.27	2.40	1.90	1.78	1.78	1.26	3.53	2.31
Orissa	3.17	2.87	3.08	2.42	2.59	1.96	1.63	1.62	2.92	2.46
West Bengal	3.73	2.79	2.82	2.30	1.77	1.71	1.50	1.42	2.92	2.29
West										
Gujarat	3.59	3.38	2.83	2.92	2.51	1.99	2.16	1.71	2.99	2.72
Maharashtra	3.47	3.12	3.00	2.73	2.47	2.33	2.08	1.95	2.86	2.52
South										
Andhra Pradesh	2.97	2.35	2.23	2.22	2.23	1.94	1.84	2.20	2.59	2.25
Karnataka	3.39	2.57	2.57	2.09	2.45	2.06	2.00	1.89	2.85	2.13
Kerala	2.31	2.22	2.16	2.02	1.95	2.14	1.95	2.02	2.00	1.96
Tamil Nadu	2.84	2.49	2.49	2.37	2.20	2.21	2.04	1.85	2.48	2.19
INDIA	4.03	3.47	3.01	2.64	2.49	2.26	2.15	1.99	3.39	2.85

Source: International institute for population Sciences, National Family Health Survey. 1992-93. Final Reports, various states and India, Mumbai

Table 2 Decomposition of fertility change among illiterate and literate women in India, NFHS-1 and 2, 1992-93 and 1998-99

States	*Percent contribution of the change in TFR among*		*Contribution of change in educational composition of women*
	Illiterate	***Literate***	
North			
Bihar	41	10	49
Haryana	64	24	12
Himachal Pradesh	43	40	17
Jammu	24	18	58
Madhya Pradesh	47	12	41
Punjab	37	34	29
Rajasthan	-	-	-
Uttar Pradesh	68	15	17
East			
Orissa	23	23	54
West Bengal	47	16	37
West			
Gujarat	14	13	73
Maharashtra	21	13	66
South			
Andhra Pradesh	34	-.12	66
Karnataka	56	16	28
Kerala	0.10	4	96
Tamil Nadu	22	7	71
India	41	24	46

