Maternal Education and the Utilization of Maternal and Child Health Services in India

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India's National Family Health Survey (NFHS) was conducted in 1992–93 under the auspices of the Ministry of Health and Family Welfare. The survey provides national and state-level estimates of fertility, infant and child mortality, family planning practice, maternal and child health care, and the utilization of services available to mothers and children. The International Institute for Population Sciences, Mumbai, coordinated the project in cooperation with 18 population research centres throughout India, the East-West Center Program on Population in Honolulu, Hawaii, and Macro International in Calverton, Maryland. The United States Agency for International Development provided funding for the project.

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Abstract. *Extensive research based on national surveys and censuses conducted in developing countries shows maternal schooling to be a very strong and consistent predictor of reduced child mortality and morbidity. A deeper understanding calls for an investigation of how maternal schooling affects women's health-seeking behavior. It can be argued that this relationship is not simply a reflection of a co-occurrence of education with other socioeconomic variables. Using data from the National Family Health Survey 1992–93, we examine the relationship between maternal schooling and factors known to reduce the risks of maternal and child mortality, namely, health-care practices, for some selected northern and southern states in India. We hypothesize that the practices of educated women are quite different from those of uneducated women with regard to pregnancy, childbirth, immunization, and management of childhood diseases such as diarrhoea and acute respiratory infection (ARI). However, there exist a number of confounding factors such as socioeconomic status that are associated with the study of the impact of maternal education on health-care utilization. The hypothesis that the relationship between mother's education and health-care practices might be the result of other variables is tested, and regression analysis on several of these variables is carried out. It is evident that a higher level of maternal education results in improved child survival because health services that effectively prevent fatal childhood diseases are used to a greater extent by mothers with higher education than by those with little or no education. We conclude that the benefits of maternal education persist even when other socioeconomic factors are taken into account.*

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INTRODUCTION

Cross-country comparisons using large data sets, such as the World Fertility Survey and the Demographic and Health Surveys, have shown that education in general and female education in particular exert a very strong influence in reducing child morbidity and mortality (Boerma et al. 1990; Bicego and Boerma 1993; Caldwell and Caldwell 1990; Hobcraft, McDonald, and Rutstein 1985; Murthi, Guio, and Dreze 1995). At the micro level, more in-depth quantitative and qualitative research that examines women's health-enhancing behavior has arrived at similar conclusions (Bhuiya and Streatfield 1991; Bourne and Walker 1991). A deeper understanding calls for an investigation of how maternal schooling affects women's health-seeking behavior. In investigating the pathways of influence, research confirms that the causal linkages between these two factors are far from clear and that this relationship is simply not a reflection of a co-occurrence of education with other socioeconomic variables (Desai 1994; Hobcraft 1993). In spite of methodological problems associated with the measurement of maternal mortality and morbidity, several studies have shown a strong relationship between maternal mortality and morbidity and the absence of prenatal care. They have also shown that and that utilization of prenatal care is dependent on, among other factors, maternal education (Monteith et al. 1987; Okafor 1991; Wong et al. 1987). Studies of factors that influence the utilization of modern delivery-care services are, however, scarce. Several other studies have been carried out to explain how maternal education may influence child health, mostly within the conceptual framework put forward by Mosley and Chen (1984), who argue that mortality is the outcome of a combination of social, economic, biological, and environmental factors and that these factors operate through a set of proximate determinants.

Three broad pathways of influence, linking maternal schooling to child mortality, that result in greater utilization of modern health services have been suggested: educated women are better able to break away from tradition to utilize modern means of safeguarding their own health and that of their children (Caldwell and Caldwell 1988; Cleland 1990); educated women are better able to utilize what is available in the community to their advantage (Barrera 1990; Caldwell 1990; Goodburn, Ebrahim, and Senapati 1990); and educated women may be able to make independent decisions regarding their own and their children's health leading to greater utilization of modern health facilities (Caldwell 1979; Caldwell 1986).

This research sets out to investigate the broad nature of the association between maternal schooling and the utilization of maternal and child health (MCH)

services in India. Using data from the 1992–93 National Family Health Survey (NFHS), we examine the relationship between maternal schooling and factors known to reduce the risks of maternal and child mortality—utilization of antenatal and delivery care services, utilization of child immunization services, and treatment of childhood diseases. We hypothesize that the practices of educated mothers, with regard to pregnancy, childbirth, immunization, and management of childhood diseases such as diarrhoea and acute respiratory infection (ARI), are quite different from those of their uneducated counterparts. In addition, the extent to which the impact of maternal schooling on the utilization of MCH services is confounded by other socioeconomic and demographic influences is examined.

In India, the striking interregional diversity is an important confounding factor. As such, the current research analyzes data for India as a whole and for the states of Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh in the north and Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu in the south. These two groups of states are distinctly different socioeconomically and culturally and are fairly representative of the north-south dichotomy observed by Dyson and Moore (1983). Southern women typically enjoy greater freedom, an outcome of the Dravidian culture, and higher levels of literacy, education, and employment. Northern women are strongly subjected to the traditional conservatism of the Mogul legacy and are predominantly illiterate, less educated, and less likely to work outside the home.

That the northern and southern states in India differ substantially is very well brought out by a comparison of selected background characteristics among the constituent states as shown by data from the NFHS in Table 1. On average, the southern states fare better than their northern counterparts on all the selected characteristics. For instance, the percentage of females age 6 and older who are illiterate ranges from 66 percent in Madhya Pradesh to 75 percent in Rajasthan in the north whereas it ranges from 18 percent in Kerala to 62 percent in Andhra Pradesh in the south. While the total fertility rate in the northern states is 3.6 births or higher per woman, it is 2.9 or lower in the southern states. More pronounced differences are observed when Uttar Pradesh in the north is compared to Tamil Nadu in the south. More than two-thirds of females age 6 and older are illiterate in Uttar Pradesh, compared with more than two-fifths in Tamil Nadu (Table 1). Similarly, half the girls age 6–14 do not attend school in Uttar Pradesh, compared with less than one-fourth in Tamil Nadu. Less than one-third of homes in Uttar Pradesh are electrified, compared with nearly two-thirds of homes in Tamil Nadu. Women from Tamil Nadu are three and a half times as likely to be employed outside the home as women from Uttar Pradesh. Despite the rapid overall decline in infant mortality, 1 in every 10 children born in Uttar Pradesh during the five years before the NFHS died within the first year of life, and 1 in every 7 children

Table 1 Background characteristics for India and selected northern and southern states, 1992–93

