Aren't you glad your Ma went to school?
The Linkages between Maternal Education and Childhood Immunization

The relationship between maternal education and child health outcomes in developing countries has attracted considerable attention in demography and public health research. Most research suggests that a causal relationship exists between maternal education and childhood health and mortality. Maternal education has frequently been suggested to be the most important factor explaining differentials in child health outcomes. For example, research has estimated that the risk of child mortality (mortality rates for children under five) decreases by 2-5 per cent with each year of maternal schooling (Cochrane 1982).

This paper seeks to shed some light on the possible pathways that mediate the relationship between maternal education and childhood immunization. While, causally prior variables like socio-economic status and geography explain to a large extent the impact of maternal education on child health outcomes, they do not explain all of the impact of education on child health outcomes especially with respect to health seeking behaviors such as immunizations. Education continues to have an impact that still gives educated women an advantage. We seek to explore the hypothesis that acquisition of education leads to better human, social and cultural capital among mothers, which is associated with better immunization status for the children. Additionally, we test whether higher education of the mother is associated with greater physical and decision-making autonomy for her within the household, which may lead to better health outcomes for the child.

THE CAUSALITY DEBATE

The well-known relationship between maternal education and child mortality has usually been understood as causal (Caldwell 1979, Cleland and Van Ginnekin 1988, Bicego and Boerma 1993). Initial studies exploring the linkages between maternal education and child health outcomes highlighted a strong relationship, although in the presence of weaker controls and under-developed measures Using data from the Changing African Family Survey I and II, Caldwell (1979) emphasized that maternal education played an

important role in determining child survival, even after controlling for certain socioeconomic characteristics including father's and mother's occupation and whether the respondents lived in an urban or rural area. Using data from ten developing countries from the World Fertility Survey, Caldwell and McDonald (1982) confirmed the importance of maternal education but also highlighted the importance of father's education. They estimated the impact of parental education to be greater than the combined impact of income and accessibility to health services. Cleland and Van Ginneken (1988) argue that the economic advantage of education accounts for only half of the relationship between maternal education and child mortality.

However, the causal interpretation of this relationship has been questioned in some research. Studies have shown that the strength of this relationship declines significantly in the presence of socioeconomic controls, suggesting that mother's education maybe a consequence of other factors such the socioeconomic status of the household and the husband's education. Similarly, using Demographic and Health Survey (DHS) data of 22 countries, Desai and Alva (1998) have shown that the effect of maternal education on child health outcomes reduces significantly in many countries once controls for the socioeconomic status of the family and the geographic area of residence are added. The relationship between maternal education and infant mortality and children's height-for-age declines significantly when controls for husband's education, access to piped water and toilet facilities are introduced. The relationship is further attenuated with the addition of controls for geographic area of residence through fixed effects modeling. Steele, Diamond and Amin (1996) find that the effect of mother's education on immunization in Bangladesh becomes insignificant once father's education is added to the model. Father's education also ceases to be significant when village level variables are added -- suggesting the education maybe a proxy for community level factors. This suggests that maternal education may function as a proxy of the socioeconomic status of the family as well as certain community level factors. Importantly, educated mothers are more likely to live in areas with greater availability of and access to certain services.

Community level characteristics such as access to piped water, sanitation, primary healthcare facilities and immunization campaigns can be important factors that mediate this relationship. According to Govindaswamy and Ramesh (1997), with the improvement of public health facilities in the south of India, education becomes a less influential factor in utilization of resources. They show that the relationship between education and child health outcomes reduces in the presence of regional controls and even ceases to be significant for the south of India for two outcomes - children taken to a facility for treatment for acute respiratory infection and the incidence of diarrhea. Frost et al (2005) in their analysis of 1998 Bolivia DHS data show that the impact of maternal education declines significantly with the introduction of socioeconomic controls.

Other contextual factors have also been highlighted in literature exploring the impact of maternal education on child health outcomes. Prashar (2005) highlights the importance of not just the higher levels of mother's education, especially matriculation and beyond, but also of higher literacy levels of women at the district level as influencing childhood immunization in rural districts in India. Strong correlations between women's education and child health in a region may be explained by the fact that children benefit from the knowledge base of other women in the area. Similarly, Kravdal (2004) highlights the role of positive externalities produced by other women's education in the community, which have a significant impact on childhood vaccinations and other child health outcomes. Streatfield et al (1990) have suggested that social compliance may be a strong factor for improved uptake of immunization among illiterate women in Indonesia.

