MATERNAL EDUCATION, FEMALE LABOUR FORCE PARTICIPATION AND CHILD MORTALITY: EVIDENCE FROM INDIAN CENSUS

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Title: **Maternal Education, Female Labour Force Participation and Child Mortality: Evidence from Indian Census**

Summary: The objective of this paper is to examine how child mortality risk changes with different stages of maternal education and quantify the impact of maternal education and female labour force participation rate (FLPR) on child mortality. Child mortality gradients are rather steep at the primary education level both for male and female children. In post primary stages of education incremental gains in mortality reduction are almost non-existent as the mortality gradient is more or less flat. Both Maternal education and FLPR have inverse relationship with child mortality. But, disaggregated analysis showed that FLPR has no impact on child mortality among females with less than 7 years of education. The relative impact of maternal education on child mortality is three times stronger than that of FLPR. Excess female child mortality prevailing in certain parts of India also has an inverse relationship with the length of mothers' education and FLPR. In particular, the FLPR has stronger influence on excess female child mortality than on absolute child mortality. The evidence in the paper lends support to Bardhan's hypothesis on excess female child mortality.

Maternal Education, Female Labour Force Participation and Child Mortality: Evidence from Indian Census[1]

1. Introduction

The main objective of this paper is to document the association between the length of mothers' education and child mortality (q_5) as revealed in the Indian census data. The paper focuses mainly on how the strength of inverse relationship between child mortality rates and literacy varies with the length of mothers' education (henceforth referred to as mortality gradient) in different States of India. It also examines the impact on child mortality of Female labour force participation rate at different levels of education (hence forth referred to as FLPR). Besides, the paper will examine a related question of excess female child mortality and its changes associated with different stages of maternal education and FLPR at those stages. To be specific, the paper tests the validity of Bardhan's hypothesis on the relationship between excess female mortality rate and FLPR (Bardhan 1988).

In the following section the paper reviews the existing evidence on how maternal education reduces child mortality. Section 3 presents data on child mortality for different States of India and analyses the inter-State differences in the level of mortality and the relative mortality risks at

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different stages of maternal education. The impact of length of mother's education and FLPR are also examined. The issue of excess female mortality is discussed in Section 4. Findings of the study are summarised in Section 5.

2. Child mortality and Female literacy

There is overwhelming micro and macro level evidence suggesting negative association between maternal education and child mortality rates (see Cochrane et.al. 1980; Cleland 1990) for a good survey of literature). The ways in which female literacy influences child mortality rate are fairly complex. Yet, three major routes of causation are identified in the literature. First, by affecting the quality of child care by the mother or what is known as household production of health in the literature (Grossman 1972). It is hypothesised that the effectiveness with which basic child health promoting inputs, such as personal hygiene, pre and post-natal care, feeding practices are combined, improves with the level of education of the mother. Second, as the level of education increases, mothers' knowledge about alternative health promoting practices and their cost effectiveness also increases enabling them to improve the technical efficiency with which child health is produced. Third, with higher duration of education, women are likely to have higher income and social status either due to their direct participation in labour market or due to the higher probability of wealthier men marrying them. The first and the second routes of causation differ mainly in the type and quality of inputs used to

promote child health. The third route of causation is through health benefits arising from the enhanced family income and social status.

It can be argued that literacy will have significant impact mainly through the first two routes of causation as they essentially depend on women's knowledge about health practices and the efficacy of medical interventions. For this reason, the influence of the second route may be stronger in the case of higher levels of maternal education. The third route of causation operates mainly through the elevated socioeconomic status. In so far as social and economic status of women improves with their participation in the labor market, and that the per capita spending on children is higher in households where women also work (see Dwyer and Bruce 1988 for a review of studies on this and related issues), FLPR at different stages of education can be used to isolate the impact of the third route of causation. This issue is examined below.

A number of external factors influence the strength of association between maternal literacy and child mortality. It was found that the overall strength of association between maternal education and child mortality is more among children in the age group of 3 to 7 years than among infants (Cleland and Van Ginneken 1988). This happens due to the fact that biological factors rather than child care practices play an important role in determining mortality among children in their early infancy. As they grow, the influence on health of environmental factors and child care practices become important. Further, the influence on mortality differentials of improved

availability of basic public health facilities such as access to clean drinking water, proximity to good primary health facilities and sanitary disposal of human and animal wastes is found to be indeterminate (Cleland and Van Ginneken 1988). In some societies, notably Costa Rica, China and Srilanka, improved access to better public health facilities reduced the differences in child mortality rates among well and not so well educated mothers. But in many developing countries the mortality differentials due to maternal education did not change appreciably even after some improvement in the availability of public health facilities has taken place. Thus the supportive role played by the availability of public health infrastructure in strengthening the influence of maternal education in improving child health is not clear.