	Percent illiterate (females age 6+)	Percent attending school (females age 6–14)	Perecent of households electrified	Percent of respondents employed[a]	Total fertility rate[b]	Per-cent urban	Infant mort-ality rate[c]	Under-five mort-ality rate[c]
All India	56.7	58.9	50.9	31.5	3.39	26.5	78.5	109.3
North								
Bihar	71.4	38.3	16.6	24.9	4.00	15.6	89.2	127.5
Madhya Pradesh	65.7	54.8	62.4	32.4	3.90	23.8	85.2	130.3
Rajasthan	74.6	40.6	51.9	31.4	3.63	19.2	72.6	102.6
Uttar Pradesh	68.5	48.2	31.9	13.4	4.82	21.5	99.9	141.3
South								
Andhra Pradesh	61.5	54.8	62.2	53.4	2.59	27.0	70.4	91.2
Karnataka	53.5	64.4	64.0	47.0	2.85	32.6	65.4	87.3
Kerala	17.6	94.8	60.3	24.7	2.00	27.8	23.8	32.0
Tamil Nadu	43.9	78.7	63.8	46.7	2.48	35.8	67.7	86.5

[a]Ever-married women age 13–49.

[b]Based on births to women age 15–49 during the three years preceding the survey, expressed per woman.

[c]Per 1,000 live births for the five years preceding the survey.

died before reaching age five. The equivalent statistics for Tamil Nadu are 1 in 15 and 1 in 12, for infant and under-five mortality, respectively. We hypothesize that the nature and extent of the relationship between maternal education and utilization of MCH services differ between the north and south of India and that this difference is largely determined by the north-south differentials in the general socioeconomic and cultural environment in which women live.

The purpose of this study is to inform policymakers and program planners of the potential role of women's education in improving maternal and child health through its influence on the utilization of health services. This research is undertaken partly in response to the lack of clarity, consistency, and strength of the maternal schooling-child mortality explanation, and partly to exploit the rich data collected in the NFHS that potentially could shed more light on this subject.

DATA AND METHODOLOGY

The NFHS covers 99 percent of the population of India residing in 24 states and the National Capital Territory of Delhi.[1] Because of this huge undertaking, the survey was carried out in three phases from April 1992 to September 1993. Three types of questionnaires were administered: the Household Questionnaire, the Woman's Ques-

tionnaire, and the Village Questionnaire. For the purpose of this analysis, we use data gathered from the Household Questionnaire and the Woman's Questionnaire on the respondent's background characteristics, the health of her children, and her work status. The NFHS gathered information on various aspects of maternal-care utilization. Specifically, for each live birth in the four years preceding the survey, a woman was asked if she had received antenatal care. If she did, she was asked who administered the care, how many months pregnant she was when she first received antenatal care, how many antenatal care visits she had in all, whether she had received an injection to prevent tetanus during her pregnancy and, if so, how many injections she had received, whether she had received iron/folic-acid tablets while she was pregnant, where she gave birth, and who assisted with the delivery. Information on child health-care utilization included the percentage of children suffering from ARI and/or diarrhoea who were taken to a health facility for treatment, the percentage of children treated with oral rehydration salts (ORS) and/or recommended home fluids (RHF), and the percentage of children age 12–23 months who were fully vaccinated. At the national level, the sample was weighted, with the overall sample weight for each woman being the product of the design weight for each state and the state weight. The national weights were also used for the grouped northern and southern states.

The base sample for our study of maternal-care utilization constitutes 49,369 children born in the period 1–47 months prior to the survey. These were children born to ever-married women aged 13–49 for whom information on health was obtained. For child health-care utilization, only the 45,363 children who were alive at the time of the interview are considered. In this analysis, we include five main indicators of maternal-care utilization—antenatal care, tetanus toxoid immunization, receipt of iron/folic-acid tablets, place of delivery, and delivery care. The child health-care indicators of interest are the percentage of children born in the four years preceding the survey who suffered from ARI in the two weeks preceding the date of interview and were taken to a health facility for treatment, the percentage of children who suffered from diarrhoea in the two weeks prior to the interview and were taken to a health facility for treatment or were treated with ORS and/or RHF, and the percentage of children age 12–23 months who were fully vaccinated.

Information on maternal and child health care is birth based, that is, it is collected for each child born to respondents in the four years preceding the interview. The denominator differs for each dependent variable. For maternal health-care indicators, the denominator is all live births in the four years preceding the survey. For ARI, diarrhoea, and treatment with ORS and/or RHF, it is the number of children who were actually reported sick with the illness in the two weeks before the interview. There are five dichotomous dependent variables for maternal health-care indi-

cators: whether or not mothers received at least two doses of tetanus toxoid vaccine; whether or not mothers received iron/folic-acid tablets; whether or not mothers received antenatal care from a health professional in an institutional setting, from a health worker at home, or from any other person;[2] whether or not mothers received delivery care from a trained health professional; and whether or not the birth was delivered in a public or private medical institution. Trained health professionals include doctors, nurses, trained nurse/midwives, and other formally trained personnel. The dichotomous dependent variables for child health-care indicators are: whether or not sick children suffering from symptoms of ARI and/or diarrhoea were taken to a health facility or health provider for treatment; whether children sick with diarrhoea were treated with ORS and/or RHF; and whether children age 12–23 months at the time of interview are fully vaccinated. A health facility or provider includes government or municipal hospitals, primary health centers, subcenters, mobile clinics, village health guides, and government paramedics in the public sector and private hospitals or clinics, private doctors, mobile clinics, and community health workers in the private sector. A child is considered as having been taken to a health facility if he/she received care from one or more of the above sources. Children are considered fully vaccinated if they received the tuberculosis (BCG) and measles vaccinations and all three doses of the DPT (diphtheria, pertussis, tetanus) and polio vaccines. The dichotomous dependent variable in this case is children fully vaccinated or not. The age group 12–23 months is recommended by the World Health Organisation (WHO) as the age group to examine because it covers children older than 11 months (by which age they should have been fully vaccinated) and because it contains the most recent information (older children may not have been covered by more recent health programmes). Even though the sample is not restricted to one child per woman, it is unlikely to overrepresent women with higher fertility (who are more likely to be rural and less educated) because there are very few women who had more than one birth in the four years before the survey.[3]