While causally prior variables like socio-economic status and geographic controls explain to a considerable extent the impact of maternal education on child health outcomes, they do not explain all of the advantage that maternal education accrues to child health outcomes. Education may have an independent impact that still gives educated women an advantage even within the constraints of their communities. Recent research also highlights the positive impact of maternal education on child immunization in particular that remains stronger than for other child health outcomes. For instance, Desai and Alva (1998) show that the link between maternal education and childhood immunization (in

contrast to the links with infant mortality and children's height-for-age) remains strong even in the presence of individual and community level controls. They suggest that the impact of education does translate into health seeking behavior but its impact on health outcomes remains weak due to the contextual factors that limit the advantage that education provides to mothers. Govindaswamy and Ramesh (1997) show that higher maternal education translates into better health care utilization by mothers, which then results in improved child survival; these relationships remain after controlling for north and south of India as well as residence in urban or rural area and the working status of the mother. Children of mothers with at least middle school education are more than four times as likely to be fully immunized than children of illiterate mothers. However, education becomes a less influential factor, although still significant and positive for immunization of children, with improved quality and accessibility of health services in the southern states. Govindaswamy and Ramesh do not control for the standard of living or income of the household thereby not taking into account the most important confounders.

Research specifically focusing on the relationship between maternal education and childhood immunization also highlights the strength of this relationship. Haq and Tasnim (2008) show that urban children in Bangladesh are more likely to be fully immunized, but the relationship between maternal education and immunization remains strong despite regional controls. Using Bangladesh DHS data from 1993-94, Jamil et al (1999) show that mothers who completed at least primary education were 1.7 times more likely to have their children fully immunized as compared to those who had no education after controlling for socio-economic status of the household. There was little difference in coverage among children of mothers with no schooling and those with less than primary

level schooling thereby highlighting a threshold effect at completed primary education. Haq and Tasnim (2008) also find that children of mothers with at least higher secondary education are six times more likely to have been completely immunized than children of mothers having below primary education after the addition for certain socioeconomic controls like level of poverty and area of residence. Gage et al (1997) found that increased maternal education and higher socioeconomic status of the household significantly increases the likelihood of full immunization in Niger and Nigeria.

LITERATURE REVIEW

Although research has shown improved survival chances of children with increasing education levels of the mother, the pathways through which education translates into survival and health advantage remains unclear (Hobcraft 1993). Various pathways have been explored to explain how maternal education translates into better child health outcomes, including socioeconomic factors (Cleland 1988; Desai and Alva 1998), increase in access to and utilization of health services (Bicego and Boerma 1991; Caldwell and Caldwell 1993; Basu 1995), improved health-related knowledge and initiative (Cleland 1990; Caldwell and Caldwell 1993; Levine 1987; Frost 2005), better reproductive health outcomes such as late childbearing and lowered fertility (Hobcraft 1993; Levine 1987), the role of social networks and increased women autonomy and decision making (Caldwell1979).

We seek to shed some light on the possible pathways that mediate between maternal education and childhood immunization. Acquisition of education may lead to better human, social and cultural capitals among the mothers, which may be associated with better immunization for the children. Higher education of the mother could also be associated with greater physical and decision-making autonomy for her within the household, which may lead to better health outcomes for the child. We seek to test the

impact of each pathway as well as explore the relative contribution of each pathway in improved immunization of the child.

Human Capital. Education research in developing countries has often studied only literacy or years of schooling. However, in societies where school quality varies widely across regions and types of schools, as has been demonstrated for India (World Bank 1997; PROBE1999), years of schooling or grade completed do not provide adequate measures of education (Fuller and Heyneman 1989). Schools are often closed due to teacher absence, students may be absent due to labor force demands and many skills (particularly literacy) atrophy quickly when not used regularly.

Education leads to acquisition of capacities such as accurate knowledge about health and health behaviors. Incomplete knowledge about immunization, doses and timing of the mother could be an important factor explaining the low complete immunization rates (Jamil1999). The inclusion of direct human capital measures is a substantial improvement over simple educational levels such as grade completion. Independent measurement of health knowledge is particularly important because health specific knowledge may be gained informally as well and may vary in different regions. It is not clear whether these beliefs are influenced by formal education alone, and therefore the inclusion of health-specific knowledge in a model with formal education will help differentiate between the two effects i.e. one directly gained through schooling and one gained through health knowledge.

Streatfield, Singarimbun and Diamond (1990) have shown in a study of two Indonesian villages that although knowledge of immunization seemed prevalent, it increased slightly with higher education. Women with secondary education had higher levels of knowledge and more likely to have their children fully immunized than those with less education. Interestingly, strong correlation between knowledge of immunization (such as knowing the diseases vaccines prevent, vaccine dosage and schedule) and immunization levels existed irrespective of the educational level of the mother resulting in a U-shaped pattern with higher immunization uptake by illiterate mothers as compared to those with primary schooling. Therefore, health-specific knowledge may contribute to improved

immunization, which evidently benefits from education but is not dependent on it. This study highlights the need to include health knowledge as a pathway to improved immunization in order to distinguish between the impacts of education and health knowledge.