3. Mortality Gradient

As noted in the preceding section, mortality gradient changes with the length of mothers' education. How it changes is essentially an empirical question. A theoretical answer is difficult to find as the gradient is an outcome of interaction between the length of mothers' education and a complex set of socioeconomic factors. This section presents empirical evidence on how child mortality (q_5) changed with different levels of mothers' education in different States of India. How the relative risk of mortality and mortality gradient changed with education is also examined in detail.

The study uses child mortality estimates based on the 1981 census data (India 1988) as other sources of information have serious drawbacks. India's civil registration system suffers from abysmally low coverage. Fairly accurate annual estimates of births and deaths at State level are obtained mainly through a survey called 'The Sample Registration System'. But the sample size on which these estimates are based does not permit any further dis-aggregation of data. The Census of India gives dis-aggregated estimates of child mortality (given in India 1988) and female labour force participation rate (FLPR) (given in India 1987a)[2] in different States classified according to five different levels of mothers' education. The data on child mortality have been derived using the 'indirect estimation method' suggested by W.Brass which is known to yield fairly accurate estimates (India 1988: 1). Under this method, the child mortality estimates have been made using the 1981 census information on 'children ever born' and 'children surviving' cross classified by the age of the mother. The mortality estimates for four age groups, i.e q(1), q(2), q(3), q(5) by five different levels of mothers' education are available. The educational levels are : (i)illiterates (ii) literates and up to middle school (0-7 years of education); (iii) middle school and up to matriculate (7-10 year) (iv) matriculates and up to graduates (10-15 years); and (v) graduates and above (15-17 years). Mid points of the duration of education of the last four classes indicated above viz. 3.5 years, 8.5 years, 12.5

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2. These data are given by age groups for five different educational classes (the same educational classes for which child mortality data are available). The study considered only those in the age groups of 15 years and above and main workers.

years and 16 years respectively have been taken as the average length of education. Broadly speaking, the first two categories of literacy impart basic education and in the later two categories specific job related skills are acquired.

The average level of child mortality, absolute level of mortality among children of illiterate mothers and the relative mortality risk (relative to the child mortality risk of illiterate mothers) among children of literate mothers of varying lengths of education are given in Table 1. The information is presented by the sex of the child and by the various States. The relative mortality risk in the table refers to the risk of mortality among children of literate mothers relative to the child mortality of illiterate mothers. The important inferences that may be drawn from this information are: i) Existence of considerable inter-State differences in child mortality rates - the average female child mortality varied from 76 per thousand in Kerala to as high as 208 per thousand in Uttar Pradesh. ii) Notably, the inter-State variation in the mortality of male child is found to be lower than that of female child. This is clearly indicated by the smaller coefficient of variation. Larger inter-State differences in female child mortality was mainly on account of excess female child mortality in all major States of the northern region of the country. iii) The child mortality among illiterate mothers was fairly high even in the low mortality States. For instance, the absolute difference in female child mortality of illiterate mothers in Kerala and Bihar was about 10 per thousand but the difference in the overall mortality was 46 per thousand. iv) Further, the dispersion

of relative child mortality rates among mothers with an average of 8.5 years of education is approximately the same as the coefficients of variation were approximately identical. Roughly, more than two thirds of States fall with in a band of 8 to 12 percent of either side of the mean mortality of each stage of education. Mothers with 8.5 years of education form any where between 85 to 95 per cent of all literate female population in different States. This means, inter-State variation in mortality differences is influenced in an important way also by the manner in which a given States' population is distributed across different stages of education; it is usually felt that the differences arise mainly on account of inter-State differences in mortality rates across different educational classes.