Several independent variables, both socioeconomic and demographic, which could potentially influence the outcome were included in the analysis: mother's education, place of residence, employment status, caste, and religion,[4] and child's sex, birth order, and age (applicable to child health-care indicators only) at the time of interview. Mother's age at the time of birth of her child was not included since it is highly correlated with birth order. Mother's education was categorized into three groups: illiterate, literate less than middle school complete, and middle school complete and above. Place of residence was urban or rural. Mother's employment status was categorized into working and not working outside the home. Even though women working for cash may be in a particularly strong position, socioeconomically and otherwise, because of the small numbers working outside the home (and even smaller

numbers working for cash), it made sense statistically to group women into just these two categories. Caste was divided into two groups: those belonging to scheduled castes and scheduled tribes and those not belonging to such groups. Religion was classified into Hindu, Muslim, and others. Birth order was broken down into three categories: 1, 2–3, and 4+; and child's age in months was grouped into five categories: less than 6 months, 6–11, 12–23, 24–35, and 36–47 months.[5]

A logistic regression is run for each of the nine dependent dichotomous variables. This technique examines the potential strength of education when the influence of other socioeconomic and demographic variables is controlled. The model is based on forward stepwise selection using the Wald statistic for deleting variables that exceed the 0.1 cutoff value. The same models are applied at the national and state levels, with the four northern and southern states grouped together.

MATERNAL HEALTH CARE

The fact that more than 100,000 women in India are estimated to die every year from pregnancy- and childbirth-related causes reinforces the importance of ensuring that all pregnant women receive adequate antenatal care during pregnancy and that deliveries take place under the supervision of trained medical personnel in a hygienic environment (IIPS 1995). Antenatal care provides an opportunity for a variety of preventive interventions during pregnancy, including tetanus toxoid injections, and educating women about nutrition, safe delivery, and postpartum care (Govindasamy et al. 1993). It also allows women who face a high-risk pregnancy to be identified and monitored during pregnancy to ensure a safe delivery. Delivery care is an important aspect of maternal care. Most nonabortion maternal deaths occur around the time of labor and delivery or within a few days after birth (Fauveau et al. 1988). Access to obstetric services from qualified professionals is therefore essential to preventing maternal deaths. Educated mothers are more likely to recognize a problem, seek medical care, and report a problem.

Infant and child mortality rates are also greatly reduced if mothers received antenatal and delivery care from trained health professionals (IIPS 1995). In India for example, infant mortality rates range from 97 per 1,000 for births with neither antenatal nor delivery care, to 64 per 1,000 for births with either type of care, and 44 per 1,000 for births with both antenatal and delivery care. This pattern is constant for all the states under study. The findings are similar for institutional deliveries. Data from the NFHS show that infant mortality in India is 31 percent higher for births delivered at home than for births delivered in a public health facility and twice as high as for births delivered in a private facility.

Table 2 Percentage of live births during the four years preceding the survey, by various maternal health care indicators, for India and selected northern and southern states

	Received antenatal care[a]	Received two doses of tetanus toxoid vaccine[b]	Received iron/folic-acid tablets	Births delivered in medical institutions[c]	Deliveries assisted by health professionals[d]
All India	60.0	53.9	50.5	25.5	34.3
North	42.4	35.9	30.2	12.4	20.5
Bihar	36.3	30.7	21.4	12.1	18.9
Madhya Pradesh	52.3	42.8	44.3	15.9	30.0
Rajasthan	30.7	28.3	29.2	11.6	21.8
Uttar Pradesh	44.4	37.4	29.5	11.2	17.2
South	89.0	79.7	79.9	49.2	61.0
Andhra Pradesh	85.9	74.8	76.4	32.9	49.3
Karnataka	83.4	69.8	74.9	37.5	50.9
Kerala	97.3	89.8	91.2	87.8	89.7
Tamil Nadu	94.2	90.1	84.1	63.5	71.2

Note: Table is based on births in the period 1–47 months prior to the survey. Percentages may vary slightly from published reports because these reports exclude cases with missing information.

[a]Includes births to women visited by a health worker at home. Antenatal care is care received from trained as well as untrained health personnel.

[b]Includes women who received two or more doses.

[c]Refers to deliveries in a government/municipal hospital, private hospital/clinic, primary health center, subcenter, or maternity home.

[4]Refers to deliveries assisted by health professionals including allopathic, homoeopathic, and ayurvedic doctors, nurse/midwives, and other health professionals.

There is a striking disparity in the utilization of maternal-care services between the northern and southern states, with southern women much more likely to make use of maternal-care services than northern women (Table 2). For instance, on average, births to women in the south are more than twice as likely to receive antenatal care as births to women in the north. Births to women in the south are two and a half times as likely to receive iron/folic-acid tablets, four times as likely to be delivered in a medical facility, and three times as likely to receive delivery care from a health professional. Women in general are more likely to utilize antenatal services than delivery-care services, presumably because some antenatal services are provided by health workers at home and access is not a problem, especially for rural women. Only one in five deliveries in the north is attended by a trained health professional. This is mainly due to the fact that the majority of deliveries in the north take place at home and are attended by traditional birth attendants and friends and relatives. In the south, three out of five deliveries are attended by a health-care professional, and one out of two deliveries occurs in a health facility or institution.

BIVARIATE RELATIONSHIP BETWEEN MOTHER'S SCHOOLING AND MATERNAL HEALTH CARE

There is a consistently strong and positive relationship between maternal-care utilization and mother's education, as seen in Table 3 and Figures 1 and 2. In the country as a whole, only half of births to illiterate women received antenatal care, compared with 79 percent of births to literate women with less than middle-school education and more than 90 percent of births to women with at least middle-school education. Similar differentials by maternal education are observed for tetanus toxoid injections and iron/folic-acid tablets. The differentials in utilization of delivery-care services are even more marked between illiterate and educated women. Only 12 percent of births to illiterate women are delivered in institutions compared with 67 percent of births to women with at least a middle-school education. Similarly, only one-fifth of births to illiterate women are attended by a health professional, compared with three-fourths of births to women who have completed middle school. This pattern of a positive relationship between maternal education and utilization of maternal-care services exists even when the northern and southern states are examined separately. However, the educational differences in utilization are not as marked in the southern states as in the northern states for all five maternal-care indicators. For example, differences in maternal-care utilization between births to illiterate women and births to women who have completed middle school range from 140–800 percent in the north compared with 19–214 percent in the south.

MULTIVARIATE RELATIONSHIP BETWEEN MOTHER'S SCHOOLING AND MATERNAL HEALTH CARE

It has been variously argued that education is but one of many indices of socioeconomic status and that the strong positive relationship between education and infant and child mortality is merely a reflection of the fact that educated mothers come from wealthier homes, live in urban settings where health care is more accessible, and are married into households that have a good source of income and therefore are better able to care for their young children through the utilization of MCH services (Cleland and van Ginneken 1988; Schultz 1984; Ware 1984). Thus, controlling for the possible impact of other socioeconomic variables is an important part of the exercise to determine if the positive impact of mother's education on utilization of health-care services is real.