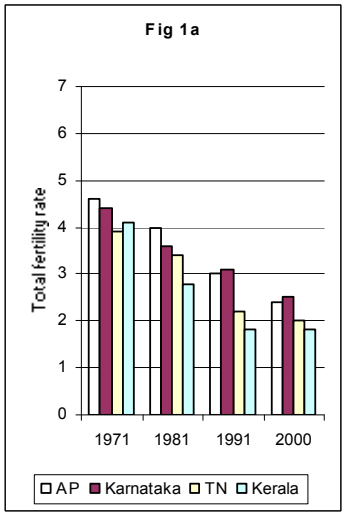
Fig 1a
Total fertility rate
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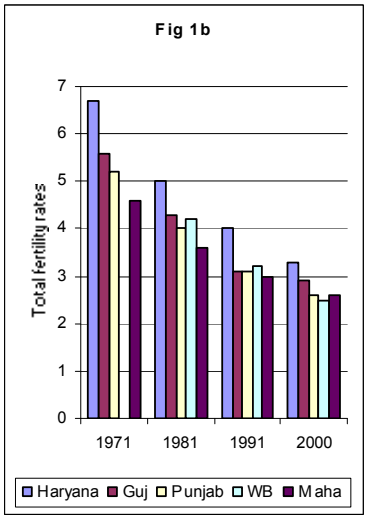
Fig 1b
Total fertility rates
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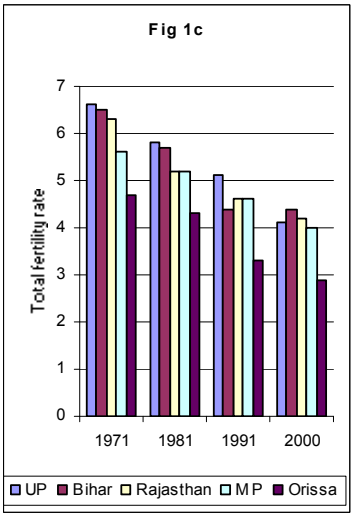
Fig 1c
Total fertility rate
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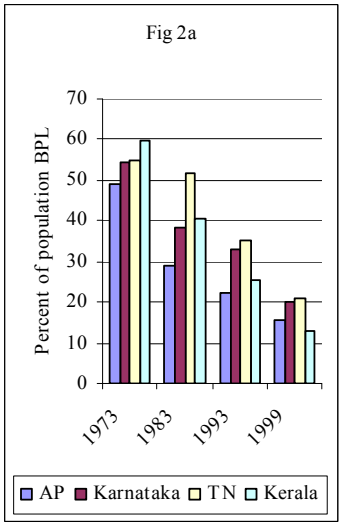
Fig 2a
Percent of population BPL
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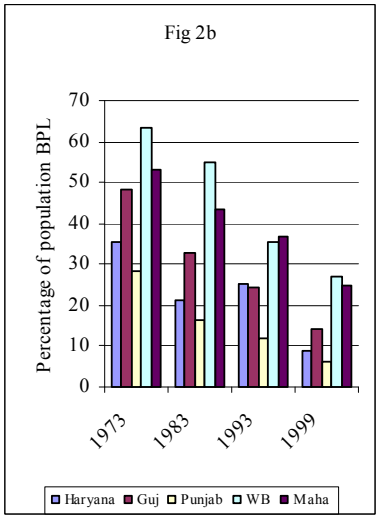
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Percentage of population BPL
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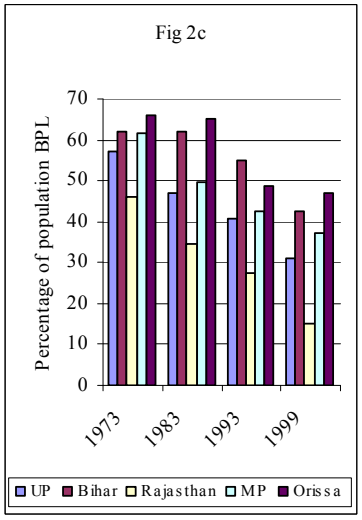
Fig 2c
Percentage of population BPL
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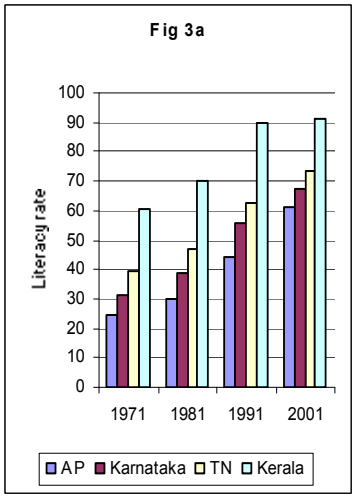
Fig 3a
Literacy rate
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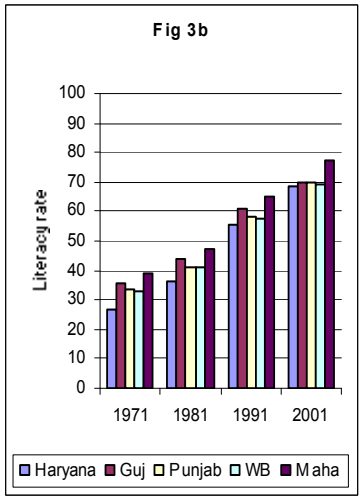
Fig 3b
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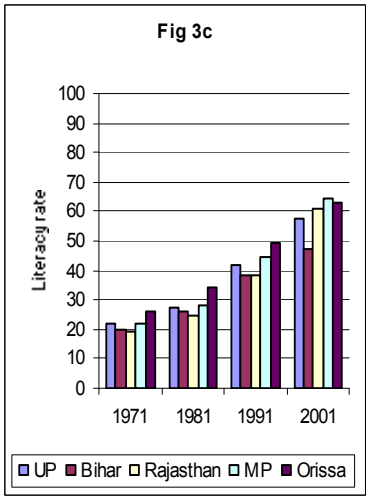
Fig 3c
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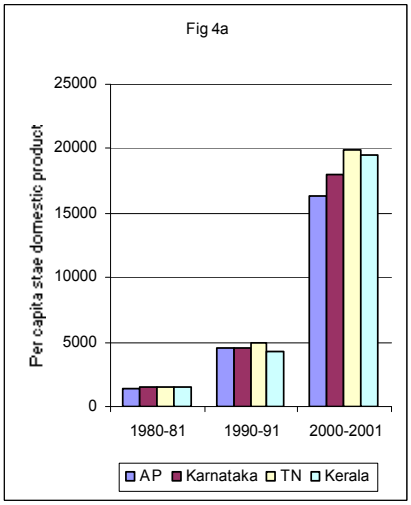
Fig 4a