The major finding of the analysis, however, is the appreciable decline in the average mortality risk associated with increase in the level of maternal education. The children of mothers with an average education of 3.5 years faced a relative risk of about two thirds of the child mortality risk of illiterate mothers. The relative child mortality risk drops to a third of that of illiterate mother with about 12 years of education and to a fifth with higher education. This pattern is roughly the same for both male and female children. Although the inter-State variation in relative risks is not high, due to considerable variation in absolute levels of mortality, the quantum of reduction in mortality for additional years of education may vary substantially across States.

To examine this issue and also to see now mortality gradients change across different stages of education, decline in child mortality for an additional year of maternal education has been computed for each stage of education (Table 2). This was done by dividing the difference between child mortality of an educational class and the class preceding it by the difference in the average duration of education of the respective classes. For example the difference in male child mortality rate of mothers with an average education of 3.5 and 8.5 years duration is 38 in Andhra Pradesh. This means movement from an average education of 3.5 years to 8.5 years (i.e. five years of additional education) results in a marginal decline in mortality by 7.60 (38/5) per an additional year of education (see Table 2). This is evidently a rough method but can serve as a first approximation.

The mortality gradient estimates show that at all States' level, male child mortality declines by 13.6 per thousand for every year of additional education in the first 3.5 years average education class (which corresponds approximately to primary education phase). But the decline in male child mortality per year of additional education falls steeply to there about of 6 per thousand and stays at that level during all the remaining post primary educational stages. Although there are a few exceptions, this pattern typifies the situation of male child mortality in most of the States. In the case of female child mortality too, one notices a steep fall in mortality rate by 15.3 for every additional year of education in primary education stage. But the reduction in mortality rate is only 7 or less per year for the remaining post primary stages of education. But

unlike in the case of male children, the rate reduction in female child mortality mildly decline with additional years of education. This indicates gains in terms of reduced female mortality as the duration of maternal education increases. The above findings show the crucial role primary education plays in the reduction of child mortality. As the unit costs of primary education are lower than the subsequent stages of education, the results indicate that primary education could be highly cost effective in reducing child mortality.

Evidently, the above results are approximations of the relationship between mortality and the length of education as the entire reduction in mortality can not be attributed to education alone. Besides FLPR, one can identify a large number of State specific factors (infrastructure, level of income, poverty etc.) and factors specific to certain stages of education (Social class, level of family income etc.) which will have an independent influence on child mortality rate. Many of these variables are either difficult to measure or have no information on them available. Thus the mortality gradient implicit in the above estimates is only a crude approximation. To estimate the mortality gradient more accurately, the following equation has been used:

$$M = a^0 + a_i + b_1E + b_2L + u$$

where M denotes child mortality rate by sex of the child; a^0 is a general intercept where ever needed, a_i, are State dummies; E is the length of education; L is female labour participation rate at different lengths of education(FLPR)

and u is the random error. Dummies have been included only where found statistically necessary after conducting variable addition/ deletion test. Since the data are available only by groups, the equations have been estimated using weighted least squares using the actual number of women in each educational class in the respective States (given in India 1987b) as weights.[3] The equation has been estimated under alternative functional form by taking different transformation of the variables. After extensive testing, it was found that exponential form passed the tests for appropriate functional form. The rough estimates of mortality gradients also suggest exponential form. Results of regression equations along with diagnostics are presented in Table 3. The table shows results of the best equations separately for male and female children.

As noted above, the exponential form passed the functional form test and also has homoskedastic residuals. These equations have been estimated using weighted least squares. Results show that both the length of mother's education and FLPR have statistically significant inverse relationship with child mortality. This is true of both male and female children. The explanatory power of this equation was approximately 42 per cent for both female and male children. The estimates of *Beta* coefficients, which indicate the relative influence of education and FLPR on

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3. Unweighted regression on grouped data will have zero mean and variance f^2/n_g; where n_g is the size of 'g'th group. This violates the equal variance assumption of OLS if group sizes are different. Multiplication of both sides of the equation by $\sqrt{n}$ will meet the requirements of classical regression but is not a good substitute to using ungrouped data. The information loss in grouped data is directly proportional to within group variation (Greene 1990: 290-91).

mortality rates (Table 4), suggest that the impact of education is approximately three time stronger than that of FLPR. This is true of both male and female child mortality rates.