A more sophisticated test of the strength of the relationship between mother's schooling and maternal-care utilization is carried out within a multivariate framework. To examine whether education continues to be a strong and significant predic-

Table 3 Percentage of live births in the four years preceding the survey by various maternal health care indicators and mother's education, for all India, north India, and south India

	Mother's education			
Maternal health-care indicators	**Illiterate**	**Literate, < middle**	**Middle +**	**Total**
All India				
Antenatal care[a]	50.5	79.1	92.3	62.0
Tetanus toxoid injections[b]	40.5	72.1	88.7	53.9
Iron/folic-acid tablets	38.3	66.6	82.1	50.5
Institutional delivery[c]	11.8	37.9	67.0	25.5
Professional delivery care[d]	20.1	48.6	75.7	34.3
North India				
Antenatal care[a]	34.5	60.8	82.7	42.4
Tetanus toxoid injections[b]	27.2	54.2	81.1	35.9
Iron/folic-acid tablets	22.4	48.0	70.0	30.2
Institutional delivery[c]	5.7	21.7	51.3	12.4
Professional delivery care[d]	13.0	34.4	62.0	20.5
South India				
Antenatal care[a]	82.5	95.5	98.1	89.0
Tetanus toxoid injections[b]	68.8	89.4	95.8	79.7
Iron/folic-acid tablets	72.4	84.6	92.5	79.9
Institutional delivery[c]	27.2	64.1	85.4	49.2
Professional delivery care[d]	41.8	75.4	91.3	61.0

Note: North India refers to Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh, and south India refers to Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu. Percentages may vary slightly from published reports because they exclude cases with missing information.

[a]Includes births to women visited by a health worker at home. Antenatal care is care received from trained as well as untrained health personnel.

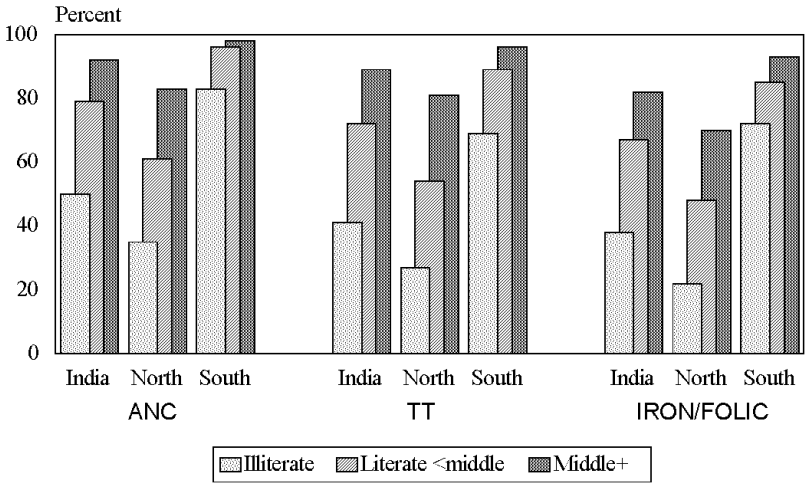
[b]Refers to women who received two or more doses.

[c]Refers to deliveries in a government/municipal hospital, private hospital/clinic, primary health center, subcenter, or maternity home.

[d]Refers to deliveries assisted by health professionals including allopathic, homoeopathic, and ayurvedic doctors,

tor of health-care utilization, selected socioeconomic and demographic factors that could possibly influence health-care utilization are controlled. The results are presented in Table 4.

Multivariate analysis confirms the positive and significant influence of mother's schooling on maternal-care utilization. Education emerges as the single most important determinant of maternal health-care utilization in India when the influence of other intervening factors is controlled. For example, educated women with at least middle schooling are nearly eight times as likely to receive antenatal care for their births as illiterate women, and literate women with less than middle schooling are



ANC: Antenatal care; TT: At least two doses of tetanus toxoid vaccine

Figure 1 Antenatal care by education

more than three times as likely. The pattern is similar for utilization of the other maternal health-care services. In general, births to literate women with less than middle-school education are about three times as likely to receive maternal care services as births to illiterate women. Similarly, births to women who have completed middle school are five to eight times as likely to receive maternal care as births to illiterate women. While other socioeconomic factors, especially residing in an urban area, are significant and important, education by itself has the strongest impact on maternal health-care utilization.

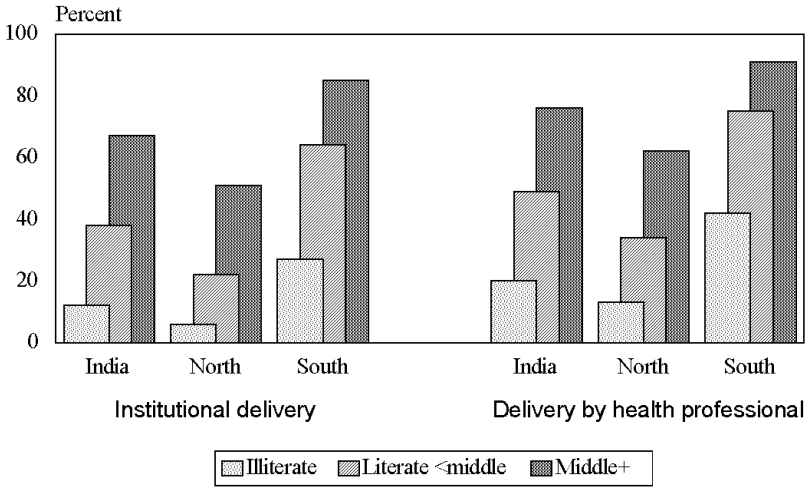


Figure 2 Delivery care by education

Table 4 Odds ratios of receiving maternal health-care services for births during the four years preceding the survey, by maternal education, controlling for selected socioeconomic and demographic variables: all India

	Antenatal care[a]	Tetanus toxoid vaccine[b]	Iron/folic-acid tablets	Delivered in a medical institution[c]	Deliveries assisted by a health professional[d]
Education (rc: illiterate)					
Literate, <middle complete	3.26***	3.18***	2.90***	3.47***	2.99***
Middle school +	7.82***	7.38***	5.26***	7.81***	6.79***
Residence (rc: rural)					
Urban	2.15***	2.05***	1.86***	5.04***	4.10***
Work status (rc: not working)					
Working	1.29***	1.09***	1.41***	ns	1.10***
Caste (rc: non-SC/ST)					
Scheduled caste/tribe	0.76***	0.73***	0.83***	0.56***	0.65***
Religion (rc: Hindu)					
Muslim	0.84***	0.89***	0.76***	0.73***	0.68***
Other	1.73***	1.56***	1.51***	1.45***	1.64***
Birth order (rc: one)					
2–3	0.81***	0.80***	0.85***	0.63***	0.65***
4+	0.51***	0.48***	0.54***	0.37***	0.40***
–2 log likelihood	56,634	58,000	60,374	40,575	49,383
Number of births	48,368	48,368	48,368	48,368	48,368

***p<0.001 for two-tailed test

rc: reference category

ns: not significant

[a]Refers to pregnancy-related health care provided by a doctor or a health worker in a medical facility or at home.