We hypothesize that the higher the education, the greater the acquisition of human capital among the mothers as measured through three specific questions relating to child health (H1).

In a study of diphtheria – pertussis- tetanus (DPT) vaccines in northern Nigeria, Babalola (2009) highlights the strong positive impact of maternal ideation on the uptake of DPT3 immunization. Knowledge about immunization, perceived social approval of immunization, discussions about child immunization with significant others, perceived self efficacy in overcoming transport-related obstacles as well as opposition from spouse among other factors were included in the ideation indicator. The study highlighted the importance of attitudes and maternal knowledge about immunization in improving immunization uptake.

In this study however, maternal education shows an inverse relationship in this study, as mothers with primary education were less likely to immunize their children as compared to illiterate mothers. Some aspects of improved education may have been explained by mother's ideation, which included measures of human, social and cultural capitals, and this distinction is lacking in the study. Maternal education and ideational factors were included concurrently in the model and therefore it is not clear if maternal education ceased to be significant with the addition of ideational measures. Therefore this relationship warrants further study to unravel the pathways between maternal education and childhood immunization more clearly. The ideational factors continued to be equally strong with the addition of the socio-economic characteristics of the household.

Social Capital. Communities have strong interdependencies and are affected by factors such as cohesiveness, presence of networks and civic associations in the community. Attitudes towards health care are also affected by community norms and knowledge of

health and medical care is shared among networks. Ethnographic studies have shown the role of immediate kin, neighbors and older women in village in providing measles related information to young mothers (Bisht and Coutinho 2000). Educated parents have social networks that provide them with knowledge, advice, and contacts that enhance their ability to recognize the severity of disease, seek treatment, and find good care. In addition to personal networks, educated individuals are far more likely to participate in local governance and in non-governmental organizations that increase their contacts with medical services and result in higher quality of care for their family members.

Lin (1982) defines social capital as resources embedded in social networks. These social resources are not possessed goods of the individual but are resources that are accessible through one' s direct and indirect ties. Operationally it can be measured as the sum of resources available to individuals or as value or quality of resources accessed and used. In more recent definitions, social capital has come to be defined as the extent of diversity of resources embedded in one's networks (Lin 2004). Lin makes an important distinction between social networks and social capital – social networks are the basis for social capital. As Putnam (2000) explains for social capital, "a well-connected individual in a poorly connected society is not as productive as a well-connected individual in a well-connected society." This public-goods aspect of social capital makes it well suited to study how households can benefit from interpersonal networks and civic associations.

Cotter, Hermsen, and Vanneman (2002) show that a family with greater social capital (measured as the social network resources available to it) will experience fewer economic hardships at the same levels of poverty. Similarly, we expect that increased social capital may lead to better immunization status for the child after controlling for the economic status of the household. We expect that the higher the education of the mother, the greater the exchange of useful information among social networks which will be reflected in higher immunization rates (H2).

Mother's participation in women's saving groups increased their children's probability to be fully immunized in Bangladesh (Steele, Diamond and Amin 1996). They suggest that

participation in such groups not only provided economic independence but also information and motivation to adopt good health behaviors. Similarly, research from Nepal shows that participation in a range of voluntary development associations and living in a neighborhood of a voluntary association increased permanent contraceptive use (Barber, Pearce, Chaudhury and Gurung 2002). The positive impact of the presence of an association in a neighborhood on contraceptive prevalence suggests that norms and values are also transmitted through networks in a village.

However, literature also highlights the negative impact of social capital. It can have a negative impact such as reinforcement of traditional attitudes and behavior as was seen in the case of sub- Saharan Africa (Caldwell et al 1987). Social networks and extended family reinforced traditional beliefs and women faced pressure to adhere to traditional norms. Social capital is influenced by the macro level institutions such as patriarchy, religion and caste and must be analyzed within this larger framework.

Therefore the kind of social capital will also define the direction of relationship. Social capital, if related to association with religious and caste organizations, may reinforce traditional attitudes, gender norms and may have a negative impact on immunization. Social capital, when measured as association with development organizations, may have a positive impact as it may encourage more modern modes of thought and make information available that is beneficial for the child such as the benefits of immunization and local immunization campaigns.