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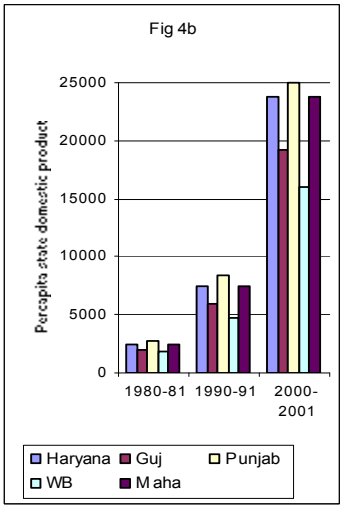

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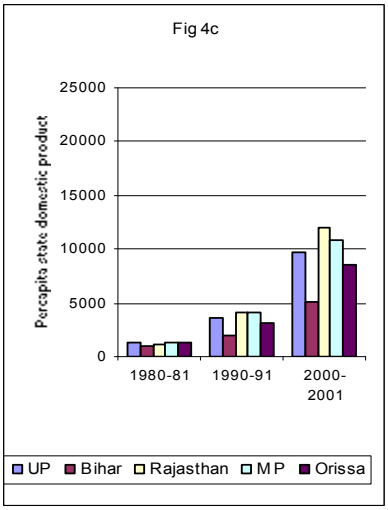
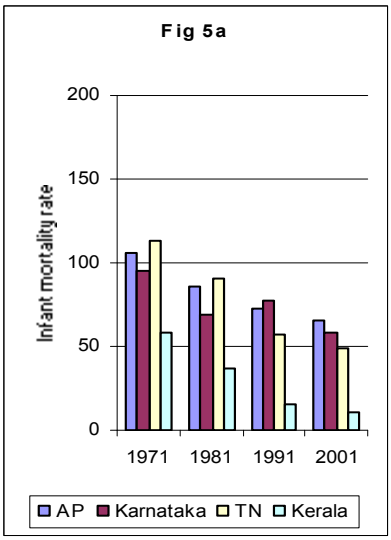


Fig 5a



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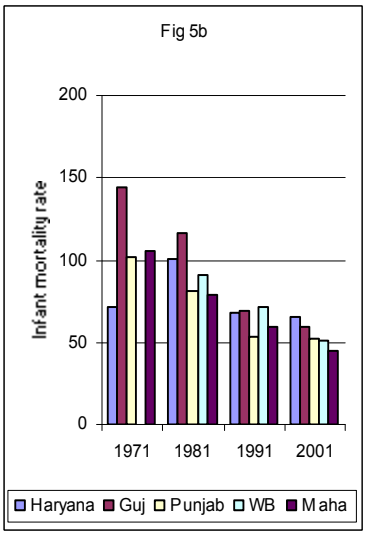