[b]Refers to women who received two or more doses.

[c]Refers to deliveries in a government/municipal hospital, private hospital/clinic, primary health center, subcenter, or maternity home.

[d]Refers to deliveries assisted by health professionals including allopathic, homoeopathic, and ayurvedic doctors, nurse/midwives, and other health professionals.

Education remains a consistently strong and significant predictor of maternal health-care utilization when northern and southern India are considered separately (Tables 5 and 6). In the four northern states, births to women who have completed middle school are six times as likely to receive antenatal care, seven times as likely to receive at least two doses of tetanus toxoid vaccine, five times as likely to receive iron/folic-acid tablets, eight times as likely to be delivered in an institution, and six times as likely to be attended by a health professional at delivery as births to illiterate women. Births to literate women with less than middle schooling are two to three

Table 5 Odds ratios of receiving maternal health-care services for births during the four years preceding the survey, by maternal education, controlling for selected socioeconomic and demographic variables: north India

	Antenatal care[a]	Tetanus toxoid vaccine[b]	Iron/folic-acid tablets	Delivered in a medical institution[c]	Deliveries assisted by a health professional[d]
Education (rc: illiterate)					
Literate, <middle complete	2.45***	2.56***	2.72***	3.13***	2.75***
Middle school +	5.92***	7.17***	5.42***	7.80***	6.00***
Residence (rc: rural)					
Urban	2.18***	2.29***	2.16***	5.90***	3.97***
Work status (rc: not working)					
Working	0.74***	0.69***	0.90*	0.70***	ns
Caste (rc: non-SC/ST)					
Scheduled caste/tribe	0.83***	0.77***	0.90**	0.54***	0.78***
Religion (rc: Hindu)					
Muslim	0.86*	0.89**	0.75***	0.56***	0.66***
Other	1.49**	1.43*	1.30*	1.88***	1.60**
Birth order (rc: one)					
2–3	0.80***	0.81***	0.81***	0.61***	0.64***
4+	0.64***	0.60***	0.65***	0.48***	0.51***
–2 log likelihood	27,868	25,837	24,853	12,393	18,961
Number of births	17,924	17,924	17,924	17,924	17,924

Note: North India refers to Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh.

***p<0.001 for two-tailed test

rc: reference category

ns: not significant

[a]Refers to pregnancy-related health care provided by a doctor or a health worker in a medical facility or at home.

[b]Refers to women who received two or more doses.

[c]Refers to deliveries in a government/municipal hospital, private hospital/clinic, primary health center, subcenter, or maternity home.

[d]Refers to deliveries assisted by health professionals including allopathic, homoeopathic, and ayurvedic doctors, nurse/midwives, and other health professionals.

times as likely to receive maternal-care services as births to illiterate women. A similar relationship exists between women's schooling and maternal health care in the southern states. In the south, when the effect of confounding variables is controlled, literate women with less than middle schooling are two to four times as likely to receive maternal care as illiterate women. Women with at least middle schooling are about eight times as likely to receive maternal care as illiterate women.

Table 6 Odds ratios of receiving maternal health-care services for births during the four years preceding the survey, by maternal education, controlling for selected socioeconomic and demographic variables: south India

	Antenatal care[a]	Tetanus toxoid vaccine[b]	Iron/folic-acid tablets	Delivered in a medical institution[c]	Deliveries assisted by a health professional[d]
Education (rc: illiterate)					
Literate, <middle complete	3.54***	3.19***	1.80***	3.38***	3.03***
Middle school +	7.55***	7.63***	3.79***	8.07***	7.57***
Residence (rc: rural)					
Urban	ns	1.16*	ns	3.81***	3.11***
Work status (rc: not working)					
Working	0.63***	0.74***	0.72*	0.61***	0.67***
Caste (rc: non-SC/ST)					
Scheduled caste/tribe	ns	ns	ns	0.63***	0.67***
Religion (rc: Hindu)					
Muslim	ns	ns	ns	ns	ns
Other	ns	ns	ns	1.63***	1.48**
Birth order (rc: one)					
2–3	0.82*	ns	ns	0.69***	0.68***
4+	0.47***	0.52***	0.67***	0.42***	0.41***
–2 log likelihood	5,701	8,240	8,699	9,305	9,595
Number of births	7,435	7,435	7,435	7,435	7,435

Note: South India refers to Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu.

***p<0.001 for two-tailed test

rc: reference category

ns: not significant

[a]Refers to pregnancy related health care provided by a doctor or a health worker in a medical facility or at home.

[b]Refers to women who received two or more doses.

[c]Refers to deliveries in a government/municipal hospital, private hospital/clinic, primary health center, subcenter, or maternity home.

[d]Refers to deliveries assisted by health professionals including allopathic, homoeopathic, and ayurvedic doctors, nurse/midwives, and other health professionals.

CHILD HEALTH CARE

The most common contributors to postneonatal mortality and especially child mortality are respiratory ailments, gastrointestinal diseases, and six vaccine-preventable diseases (namely, tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles), often exacerbated by malnutrition (UNICEF 1990). The Universal Immunization Programme in India aims to reduce infant and child mortality due to the six

Table 7 Prevalence and treatment of acute respiratory infection (ARI) and diarrhoea for children age under age four years and vaccination coverage for children age 12–23 months, for India and selected northern and southern states

	Percent with symptoms of ARI	Percent taken to a health facility among children with ARI symptoms[a]	Among children with diarrhoea			Percent fully vaccinated among children age 12–23 months[b]
			Percent with diarrhoea	Percent taken to a health facility[a]	Percent treated with ORS and/or RHF	
India	6.5	68.5	10.0	61.1	30.6	35.3
North						
Bihar	4.3	72.9	13.7	58.5	23.0	10.7
Madhya Pradesh	4.7	61.8	8.6	64.4	33.0	29.2
Rajasthan	4.9	54.3	5.7	51.3	22.7	21.1
Uttar Pradesh	7.2	68.3	8.9	65.7	22.7	19.8
South						
Andhra Pradesh	4.9	68.7	11.7	62.5	32.5	45.0
Karnataka	3.4	74.0	9.7	64.6	34.0	52.2
Kerala	9.7	81.3	9.2	70.6	37.8	54.4
Tamil Nadu	8.6	67.4	12.7	54.8	27.1	64.9

Note: Percentages may vary slightly from published reports because they exclude cases with missing information.