Cultural Capital. Not only are better educated individuals more likely to have increased knowledge and skills, they are also more likely to carry a position of privilege that commands respect from health care providers and enables families to manipulate the health system better (Gittelsohn et al 1994). Command over English language as well as certain communication styles identify individuals as belonging to upper social strata and elicit respectful communication from service providers. These skills, which Bourdieu (1977) has introduced into social science research as cultural capital, have become common elements of education research (DiMaggio 1982; Farkas et al. 1990), but have

not been incorporated sufficiently into health research. Cultural capital has been defined as institutionalized, widely shared, high-status cultural signals (attitudes, preferences, formal knowledge, behaviors, goods and credentials) used for social and cultural exclusion (Lamont and Lareau 1988). Language and communication styles are important components of cultural capital (Lareau 2003). Greater education of the mother imbues her with greater confidence, greater facility with language and a greater ability to interact with the health system. Research shows that mother's language ability along with a sense of entitlement is beneficial for children as it translates into the transmission of social class privilege (Lareau 2003).

Cleland et al (1988) highlighted the role of education in increased utilization of health services, and found that differences in utilization of maternal and child health services remained large among differently educated women. They suggested that education leads to greater willingness to make use of health services for themselves and their children as well as with greater timeliness and adherence to the treatment. Levine (1987) suggested that women gain verbal skills from schools and are more likely to use them in their maternal behavior and thereby gain access to more services. Schooling imbues a greater problem-solving capability, exposes recipients to new information and helps them understand novel messages. He found greater use of health services among mothers with more schooling, especially beyond the primary level. Mothers are more likely to seek prompt care when children are sick, use services more frequently for prenatal care, immunizations, and treatment of infants in early stages of disease, thus improving the survival chances of their children. Women with greater schooling had more exposure to mass media, paid more attention to information content in the messages, watched television shows on child development and had a greater desire to study further and higher educational aspirations for their children.

We hypothesize that this measure is a reflection of the cultural capital of the mother and reflects her ability to navigate the bureaucratic health systems (H3). We also measure her fluency in the English language, which gives privilege in the Indian context (Desai and Noon 2009).

Gender Empowerment. While education affects gender relations in the household in a variety of ways, its impact on women's physical mobility and autonomy is particularly noteworthy. Past research has shown that education leads to higher autonomy and that women's physical mobility is associated with their use of antenatal care (Jejeebhoy and Sathar 2001; Bloom, Wypij and Das Gupta 2001). This suggests that at least part of the education's effect on health seeking behavior may be mediated via gender relations in the household. Jejeebhoy and Sathar (2001) find that while even primary education increases women's autonomy in South India, an area characterized with greater gender equality. In these more patriarchal areas such as Uttar Pradesh and Pakistani Punjab, secondary education is necessary before any positive effects of education on autonomy are observed.

In a study of rural Punjab in India, Das Gupta (1984) demonstrates that education leads to greater autonomy in decision-making for mothers which in turn lead to reduced child mortality. Limited decision-making power in the household was significantly related to increased child mortality. Education helped a woman to be taken more seriously by their husbands and parents-in-laws and gave them more authority in the household as opposed to their uneducated counterparts. Also, when children were born in the husband's home, there was a significant increase in the probability of the child dying, especially during the first month. In the natal homes of the women however, the outcomes were better as women had the liberty to take decisions about their children. This suggests that women with greater autonomy in decisions related to childcare resulted in better outcomes.

Caldwell (1979) has suggested that the educated mother's ability to challenge traditional power structures and have more control over decision-making about her child's health results in better child health outcomes. Basu (1992) has underscored the importance of education in her study of Delhi slums where education led to greater decision-making autonomy which helped educated mothers – even those belonging to constrained social environs – seek medical help for themselves and their children. Jain (1994) showed higher use of preventive services for children among more educated mother, but that

education has little effect on the use of curative medical care. Educated women had greater autonomy in several dimension of childcare.

Steele, Diamond and Amin (1996) show that children of teenage mothers and those who lived with their parents-in-law were significantly less likely to be immunized. The authors suggest that mothers may not have sufficient autonomy to take health decisions about their children and that the influence of their mother-in-law's traditional health behavior might hold sway.

We seek to focus on the decision making autonomy of the mother with respect to child illness and the freedom to visit health centre and clinics and hypothesize that greater education will lead to greater decision making and physical autonomy of the mother, which will be associated with greater immunization for the child (H4). Veiling or *purdah* was included as another measure of women's empowerment. Veiling is representative of traditional beliefs and may lead to significant curtailment of women's autonomy especially physical mobility.

DATA AND METHODS

The India Human Development Survey is a nationally representative survey of 41,554 households, in urban and rural India, across all the states and union territories (with the exception of Andaman-Nicobar and Lakshwadweep Islands) and has been designed to include a variety of topics. It contains information from 33,480 ever-married women in the reproductive age group of 15-49 years and includes information about their fertility preferences, contraceptive use, cultural capital as well as detailed empowerment measures. The sample was selected using a clustered sampling procedure designed to provide a nationally representative sample of India. The sample is spread across 383 districts, 1503 villages and 971 urban blocks of India.