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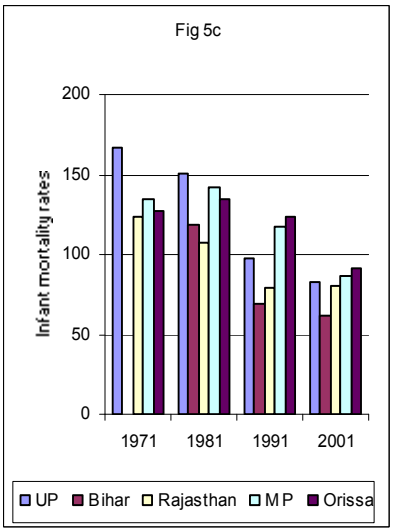
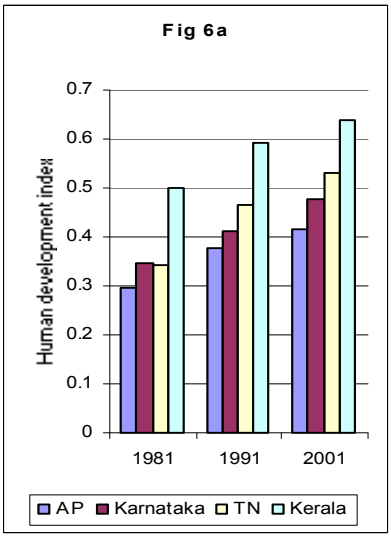


Fig 6a



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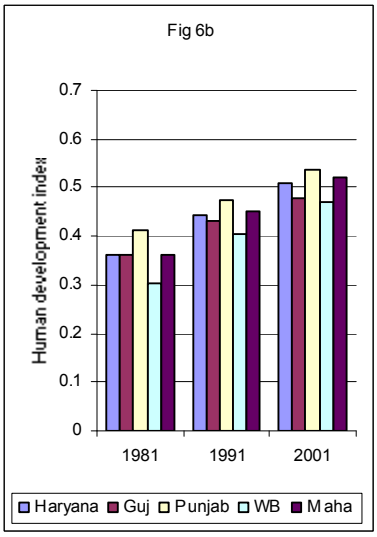

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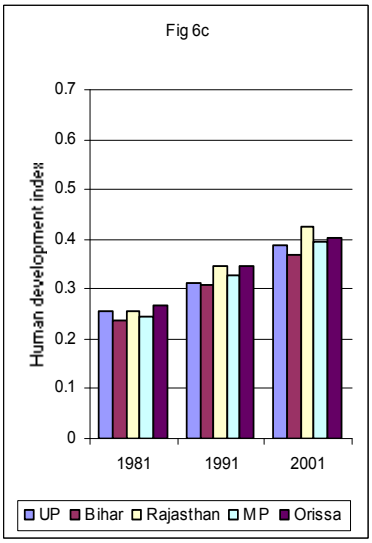

Table 3 Panel data regression analysis, 1981, 1991, 2001

(Dependent variable: percent of population below poverty Line)

Variables	Fixed effect				Random effect			
	Model I	Model II	Model III	Model IV	Model I	Model II	Model III	Model IV
tfr	0.4639***	0.3805**	0.3197*	0.1640	0.4066***	0.2526**	0.2763**	0.2471*
infant		0.2502	0.0054	-0.0064		0.4462*	-0.0047	0.0072*
sexr		0.0076	-0.0035	-0.0022		0.0053	0.0054*	0.0036
f_lit			-0.0009				-0.0047	
fwpr			-0.0146	-0.0115			-0.0031	0.0016
mwpr_nag			-.0133*	-0.003*			-0.0218**	-0.0119*
up_gr			-0.0281	-0.0255			-0.0010*	-0.0114
Ye1981_91				-0.1584				-0.0789
Ye1991_01				-0.4689				-0.3537*
Cons	1.673***	8.058*	7.590*		1.882***	-4.501*	-1.220	0.382
R_sq (within)	0.66	0.71	0.85	0.89	0.66	0.61	0.80	0.86
Wald Chi2					45.42***	54.023***	102.09***	135.12***
F-Value	52.63***	27.89***	18.32***	20.96**				
Number of observations	42	42	42	42	42	42	42	42