ORS = oral rehydration salts

RHF = recommended home fluids

[a]Includes a government/municipal hospital, private hospital/clinic, primary health center, subcenter, doctor, or other health professional. The percentage for ARI differs slightly from the final reports for India and the selected northern and southern states because it includes mobile clinics, government paramedics, and village health guides.

[b]Children who are fully vaccinated, i.e., those who have received BCG and measles vaccines and three doses of DPT and polio vaccines (excluding polio 0).

vaccine-preventable diseases by immunizing all children less than one year old. Through its Oral Rehydration Therapy Programme, the Government of India aims to increase awareness among women and in the community in general about the causes and treatment of diarrhoea. Table 7 presents the percentage of children under four years of age at the time of the interview who had symptoms of ARI, and, among those with symptoms, the percentage taken to a health facility for treatment. It also shows the percentage of children who suffered from diarrhoea (including bloody diarrhoea) and, among those children, the percentage who were taken to a health facility for treatment and the percentage who were treated with ORS and/or RHF. Finally, it shows the percentage of children age 12–23 months who are fully vaccinated, that is, who have received vaccinations against BCG and measles plus three doses of DPT and polio vaccines (excluding polio 0).

The percentage of children suffering from symptoms of ARI varies from 3 percent in Karnataka to 10 percent in Kerala. In general, more children in the south

than in the north experience symptoms of ARI. It is plausible that the more-educated mothers in the south are more likely to recognize and report symptoms of ARI than the less-educated mothers in the north. Southern mothers are also generally more likely to take their children to a health facility than northern mothers. For example, four in five children with symptoms of ARI in Kerala were taken to a health facility or provider, compared with only about half of the children in Rajasthan. The pattern is somewhat similar when examining the incidence of diarrhoea. There is an obvious difference in treatment of diarrhoea between the north and south, with mothers in the south more likely to administer ORS and/or RHF when treating their children for diarrhoea. Children living in the four southern states are also more likely to be fully vaccinated than children living in the northern states, with the percentage fully vaccinated ranging from 45 percent to 65 percent in the south, compared with 11 percent to 29 percent in the north.

BIVARIATE RELATIONSHIP BETWEEN MOTHER'S SCHOOLING AND CHILD HEALTH CARE

The relationship between maternal schooling and child health-care utilization is shown in Table 8. Mother's education is positively related to utilization of child health-care services, and this relationship is consistent for all four types of child health care analyzed and in both north and south India. This educational difference in utilization of child health-care services is marked when comparing illiterate women with those who have at least a middle-school education. Educational differences are particularly pronounced when comparing the percentage of children fully immunized (Figure 3). For example, in India as a whole, children of mothers with middle-school education are 173 percent more likely to be fully vaccinated than children of mothers who are illiterate. In the northern states they are 262 percent more likely to be fully vaccinated, and in the southern states they are 72 percent more likely. Within education groups, there is little difference between north and south in treatment for ARI and diarrhoea. Twenty-one percent of children born to illiterate mothers in the north receive ORS and/or RHF when suffering from diarrhoea, compared with 28 percent of children born to illiterate mothers in the south. The differences between educational groups are more pronounced in the north than in the south.

North-south differences are more marked for childhood vaccination. Only 13 percent of children of illiterate mothers are fully vaccinated in the north, compared with 43 percent in the south. Nearly twice as many children of literate mothers with less than middle-school education are fully vaccinated in the south as in the north. Less than one in two northern children born to mothers with at least a middle-school

Table 8 Prevalence and treatment of acute respiratory infection (ARI) and diarrhoea among children under four years of age and vaccination coverage for children age 12–23 months, by mother's education, for all India, north India, and south India

	Percent taken to a health facility for treatment of ARI[a]	Percent taken to a health facility for treatment of diarrhoea[a]	Percent treated with ORS and/or RHF	Percent fully vaccinated[b]
All India				
Illiterate	64.8	58.0	25.7	24.0
Literate, < middle complete	72.6	66.0	36.7	46.5
Middle school and above	79.7	69.2	44.7	65.6
Total	68.5	61.1	30.6	35.3
North India				
Illiterate	64.7	60.2	20.8	13.4
Literate, < middle complete	79.4	66.1	31.7	31.4
Middle school and above	85.6	69.9	44.7	48.5
Total	68.4	61.9	24.5	19.4
South India				
Illiterate	69.2	57.1	27.7	42.5
Literate, < middle complete	77.2	66.3	34.3	57.0
Middle school and above	84.1	67.5	38.8	72.9
Total	74.3	61.4	31.7	53.6

Note: Percentages may vary slightly from published reports because they exclude cases with missing information.

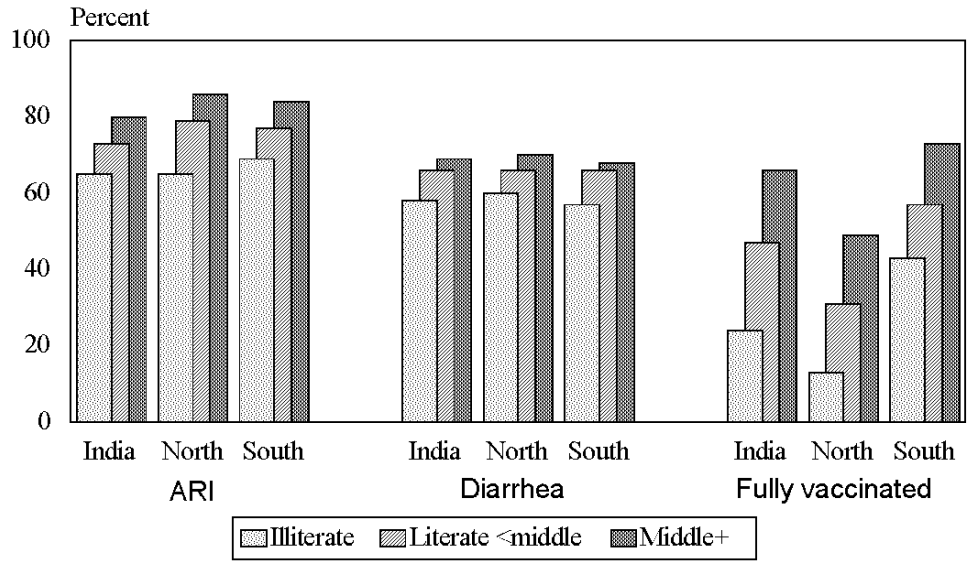
ORS = oral rehydration salts

RHF = recommended home fluids

[a]Includes a government/municipal hospital, private hospital/clinic, primary health center, subcenter, doctor, or other health professional. The percentage for ARI differs slightly from the final reports for India and the selected northern and southern states because it includes mobile clinics, government paramedics, and village health guides.