In addition to substantial health information, the IHDS also collected information on health knowledge of the eligible women, detailed assessment of the household's economic capital including income, occupation, and standard of living; household

measures of social capital: its networks and associations and an assessment of cultural capital of the women through interviewer reports of the respondent's interaction style.

The survey was carried out in face-to-face interviews and contained the several modules. The two used in this study are (1) an interview with a knowledgeable informant typically the head of the household regarding socio-economic condition of the household including income, their networks and associational memberships, employment, educational status etc., and (2) an interview with an ever-married woman aged 15-49 regarding health, education, fertility, family planning, marriage, and gender relations.

The survey instruments were translated into 13 Indian languages and were administered by local interviewers. A team of one male and one female interviewer visited each home; women respondents were interviewed by women interviewers whenever possible. The fieldwork was carried out under the supervision of the National Council of Applied Economic Research (NCAER), New Delhi. All analysis was conducted using a district-level weight provided in the IHDS dataset. Multivariate logistic regressions were carried out using STATA IC 10.

Dependent Variable

The dependent variable is operationalized as a dichotomous variable indicating whether the child has received the full schedule of immunizations. The World Health Organization and the Ministry of Health, Government of India recommends three doses of polio vaccine, three doses of DPT (diphtheria-pertussis-tetanus), one dose of BCG Bacillus Calmette-Guerin) against tuberculosis, and one dose of measles vaccine by the age of 12 months, and for the child to have completed the immunization schedule by 12 months of age. Our sample consists of children in the age group of 12 months to 5 years for whom we have immunization data (n=8844). These are the last-born children of eligible women in reproductive age group of 15 to 49 who were included in the sample. The women were asked information about their last birth as well as next to last birth but we have included only the last births in this analytical sample. Immunization data was

collected using the government issued vaccination card or through recall if the card was missing.

Independent Variables

Education. The education of the eligible woman is measured as the highest years of education completed as reported by the eligible women. For missing cases (n = 218), the education level as reported by the household head for the mother was used. The IHDS measures education on a continuous scale that ranges from 0 years (indicating no formal education) to 15 years (implying completion of college or a higher academic degree). We have categorized education of the women in the following categories: Illiterate (those with no education), any primary education (from the grades one to five), any upper primary education (includes grades six to eight), any secondary education (includes grades nine and tenth), any senior secondary education (includes grades eleventh and twelfth), and any college education (any college or higher academic degree). This has been done primarily to study threshold effects of education on child health outcomes, which has often been reported in the literature (for instance, Caldwell and McDonald 1982; Levine 1987; Basu 2005). Threshold effects show that once a certain level of education is achieved, the benefits of higher education may leads to diminishing returns or none at all.

Table 1: Last-born children in age group of 1-5 years who received vaccines before the survey, and the educational attainment of the mother, 2004-2005

Mother's educational attainment	Total (2)	Fully immunized (3)	Not fully-immunized (4)
Illiterate	3,831 (43.32)	1,396 (36.44)	2,435 (63.56)
Primary education	1,354 (15.31)	701 (51.77)	653 (48.23)
Upper Primary education	1,194 (13.50)	733 (61.39)	461 (38.61)
Secondary education	1,394 (15.76)	917 (65.78)	477 (34.22)
Senior secondary education	529 (5.98)	368 (69.57)	161 (30.43)
College education	540 (6.11)	394 (72.96)	146 (27.04)
Missing cases	2	0	2
Total	8,844 (100)	4,509 (50.98)	4,335 (49.02)

Note: Proportion of total cases are given in parenthesis in column (2); proportion of total cases within the educational category are in parenthesis in columns (3) and (4).

Human Capital. Eligible women were asked three questions related to child health and pregnancy beliefs. These were, (1) if it was harmful to drink 1-2 glasses of milk every day during pregnancy, (2) if colostrum feed was beneficial for the child and (3) if the child needed to be given more than usual water to drink during diarrhea. The responses were coded as dichotomous based on whether the answers given were correct and not. Even though these do not directly measure the mother's knowledge of the benefits of immunization, responses to questions on these aspects of maternal and child health may be indicative of the their knowledge related to care during pregnancy and for young children.

Social Capital. The measure of social capital is based on the number of groups or associations that any member of the household participates in. The IHDS does not include social network measures specifically for women. However, social capital available to the household is representative of the resources available to the women. Respondents were asked nine questions about their family members' participation in social organizations. "Does anybody in the household belong to": 1) women's group 2) youth club, sports group, or reading room; 3) trade union, business or professional group; 4) self help group; 5) credit or savings group; 6) religious or social group or festival society; 7) caste association; 8) development group or NGO; and 9) agricultural, milk, or other co-operative. We use these nine dichotomous variables to construct two additive indexes of the associational membership of households.