While this is so, earlier studies came out with contradictory conclusions on the influence of FLPR. Many of the international studies cited in (Dwyer and J. Bruce 1988), suggest inverse relationship between child health and FLPR. Some studies even suggest that, after controlling for family income, children are better fed and looked after in households where women work. In such households, a larger proportion of the family's earnings are expended on child care and related activities. A study by Kumar[4] (Kumar 1977) in Kerala indicated positive association between female earnings and child nutrition. But similar association between paternal income and child nutrition was not found. Another study of poor households in Kerala and Tamil Nadu categorically states that "eliminating female work, even if it means some improvement in male employment, would have a very negative effect, not only on the females themselves, but also on the families they support" (Mencher 1988: 119).

On the contrary, a recent study reported adverse impact of mother's participation in labour force on child mortality (Basu and Basu 1991). The results of our study apparently contradict Basu and Basu's finding and seem to confirm the findings of the studies suggesting favourable impact of FLPR on child mortality. But it is not entirely

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4. As cited in (Dwyer and Bruce 1988)

true. The difference between Basu and Basu's and our conclusions could be due to the fact that their study is based on aggregate data, whereas, the present study controls for the level of education by considering participation rates at different level of female education. Disaggregated analysis of the data showed that there was no statistically significant relationship between FLPR and child mortality among illiterate females and those with less than 7 years of education (Table 5). Favourable impact was found only among those with 7 years of education or above. It may be noted here that job related skills are obtained mainly after the first seven years of general education. Thus the factors implicit in Basu and Basu's argument seem to play a significant role mainly in households with low levels of female education which are also generally poor households. Yet, when controlled for the level of education, overall relationship between child mortality and female labour participation was inverse and statistically significant.

4. Excess Female Child Mortality

An important feature observed in some of the States in the northern region of the country is the excess female child mortality which is rather unusual. Biological factors endow female children more than male children with better abilities to survive and, therefore, male children usually have a higher level of mortality than female children in most societies. This is true even in many parts of India(Table 6). However in some regions the problem of excess female child Mortality is rather acute. For instance, the excess female child mortality of 34 per thousand in Uttar Pradesh is almost half of the overall

female child mortality of 74 in Kerala. Even in a State like Haryana, which is a better off State in terms of per capita income, the excess female child mortality is almost a third of the overall female child mortality in Kerala.

A number of reasons have been propounded to explain this phenomenon (see (Basu 1989);(Bardhan 1988); (Das Gupta 1990)). Besides female literacy, three important factors are identified to explain excess female mortality. They are: cultural preference for male children; low social status of women; and low female labour requirement in areas where rice is not grown. Among these three, the last hypothesis propounded by Bardhan (1988) is intuitively the most appealing. The underlying factor in Bardhan's hypothesis is low economic value of women and hence female children in areas where the labour force participation rates of women are low. To us it appears that the other two factors (low social status and cultural preference) responsible for excess female child mortality stem from low economic value of women. This is not to say that there are no other factors. But our purpose is to stress the fact that womens' economic value will have a significant bearing on the other two factors. In view of the importance of Bardhan's hypothesis, the paper makes an attempt to test it.

The model employed to test Bardhan's hypothesis is similar to the one described in the previous section. In the place of absolute child mortality, the ratio of female child mortality to male child mortality (henceforth referred to as relative excess female child mortality or REFM for short) is taken as the dependent variable. The right hand side variables are length of mother's education and FLPR at

different lengths of female education. State dummies to capture the impact of excluded variables are included in one of the equations. In this model an inverse and statistically significant relationship between REFM and FLPR would lend support to Bardhan's hypothesis. The model was estimated using weighted least squares with the same weights used in absolute child mortality equations discussed above (see footnote 3). Unlike in the case of absolute child mortality equations where the exponential form passed the functional form test, the log linear form was found to be the most appropriate functional form for REFM equations.

The results of the best equations presented in Table 7 show that FLPR alone has statistically significant inverse relationship with REFM - but the equation had heteroskedasticity problem. The inclusion of the length of mothers' education as an additional variable improved the explanatory power of the equation considerably and also to overcome heteroskedasticity. Both length of education and FLPR were inversely related with REFM and statistically significant. Inclusion of State dummies improved the explanatory power, as expected, and did not considerably change the magnitude of the coefficient for length of education and FLPR. The Beta coefficients presented in Table 4 show that the relative impact of FLPR on excess female mortality is slightly less than half of that of the influence of education. Thus, even though Bardhan hypotheses is upheld by the Census data, maternal education seems to have a stronger influence in explaining REFM than FLPR. But as between excess female child mortality and

absolute child mortality, FLPR has stronger influence in explaining excess female mortality than explaining the absolute level of male/female child mortality.