[b]Children who are fully vaccinated, i.e., those who have received BCG and measles vaccines and three doses of DPT and polio vaccines (excluding polio 0).

education is fully vaccinated, compared with nearly three in four southern children. Within the regions, educational differences in immunization coverage are less pronounced in south India than in the north. In the north, children of mothers with at least a middle-school education are three and a half times as likely to be fully immunized as children of illiterate mothers. This ratio is just over one and a half times in south India, although the absolute education differences are similar in the north and the south.



ARI: percentage with symptoms of ARI who were taken to a health facility
Diarrhea: percentage with diarrhea who were taken to a health facility

Figure 3 Child healthcare by education

MULTIVARIATE RELATIONSHIP BETWEEN MOTHER'S SCHOOLING AND CHILD HEALTH CARE

When background variables such as residence, mother's work status, caste and religion, sex of the child, birth order, and age of the child are taken into account, mother's education continues to be a powerful, positive, and significant predictor of the utilization of child health-care services in India (Table 9). Children of mothers with at least a middle-school education are 62 percent and 45 percent more likely to be taken to a health facility for treatment of ARI and diarrhoea, respectively, than children of illiterate mothers. The educational effect between these two groups is even stronger for treatment with ORS and/or RHF (two and a half times) and full vaccination of children (more than four times). The educational difference in utilization of child health-care services is not as strong when we compare children of illiterate mothers with children of mothers who are literate with less than middle-school education.

When we examine the controlled educational effect on child health-care utilization in the northern and southern states, there is some variation. Overall, the education effect continues to be positive, strong, and significant. In the northern states, women with at least middle-school education are between one and a half and four

Table 9 Odds ratios of receiving child health-care services for births during the four years preceding the survey, by maternal education, controlling for selected socioeconomic and demographic variables, all India

	Taken to a health facility for treatment of ARI[a]	Taken to a health facility for for treatment of diarrhoea[a]	Diarrhoea treated with ORS and/or RHF	Children age 12–23 months fully vaccinated[b]
Education (rc: illiterate)				
Literate, <middle complete	1.32**	1.33***	1.74***	2.42***
Middle school +	1.62***	1.45***	2.48***	4.37***
Residence (rc: rural)				
Urban	1.51***	1.31*	ns	1.56***
Work status (rc: not working)				
Working	ns	0.77***	ns	1.35***
Caste (rc: non-SC/ST)				
Scheduled caste/tribe	0.82*	ns	ns	0.69***
Religion (rc: Hindu)				
Muslim	ns	ns	ns	0.59***
Other	ns	ns	ns	1.42***
Sex (rc: female)				
Male	1.61***	1.16*	1.20**	1.13**
Birth order (rc: one)				
2–3	0.63***	ns	ns	0.84***
4+	0.58***	ns	ns	0.53***
Child's age (rc: 1–5 months)				
6–11 months	ns	1.39**	2.51***	na
12–23 months	ns	1.68***	2.84***	na
24–35 months	ns	1.43***	2.33***	na
36–47 months	ns	ns	2.54***	na
–2 log likelihood	3,536	5,986	5,427	13,636
Number of births	2,971	4,807	4,807	11,602

***p<0.001 **p<0.01 *p<0.05 for two-tailed test

ORS = oral rehydration salts

RHF = recommended home fluids

rc: reference category

ns: not significant

na: not applicable

[a]Includes a government/municipal hospital, private hospital/clinic, primary health center, subcenter, doctor, or other health professional.

[b]Children who are fully vaccinated, i.e., those who have received BCG and measles vaccines and three doses of DPT and polio vaccines (excluding polio 0).

Table 10 Odds ratios of receiving child health-care services for births during the four years preceding the survey, by maternal education, controlling for selected socioeconomic and demographic variables, north India

	Taken to a health facility for treatment of ARI[a]	Taken to a health facility for for treatment of diarrhoea[a]	Diarrhoea treated with ORS and/or RHF	Children age 12–23 months fully vaccinated[b]
Education (rc: illiterate)				
Literate, <middle complete	1.97**	ns	1.82***	2.55***
Middle school +	2.02*	1.51*	3.34***	4.22***
Residence (rc: rural)				
Urban	2.35***	1.47*	ns	1.67***
Work status (rc: not working)				
Working	0.61**	0.64***	ns	ns
Caste (rc: non-SC/ST)				
Scheduled caste/tribe	ns	1.27*	ns	0.63***
Religion (rc: Hindu)				
Muslim	ns	ns	ns	0.66***
Other	ns	ns	ns	1.70*
Sex (rc: female)				
Male	1.76***	1.23*	ns	1.41***
Birth order (rc: one)				
2–3	0.65*	ns	ns	ns
4+	0.61**	ns	ns	0.70***
Child's age (rc: 1–5 months)				
6–11 months	1.67*	1.41*	1.78**	na
12–23 months	1.98**	1.64**	2.43***	na
24–35 months	ns	1.59**	2.08***	na
36–47 months	ns	ns	1.91**	na
–2 log likelihood	1,372	2,485	2,131	4,914
Number of births	935	1,495	1,495	4,336

Note: North India refers to Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh.

***p<0.001 **p<0.01 *p<0.05 for two-tailed test

ORS = oral rehydration salts

RHF = recommended home fluids

rc: reference category

ns: not significant

na: not applicable

[a]Includes a government/municipal hospital, private hospital/clinic, primary health center, subcenter, doctor, or other health professional.

[b]Children who are fully vaccinated, i.e., those who have received BCG and measles vaccines and three doses of DPT and polio vaccines (excluding polio 0).