We separate religion and caste organizational memberships from development/self-help group organization memberships as their impact could be in opposing directions. Participation in caste and religious groups might reinforce traditional norms and preferences and participation in development organizations, on the other hand might suggest a shift in values and a move toward modernization. Cronbach's alpha estimates suggest that both the indexes have reasonable estimates of reliability: religious and caste group index has a reliability of .60 and development memberships index has a reliability of .57.

A measure of social capital is also developed by simply adding up the number of contacts a household has that work in the following domain: school, health services and government services. We construct a four-category scale of the number of network ties by adding the network ties of each the three domains. Even with just three items, the scale has a good estimate of reliability (Cronbach's alpha= 0.71). 47.5 percent of the households have none of the three network ties; 21.2 percent have one, 15.5 percent have two, and 15.5 percent have all three types of network ties.

Cultural Capital. The third independent variable is a measure of cultural capital for the women in the sample. It is constructed by adding five measures of the women's communication abilities, confidence and overall knowledge as judged by the interviewer. The scale has five items, which measured the following: whether she understood the purpose of the interview; whether she had any difficulty understanding the questions; whether she looked directly at the interviewer and clearly understood the questions; whether she was knowledgeable about health and education expenditure and whether she appeared confident. The row means were taken to construct this index and it has a Cronbach's alpha of .75.

We include a measure of her women's fluency in the English language. The response categories – little fluency and fluent for self reported English fluency has been merged and has been categorized as having English speaking abilities.

Empowerment. Those aspects of women's empowerment have been used in the models that are directly relevant to child health. Earlier, we had decided to include a scale of decision-making autonomy with respect to all the domains covered in the interview. However, the reliability of such a scale was suspect because of the domains included decisions about mundane things wherein women may exercise greater control as well as decisions about major purchases where women exercised little or no autonomy. We include two variables, both dichotomous, which capture dimensions of women's autonomy with respect to child health - if the respondent is the main decision maker if the child is ill and whether she needs to seek permission to go to the local health centre. The

practice of veiling is also included in the regressions as it is suggestive of significant curtailment of autonomy.

Control Variables

Child Characteristics. Research has highlighted the disadvantaged position of girls with respect to a range of demographic outcomes in India. In India, girls suffer from neglect and discrimination and this is reflected in higher mortality among girls as well as skewed sex ratios at birth (for instance, Das Gupta 1987; Das Gupta and Bhatt 1997). We expect this discrimination to be reflected in immunization completion rates as well. Although, children in India are supposed to be fully immunized by twelve months such is often not the case. Children have a higher probability of being immunized with increased passage of time. We expect higher age of children to be associated with higher likelihood of being fully immunized. Accordingly, the sex and age of the child are included in the model. Age is also squared to see if it has a curvilinear relationship with immunization.

Mother's Characteristics. Mother's employment, her age and parity are also included in the model. Mother's employment has a contested relationship with child health outcomes. Basu and Basu highlight the negative relationship between maternal education and child mortality (1991). Hobcraft, McDonald and Rutstein (1984) do not find any consistent relation between maternal employment and child mortality. The context and type of work is of relevance as well and therefore we include two kinds of work performed by women – animal work, and any work excluding animal work. As taking care of animals is often understood as housework, animal work is included separately to see if taking care of animals has a relationship similar to other work performed by the women.

Mother's age may also have a relationship with childhood immunization. Hierarchies in Indian households are complex and age has a direct correlation with the degree of autonomy in the lives of married women. Women become more autonomous as they age and exercise greater control over household decisions (Sen, Rastogi and Vanneman 2006; Bloom, Wyji and Das Gupta, 2000). Maternal age is also squared and included simultaneously in the model.

Regional Factors. Place of residence is included in the model with details about whether the child resides in an urban or rural area as well as state of residence in which the residence is located. . There are significant differences across the states in India and therefore a dummy has been included for every state in the model. The quality and availability of services vary immensely across the regions and therefore state controls also control for the variability in the service provision across the country. Goa and Maharasthra are combined; Northeastern states are also combined except for Assam.

Caste and Religion. The caste and religion of the family is included in the model. The IHDS indicates that Muslim families have the lowest percentage of children that are fully immunized (34.3%). Other religious groups like Christians (66.6%) and Sikhs (58.6 %) have much higher immunization rates than the majority, Hindus (49.3%).

Scheduled castes, other backward castes and other backward tribes have lower completed immunization rates but scheduled tribes are worst off among all the caste categories with only 40% coverage. Hindus and Brahmins have been treated as the reference category in the regression models.

Household Characteristics. Control for per capita income and standard of living are included to reflect the long-term economic status of the household as well as resources available to each individual in the household. The IHDS calculates a household's standard of living based on 30 housing amenities and household goods (includes flush toilet, cooking gas, electricity and household goods). To calculate income per capita, the total income of the household was divided by the number of people in the household.