5. Summary

The objective of this paper is to examine how child mortality risk changes with different stages of maternal education and quantify the impact of maternal education and female labour force participation rate (FLPR) on child mortality. Child mortality gradients are rather steep at the primary education level both for male and female children. In post primary stages of education, incremental gains in mortality reduction are almost non-existent as the mortality gradient is more or less flat. Both maternal education and FLPR have inverse relationship with child mortality. But disaggregated analysis showed that FLPR has no impact on child mortality among females with less than 7 years of education. The relative impact of maternal education on child mortality is three times stronger than that of FLPR. Excess female child mortality prevailing in certain parts of India also has inverse an relationship with the length of mothers' education and FLPR. In particular, the FLPR has stronger influence on excess female child mortality than on absolute child mortality. The evidence in the paper lends support to Bardhan's hypothesis on excess female child mortality.

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Table 1

Child Mortality Risk for Mothers With Different Levels of Education

States	Mortality of male child: Average male child mortality rate @	Rate @ for illiterate mothers	Relative Risk # by mothers' education in years: 3.5	8.5	12.5	16	Mortality of female child: Average female child mortality rate @	Rate @ for illiterate mothers	Relative Risk # by mothers' education in years: 3.5	8.5	12.5	16
Andhra Pradesh	143	156	69.2	44.9	32.7	21.2	135	149	64.4	40.9	28.9	18.8
Bihar	131	133	71.4	54.1	40.6	24.8	153	144	72.9	51.4	36.8	24.3
Gujarat	119	140	65.0	47.1	34.3	22.1	129	164	61.0	55.5	32.9	22.0
Haryana	125	133	72.2	51.1	39.8	21.1	153	166	59.0	44.0	30.1	18.7
Himachl Pradesh	142	156	65.4	50.6	43.6		136	149	66.4	48.3	34.9	
Jammu & Kashmir	114	120	58.3	43.3	31.7	23.3	117	123	58.5	46.3	30.9	18.7
Karnataka	143	160	68.8	49.4	31.9	15.6	140	159	63.5	44.0	27.7	12.6
Kerala	85	123	66.7	47.2	28.5		76	113	66.4	41.6	26.5	
Madhya Pradesh	193	208	61.1	39.4	30.3	23.6	201	217	58.5	34.1	23.5	13.4
Maharastra	146	172	68.0	45.9	27.9	16.3	144	172	65.1	41.9	22.7	14.5
Meghalaya	147	166	75.9	50.6	31.3		137	158	72.2	47.5	27.2	
Nagaland	104	122	68.0	45.9	39.3		96	115	63.5	40.0	42.6	
Orissa	181	193	79.8	47.7	28.0	17.1	176	188	79.8	47.3	29.3	17.6
Punjab	104	115	73.9	53.0	38.3	25.2	118	132	73.5	48.5	32.6	26.5
Rajasthan	166	175	61.7	44.0	33.1	21.1	186	197	59.4	37.6	24.9	20.8
Tamil Nadu	134	153	73.2	53.6	35.9	20.9	131	153	68.6	47.7	32.7	17.6
Tripura	150	169	78.1	49.1	34.3		146	161	78.9	47.2	29.2	
Uttar Pradesh	174	183	62.8	47.5	33.3	24.0	208	220	62.7	41.8	30.5	20.0
West Bengal	132	138	70.3	39.1	23.9	17.4	125	141	68.1	34.8	24.1	16.3
Average	138.5	153.4	68.9	47.5	33.6	20.9	142.4	159.0	66.4	44.2	29.8	18.70
std	26.7	25.5	5.6	4.1	4.9	3.10	32.0	29.4	6.3	5.3	4.8	3.7
cv	0.19	0.17	0.08	0.09	0.15	0.15	0.23	0.19	0.10	0.12	0.16	0.20

Notes: @ Child mortality rate per 1000; std Denotes standard deviation.
Relative risk in percent; Cv Denotes coefficient of variation.