Table 11 Odds ratios of receiving child health-care services for births during the four years preceding the survey, by maternal education, controlling for selected socioeconomic and demographic variables, south India

	Taken to a health facility for treatment of ARI[a]	Taken to a health facility for for treatment of diarrhoea[a]	Diarrhoea treated with ORS and/or RHF	Children age 12–23 months fully vaccinated[b]
Education (rc: illiterate)				
Literate, <middle complete	ns	ns	1.49*	1.67***
Middle school +	ns	ns	1.83***	3.13***
Residence (rc: rural)				
Urban	ns	ns	ns	ns
Work status (rc: not working)				
Working	0.57**	0.60**	ns	0.79*
Caste (rc: non-SC/ST)				
Scheduled caste/tribe	ns	0.63**	ns	ns
Religion (rc: Hindu)				
Muslim	ns	1.91**	ns	0.66**
Other	ns	ns	ns	ns
Sex (rc: female)				
Male	ns	1.37*	ns	ns
Birth order (rc: one)				
2–3	ns	ns	ns	0.82*
4+	ns	ns	ns	0.61***
Child's age (rc: 1–5 months)				
6–11 months	ns	ns	3.70***	na
12–23 months	ns	ns	4.68***	na
24–35 months	ns	ns	2.86**	na
36–47 months	ns	ns	4.00***	na
–2 log likelihood	591	1,229	1,155	2,858
Number of births	441	751	751	1,785

Note: South India refers to Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu.

***p<0.001 **p<0.01 *p<0.05 for two-tailed test

ORS = oral rehydration salts

RHF = recommended home fluids

rc: reference category

ns: not significant

na: not applicable

[a]Includes a government/municipal hospital, private hospital/clinic, primary health center, subcenter, doctor, or other health professional.

[b]Children who are fully vaccinated, i.e., those who have received BCG and measles vaccines and three doses of DPT and polio vaccines (excluding polio 0).

times as likely to utilize modern health care in treating childhood illnesses and to have their children fully vaccinated as women who are illiterate. With the exception of children taken to a health facility for treatment of diarrhoea, literate women with less than middle-school education are about twice as likely to utilize modern child health-care services as illiterate women (Table 10). In the southern states, however, the relationship between maternal schooling and percentage of children taken to a health facility for treatment of ARI and diarrhoea, although positive, is not significant (Table 11). It is not clear why education loses its positive and significant effect when other variables are controlled, nor is it clear what other factors could possibly influence a mother's decision in this matter.[6] It could be that as access to public health facilities improves, as in south India, education becomes a less influential factor for the utilization of these facilities (Rosenweig and Schultz 1982). Data from the NFHS show that health facilities are more accessible in the south than in the north, with between 65 and 100 percent of ever-married women living in a village that has a health facility, compared with 34 to 62 percent of ever-married women in the north. Inclusion of village-level data on service availability in the present analysis would certainly enhance the understanding of the factors influencing the utilization of MCH services.

With the exception of the work variable, none of the other variables was highly significant in the south. Surprisingly, working mothers are less likely than nonworking mothers to take their children to be treated at a health facility for ARI or diarrhoea. Perhaps this is because the opportunity cost of not going to work is greater than the ill effects of treating children at home. This is especially evident from the fact that working mothers are not less likely to administer ORS and/or RHF (usually given at home) to their children.

CONCLUSION

Numerous studies over the past decade have found a nearly universal and positive association between mother's schooling and child survival. This relationship has persisted even when other socioeconomic influences have been held constant. Nevertheless, research investigating the nature of this relationship has been somewhat murky. While the work of researchers such as Caldwell provides useful insights into how education could influence child health-care behavior, such investigations lack a quantitative foundation. Part of the problem lies in the lack of large-scale data allowing a more quantitative investigation into the pathways linking education and child survival. Another problem has been the absence of a cross-cultural dimension in the investigations. Subsequent research in this area has produced additional insights, but

it has been limited to small-scale investigations of one or a few child health-care indicators.

Using data from the NFHS in India, this research has, by examining the relationship between education and the utilization of MCH services, shed more light on the factors that could affect maternal, infant, and child mortality and morbidity and the relationship to mother's schooling. This research verifies the positive relationship between mother's education and utilization of MCH services in a much more detailed way—by examining the utilization of antenatal-care services, delivery-care services, and child health-care services—and takes the research in this area one step further. By exploiting the rich data in the NFHS, we are able to examine the strength of education across cross-cultural settings within one nation. We do this by analyzing data separately for four states in the north and four states in the south of India that are quite distinct culturally. In general, maternal education emerges as the single most significant predictor of the utilization of MCH services with no systematic difference between the north and south. We find that a higher level of maternal education results in improved child survival to a substantial extent because preventive health services are used to a greater extent by mothers with higher education than those with little or no education. We conclude that the benefits of maternal education persist even when other socioeconomic factors are taken into account.

From the programmatic point of view, the conclusions reached in this paper reinforce the call for continued investments in female education, which are indispensable for achieving reduced infant and child mortality and morbidity and possibly have an impact on factors that reduce maternal mortality. This research also confirms that, while the mechanisms of influence vary across different cultural settings, education per se exerts a dominating influence. Nevertheless, public policies should not focus on education alone, as there are other factors, such as access to health facilities, which affect health-care utilization. In a setting where illiteracy is high, improving access to health facilities should go hand in hand with educating women.

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NOTES

1. The state of Sikkim and the Kashmir region of the state of Jammu and Kashmir were excluded.

2. Antenatal care from persons other than health professionals was 2.3 percent for all of India and ranged from 0 to 0.6 percent for the eight states considered in this analysis.

3. The analysis was also carried out using one child per woman selected at random. There was no substantive difference in the final results because the numbers involved were so small. Including all births also minimized sampling errors. Westoff (1986) argues that estimates based on the last live birth (or, as in this case, any one birth) will tend to underrepresent births to (illiterate) women when based on any period beyond one year, and thus overestimate, in this case, the percentage taken to a health facility or fully vaccinated.

4. Information on caste and religion was obtained for the head of the household, and women were assumed to have the same caste and religion as the head of the household.

5. Child's age is not included as an explanatory variable in the model that examines the relationship between maternal schooling and children fully vaccinated because this analysis is restricted to children in the age group 12–23 months.

6. Findings from an earlier study by Govindasamy and Ramesh (1996) confirm that access to medical care for children is differentiated by gender and maternal education. Many female children are denied access to basic health care, and, as mother's education improves, this bias is exacerbated. This gender bias is reversed only at very high levels of education for vaccination alone, when mothers seem to value their daughters more than their sons.

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