Other household level controls include maximum male educational attainment in the household as well as the exposure to mass media of the women in the household. Caldwell and McDonald (1982) had first emphasized the role of paternal education in improving child mortality, and subsequent research has confirmed the positive association of father's education on child health outcomes (for instance, Pebley Goldman and Rodriguez, 1996). We do not directly control for father's education but instead take the highest educational attainment of any male in the family because the benefits of

education of any member may accrue to all members in the household (Basu, Naryan and Ravallion 1999).

Another dimension of capital is information gained through exposure to television. We include a measure of television viewing of the women in the household. It is an ordinal variable ranging from “never” to “regularly”.

Lastly, we control for the structure of family be adding a dummy variable indicating whether the family structure was a joint or nuclear one. Household structure has been shown to be an important determinant of child mortality. Das Gupta (1990) highlighted the fact that the mother- in-law or other members of the husband’s family often mediate decisions about children.

The controls are added in a stepwise manner (Table 2) and the four mediating pathways are tested in separate regression models to explore the impact of each pathway. All the pathways are added in the final regression model to test how much of the initial relationship between maternal education and childhood immunization is explained by these intervening variables.

RESULTS

In the base model, all the educational categories have a strong and significant impact on immunization. The coefficients are stronger for higher educational categories but the largest relative increase is seen at the primary and the upper primary level with respect to illiterates. College education has the strongest coefficient but the relative increase is highest from no eduation to primary education, followed by primary to upper primary education.

A dummy dichotomous variable was included in the regression for the imputed values for education of the mother. Missing values (n=218) are substituted from the household’s educational roster where the head of the household reported the educational attainments for all members of the household. This dummy indicating missing values has a negative and significant impact on completed immunization and is probably because the data on educational attainment of the mother was largely left blank if she was illiterate.

In Model 2, which includes dummies for every state and for urban and rural differences, the impact of education on full vaccination remains significant but the strength of educational coefficients is substantially reduced especially for any primary education and upper primary levels. There is a great degree of variation across states as expected and most of the state coefficients are significant.

With the introduction of religion and caste in Model 3, the educational coefficients are driven down marginally but there is no change in their levels of significance. Interestingly, the loss of magnitude is stronger for higher educational categories suggesting the strong association of higher education attainment with caste and religion. The coefficient for senior secondary education becomes stronger than college education and the educational coefficients become similar for senior secondary and college categories. Being Muslim and belonging to a scheduled tribe has a strong and significant negative impact on achieving full vaccination. The additions of child characteristics do not make a substantial difference to the educational coefficients in Model 4. There is slight drop in magnitude at all levels of education, except for college education wherein the magnitude of the drop is more modest.

With the introduction of socioeconomic variables in Model 5, the educational coefficients come down considerably but remain statistically significant at $p < 0.001$. This reduction is greater at higher levels of education suggesting the role of economic factors such as standard of living as well as male education in educational attainment at the senior secondary and college level. Among the caste and religious categories, only being Muslim continues to have a significant negative impact. Living in urban areas has a negative and statistically significant impact and it becomes significant only in this model suggesting that once household socio-economic status is controlled for, urban children are worse off than compared to their rural counterparts.

The magnitude of the educational coefficients goes down only minimally as the eligible women's characteristics are added to the model. The addition of human capital questions does not have much of an impact on educational coefficients. Surprisingly, only one health knowledge question has a strong, significant and positive impact, while the other

two have a small positive although statistically insignificant impact on child immunization. TV viewing by the women in the household has a positive and significant impact on immunization.

With the addition of social capital variables, the educational coefficients gain some magnitude at the any primary and any upper primary level but are reduced marginally for higher educational groups. Association with development organizations has a significant and a positive impact on being fully immunized. It is interesting to note that the direction of association with religious and caste-based organizations is indeed negative although not significant. The dummy variable for missing values for total number of networks and for development organizations is significant and negative, and directs our attention to the pattern of missing values for social capital. Those households with missing data on social capital variables are probably those households with no social capital and this isolation has a detrimental effect on being fully immunized. The impact of social capital is significant and in the expected direction, the lack of social capital is conspicuous by its impact on the likelihood of being fully immunized.

In Model 8, inclusion of cultural capital variables leads to an increase in magnitude of educational coefficients especially at the senior secondary and college level and this suggests that higher education becomes of increased relevance as speaking abilities of women are factored in. The educational coefficients are driven down marginally at primary and upper primary levels and the any primary coefficient loses some significance (from $p<.001$ to $p<.05$ level of significance). The cultural capital scale appears to have the strongest impact on full immunization as compared to all the other forms of capital. English speaking abilities have an unexpected negative and significant impact on the being fully immunized. However, bivariate analysis of English speaking abilities and being fully immunized suggests a positive and significant impact of English fluency. This negative relationship is likely due to other controls in the model such as the socio-economic status and educational attainments of men and women in the household.