Table 2

Decline in Child Mortality
for an Additional Year of Maternal Education

	Decline@ - male child				Decline@ - female child			
	Years of mothers' education				Years of mothers' education			
	First 3.5	next 5	next 4	next 3.5	First 3	next 5	next 4	next 3.5
Andhra Pradesh	13.71	7.60	4.75	5.14	15.14	7.00	4.50	4.29
Bihar	10.86	4.60	4.50	6.00	11.14	6.20	5.25	5.14
Gujarat	14.00	5.00	4.50	4.86	18.29	1.80	9.25	5.14
Haryana	10.57	5.60	3.75	7.14	19.43	5.00	5.75	5.43
Himachl Pradesh	15.43	4.60	2.75		14.29	5.40	5.00	
Jammu & Kashmir	14.29	3.60	3.50	2.86	14.57	3.00	4.75	4.29
Karnataka	14.29	6.20	7.00	7.43	16.57	6.20	6.50	6.86
Kerala	11.71	4.80	5.75		10.86	5.60	4.25	
Madhya Pradesh	23.14	9.00	4.75	4.00	25.71	10.60	5.75	6.29
Maharastra	15.71	7.60	7.75	5.71	17.14	8.00	8.25	4.00
Meghalaya	11.43	8.40	8.00		12.57	7.80	8.00	
Nagaland	11.14	5.40	2.00		12.00	5.40	-0.75	
Orissa	11.14	12.40	9.50	6.00	10.86	12.20	8.50	6.29
Punjab	8.57	4.80	4.25	4.29	10.00	6.60	5.25	2.29
Rajasthan	19.14	6.20	4.75	6.00	22.86	8.60	6.25	2.29
Tamil Nadu	11.71	6.00	6.75	6.57	13.71	6.40	5.75	6.57
Tripura	10.57	9.80	6.25		9.71	10.20	7.25	
Uttar Pradesh	19.43	5.60	6.50	4.86	23.43	9.20	6.25	6.57
West Bengal	11.71	8.60	5.25	2.57	12.86	9.40	3.75	3.14
Average	13.61	6.62	5.38	5.24	15.32	7.08	5.76	4.90
Std	3.58	2.16	1.84	1.41	4.63	2.52	2.13	1.51
cv	0.26	0.33	0.34	0.27	0.30	0.36	0.37	0.31

Notes: @ In child mortality rate per 1000.
* Statistically significant at 5% level or better.
Std Denotes standard deviation.
Cv Denotes coefficient of variation

Table 3

Mortality Gradients - Regression Results
(Based on Weighted Least Squares)

Variable/Equation	1	2
1. **Dependent Variable**		
Male child mortality		
Length of Education	-0.1269**	-0.1384**
	(-7.09)	(-7.66)
Labour force Participation rate	-	-2.082*
		(-2.30)
Use of State Dummies	Yes	Yes
$\bar{R}^2$	0.381**	0.417**
F-Statistic	3.88	4.17
Diagnostics - (F-Statistics)		
Functional form	0.683#	0.04#
Heteroskedasticity	2.846$	2.63$
2. **Dependent Variable**		
Female child mortality		
Length of Education	-0.1311**	-0.1435**
	(-7.15)	(-7.69)
Labour force Participation rate	-	-2.836*
		(-2.25)
Use of State Dummies	Yes	Yes
$\bar{R}^2$	0.382**	0.416**
F-Statistic	3.89	4.172
Diagnostics - (F-Statistics)		
Functional form	0.451#	0.224#
Heteroskedasticity	3.407$	3.296$

Notes: ** Coefficient significant at 99% level of confidence
* Coefficient significant at 95% level of confidence.
# Functional form is appropriate at 95% level of confidence or better. F-statistic is based on Ramsey's RESET test.
$ Errors are homoskedastic at 95% level of confidence or better. The test is based on the regression of squared reminders on squared fitted values.

Table 4

Relative Influence of Maternal Education and Female Labour Force Participation on Child Mortality

Equation	Beta Value of	
	Length of Education	Labour Force participation rate
1. Female Child Mortality equation (with state dummies)	-0.8407	-0.2662
2. Male Child Mortality equation (with state dummies)	-0.8370	-0.2718
3. Excess Female Child Mortality (with state dummies)	-0.7421	-0.324

Note: **Beta** values are obtained as follows:

$$\text{Beta} = \frac{\tilde{A}_x S_x}{S_y}$$

Wher $\tilde{A}_x$ regression slope coefficient of indep ndent variable 'X'; S_x standard deviation of variable 'X'; and S_y is standard deviation of the dependent variable y. Thus Beta values normalise the regression coefficients for the differences in their magnitudes and put them on a relative scale for the purpose of direct comparison.