* p<0.10; ** p<0.05 *** p<.001

Note:*tfr- Total fertility rates, infant-infant mortality rates, lit_f- female literacy rates, lit_m-male literacy rates, lsdp-log of state domestic product, fwpr- female work participation rate, mwpr_nag- male work employed in non-agricultural sector*

Table 4 Panel data regression analysis, 1981, 1991, 2001

(dependent variable: infant mortality rate)

Variables	Fixed effect				Random effect			
	Model I	Model II	Model III	Model IV	Model I	Model II	Model III	Model IV
tfr	0.4655***	0.4435***	0.4380**	0.4230*	0.3872***	0.3826***	0.3408**	0.3063**
sexr		-0.0039	-0.0001	-0.0031		-0.0013	-0.0013	-0.0018
lsdp			-0.1041	-0.4577*			-0.0663	0.2627
f_lit			-0.0123*	-0.0267**			0.0027	0.0047
fwpr			0.0184*	0.0201*			0.0162*	0.0211*
mwpr_nag			-0.0100	-0.0065			-0.0103*	-0.0131*
up_gr			-0.0054	-0.0262			0.0054	-0.0083
Ye1981_91				-0.7196**				-0.4267*
Ye1991_01				-1.6015**				-0.7706*
Cons	2.823***	6.4581*	3.322	1.9079	2.853***	4.1616	4.644*	3.156
R_sq (within)	0.75	0.76	0.86	0.90	0.75	0.76	0.83	
Wald Chi2					96.42***	97.70***	124.84**	143.53**
F-Value	82.55***	43.10***	19.53***	21.03***				
No of observation	42	42	42	42	42	42	42	42

* p<0.10; ** p<0.05 *** p<.001

Table 5 Panel regression analysis, 1981, 1991, 2001

(Dependent variable: female work participation rates)

Variables	Fixed effect				Random effects			
	Model I	Model II	Model III	Model IV	Model I	Model II	Model III	Model IV
tfr	-0.3280***	-0.3934**	-0.5099*	-0.6629*	-0.2742***	-0.3302**	-0.1103	-0.5267*
infant		0.0023	0.0053	0.0077		0.0020	0.0008	0.0057
sexr		-0.0027	-0.0066	-0.0040		-0.0006	0.0086**	-0.0011
lsdp			-0.2566	-0.8761*			0.4062**	-0.6906*
f_lit			0.0149	-0.0056			0.0179*	-0.017
mwpr_nag			0.0195*	0.0151			-0.0096	0.0149
up_gr			-0.0179				0.0303*	
Ye1981_91				0.7237				0.7281*
Ye1991_01				1.7819				1.7497**
Cons	4.186***	6.851	11.887**	14.823*	3.991***	4.688*	-8.482*	10.705*
R_sq (within)	0.42	0.43	0.54	0.60	0.42	0.43		0.57
Wald Chi2					17.01***	15.54**	16.34***	26.89**
F-Value	20.15***	6.47***	3.61**	3.88**				
Number of observations	42	42	42	42	42	42	42	42

* p<0.10; ** p<0.05 *** p<.001

Table 6 Adjusted percentage of women receiving antenatal care by education and parity at sterilization, NFHS-2, 1998-99

States	Uneducated		Educated	
	<=2 parity	>2 parity	<=2 parity	>2 parity
Andhra Pradesh	66.9	61.4	72.9	66.9
Bihar	53.2	10.6	58.1	39.1
Gujarat	50.4	43.1	63.7	58.9
Haryana	70.2	17.6	68.2	43.3
Himachal Pradesh	50.2	29.9	37.4	39.5
Jammu & Kashmir	85.2	48.7	49.8	19.0
Karnataka	59.5	48.0	82.1	64.1
Kerala	59.2	-	85.6	81.7
Madhya Pradesh	25.1	17.8	53.3	21.4
Maharashtra	51.1	39.2	57.7	63.2
Orissa	31.0	39.9	51.1	48.1
Punjab	57.1	27.6	30.9	23.3
Rajasthan	8.2	8.2	37.3	19.7
Tamil Nadu	82.4	88.6	93.0	77.7
West Bengal	42.3	29.8	66.8	34.9
Uttar Pradesh	-	-	-	-
India	51.5	32.8	71.4	53.7

Note: The adjusted Percentages are calculated from logistic regression coefficients. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values.