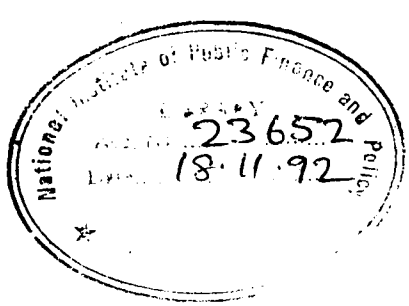

Table 5

Impact of Female Labour Force Participation Rates on Child Mortality: Disaggregated Analysis (Based on Weighted Least Squares)

Variables / Equations	Illiterates & up to 7 years of education	Above 7 years of education
1. **Dependent Variable**		
Male child mortality		
Labour force Participation rate	-0.353	-5.307**
	(-0.40)	(-6.14)
Constant	6.368	4.975
R^2	0.004	0.430**
F-Statistic	0.163	37.78
Diagnostics - (F-Statistics)		
Functional form	4.471	0.101#
Heteroskedasticity	3.328	0.088$
2. **Dependent Variable**		
Female child mortality		
Labour force Participation rate	-0.594	-5.658**
	(-0.65)	(-6.61)
Constant	6.433	4.977
R^2	0.012	0.467**
F-Statistic	0.431	43.76
Diagnostics - (F-Statistics)		
Functional form	3.488	0.218#
Heteroskedasticity	2.648	0.159$

Notes: ** Coefficient significant at 99% level of confidence
* Coefficient significant at 95% level of confidence.
# Functional form is appropriate at 95% level of confidence or better. F-statistic is based on Ramsey's RESET test.
$ Errors are homoskedastic at 95% level of confidence or better. The test is based on the regression of squared reminders on squared fitted values.

Table 6

EXCESS FEMALE CHILD MORTALITY RATE #$

States	Overall	Years of mothers' education				
		0	3.5	8.5	12.5	16
Andhra Pradesh	-8	-7	-12	-9	-8	-5
Bihar	22	11	10	2	-1	2
Gujarat	10	24	9	25	6	5
Haryana	28	33	2	5	-3	3
Himachal Pradesh	-6	-7	-3	-7	-16	
Jammu and Kashmir	3	3	2	5	0	-5
Karnataka	-3	-1	-9	-9	-7	-5
Kerala	-9	-10	-7	-11	-5	
Madhya Pradesh	8	9	0	-8	-12	-20
Maharastra	-2	0	-5	-7	-9	-3
Meghalaya	-10	-8	-12	-9	-9	
Nagaland	-8	-7	-10	-10	1	
Orissa	-5	-5	-4	-3	1	0
Punjab	14	17	12	3	-1	6
Rajasthan	20	22	9	-3	-9	4
Tamil Nadu	-3	0	-7	-9	-5	-5
Tripura	-4	-8	-5	-7	-11	
Uttar Pradesh	34	37	23	5	6	0
West Bengal	-7	3	-1	-5	1	-1

Note: Positive numbers indicate excess female child mortality.

#$ Mortality rate is per 1000.

Table 7

Excess Female Child Mortality Rates:
Regression Results

Variable/Equation	1	2	3
Dependent Variable			
Relative Excess Female Child Mortality - CMR_f/CMR_m			
Weighted Least Squares (Log linear)			
Labour force participation rate	-0.306*	-0.464**	-0.449**
	(-2.12)	(-3.52)	(-4.08)
Length of Education	-	-0.221**	-0.331**
		(-4.95)	(-11.14)
Use of State Dummies	None	None	Yes
Constant	0.043	0.047	-
$\bar{R}^2$	0.038*	0.242**	0.699**
F-Statistic	4.53	15.17	11.34
Diagnostics - (F-Statistics)			
Functional form #	0.088#	0.094#	0.002#
Heteroskedasticity $	7.07	0.276$	0.080$

Notes: ** Coefficient significant at 99% level of confidence
* Coefficient significant at 95% level of confidence.
# Functional form is appropriate at 95% level of confidence or better. F-statistic is based on Ramsey's RESET test.
$ Errors are homoskedastic at 95% level of confidence or better. The test is based on the regression of squared residuals on squared fitted values.

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