Table 7 Adjusted percentage of children fully immunized by women's education and parity at sterilization, NFHS, 1998-99

States	Uneducated		Educated	
	<=2 parity	>2 parity	<=2 parity	>2 parity
Andhra Pradesh and Karnataka	54.2	41.7	67.1	52.2
Goa, Tamil Nadu and Kerala	89.5	75.0	81.8	77.3
Gujarat and Maharashtra	45.5	55.3	74.3	68.8
Delhi, Haryana and Punjab Himachal Pradesh and Jammu and Kashmir	58.3	59.3	83.3	73.0
Bihar, Uttar Pradesh, Rajasthan and Madhya Pradesh	14.8	9.8	33.3	38.0
Assam, Orissa and West Bengal	50.0	35.7	73.7	28.6
India	50.4	37.6	71.8	56.7

Table 8 Adjusted percentage of children attending school (6-14 years) by women's education and parity at sterilization, NFHS-2, 1998-99

States	Uneducated		Educated	
	<=2 parity	>2 parity	<=2 parity	>2 parity
Andhra Pradesh	85.2	72.5	97.8	92.9
Bihar	82.9	65.8	90.5	92.6
Gujarat	65.9	67.7	99.2	91.5
Haryana	91.3	86.6	100	97.4
Himachal Pradesh	97.5	96.5	99.2	98.7
Jammu & Kashmir	94.4	87.0	100	99.4
Karnataka	82.4	75.7	98.7	95.0
Kerala	82.4	91.2	99.6	98.3
Madhya Pradesh	81.3	74.3	100	93.3
Maharashtra	86.1	85.9	99.0	96.5
Orissa	83.6	74.8	96.0	97.0
Punjab	83.3	82.4	100	95.4
Rajasthan	87.1	79.7	100	94.7
Tamil Nadu	95.2	87.7	98.6	94.8
West Bengal	83.1	73.3	92.9	90.2
Uttar Pradesh	96.7	80.0	97.3	94.7
India	87.3	79.3	98.4	95.6

Table 9 Adjusted neonatal (0-28 days), Infant (1-11 months) and child (12-47 months) mortality rates by mother's education and parity at sterilization, NFHS-2, 1998-99

States	Neonatal				Infant			
	Uneducated		Educated		Uneducated		Educated	
	<=3 par	>3 par	<=3par	>3par	<=3 par	>3 par	<=3par	>3par
AP	21	71	18	94	13	38	10	35
Bihar	5	41	18	37	3	21	3	22
Gujarat	21	62	16	71	13	41	8	38
Haryana	5	41	8	51	7	30	6	23
Karnataka	19	55	16	52	11	37	11	24
Kerala	14	76	10	47	3	45	3	13
MP	15	79	8	71	9	37	4	39
Maharashtra	19	57	14	74	8	34	4	19
Orissa	33	76	14	64	13	51	5	31
Punjab	12	59	-	20			11	34
Rajasthan	16	59	11	64	7	37	6	43
Tamil Nadu	21	70	16	81	8	39	7	39
West Be	15	55	16	52	9	26	5	36
Uttar Pradesh	13	71	16	62	8	42	-	-
India	18	64	14	63	9	36	6	31

Contd…

Child (12-47)			
Uneducated		Educated	
<=3 par	>3 par	<=3par	>3par
10	28	6	23
11	28	6	9
15	40	-	-
8	24	4	21
9	29	7	18
10	12	1	14
17	45	9	30
5	37	5	16
9	30	5	15
11	18	8	15
12	39	11	28
9	29	9	30
8	32	6	17
12	39	4	23
11	35	6	21

Note: The adjusted mortality rates are calculated from cox proportional hazard model coefficients. When calculating adjusted rate for categories of a given predictor variable, other variables are held constant at their mean values.