Adding gender empowerment variables have little impact on the educational coefficients with only one empowerment variable being significant. Having the decision-making

authority when the child is sick has a significant and positive impact on being completely immunized. The practice of *purdah* or veiling has a negative although insignificant impact.

Adding all the pathways together in Model 10 present an interesting story – as compared to the complete control model, the educational coefficients come down for primary, upper primary and secondary education. Primary education also loses some significance but remains significant at the $p<.05$ level. The higher education categories gain strength especially at the highest level of education. The pathways that remain significant are human capital, social capital and cultural capital suggesting that education works through these pathways but that these pathways continue to exert an important, perhaps to a certain extent independent impact on education. None of the empowerment variables are significant which may suggest that the empowerment works through education.

Two social capital variables continue to have a significant at $p <.05$ and positive impact on being fully immunized. Membership in networks related to school, health services and government services has a beneficial impact, as does associating with development organizations. Having knowledge about the importance of milk consumption during pregnancy is significantly and positively associated with being immunized. Knowledge about importance of colostrum and increased water intake during diarrhea is not significant.

The language abilities of the mother has a strong, positive and significant (at $p <.001$) suggesting that an important pathway leading to improved immunization is through mothers abilities.

The results also highlight the variation across different socio-economic and geographic groups. There is a great degree of variation across states as was expected. The states with strongest negative coefficients include the northeastern states and a few of the most populated states of the Hindi-speaking belt - Uttar Pradesh, Bihar and Rajasthan. The

states of Andhra Pradesh, Karnataka, Himachal Pradesh, Uttarkhand and West Bengal have better immunization coverage. (See the map for national variation)[1].

Living in an urban area has a strong and continuing disadvantage once the socio-economic controls are added to the model. The coefficients for living in an urban area are significant in all models after the addition of socioeconomic variables of the household. Muslims remain sharply disadvantaged and this disadvantage persists in all the models suggesting that being Muslim has a strong and pervasive disadvantage with respect to childhood immunizations. However, the disadvantage becomes less skewed in the final model suggesting that some of the disadvantage of being Muslim can be overcome through the pathways in the final model.

Also, tribal areas have been somewhat isolated from the mainstream and live in areas where health services are usually not readily available and this is reflected in models before the socioeconomic variables are added to the model. Upon the addition of socioeconomic variables their disadvantage becomes insignificant suggesting the role of socioeconomic variables in overcoming the disadvantage of being scheduled tribe.

Girls are less likely to be immunized (β=-.151, p<.05) in the final model. Age of the child and age of the child squared are significant in the models. This is expected as with age the probability of acquiring full immunization increases. However, since the squared variable is significant it suggests a curvilinear relationship of age with immunization. The inflection point is 4.10 suggesting that until age 4.10 the child's age has a positive (but diminishing) impact on childhood immunization and after that it has a negative impact. Age of mother is not significant in any of the models.

Lastly, as expected standard of living has a positive and significant impact on being fully immunized. The dummy variable for imputed values of male education (missing values were replaced by the weighted mean of the variable) has a negative and significant association (in all models except the final model) with child immunization perhaps

[1] Yet to be uploaded

indicating that the missing values for male education may be including men that are not in the household.

CONCLUSION

When background variables such as residence, socioeconomic controls for the household, male education in the household, religious and caste controls, mother's work status, sex and age of child are taken into account among other, mother's education continues to be a powerful, positive, and significant determinant of the child health status. The pathways included in this study highlights that education works through some of the suggested pathways but that these pathways continue to have an influence that is independent of education.

Table 2: Structure for the Stepwise Regression Analysis

Models	**Variables included in the Model**
Step 1	
Model 1: Base Model	Mother's education
Model 2: Adding regional controls	Residence State
Model 3: Adding Household-level Predisposing Characteristics	Caste Religion
Step 2	
Model 4: Adding Household-level Controls	Standard of Living Per capita income Highest Education attainment by a male in the household Family Structure
Model 5: Adding Child Characteristics	Child Age Sex of the child
Model 6: Adding Mother's characteristics	Mother's age Women's employment
The complete control model refers to Model 6	
Step 3	
Model 6: Human Capital	Health Knowledge Questions Access to mass media (TV)
Model 7: Social Capital	Membership in Development Organizations Membership in caste- and religion-based organizations Total number of contacts in the health, education and government for the household
Model 8: Cultural Capital	Respondent Language and Speaking Abilities
Model 9: Empowerment	*Purdah* practice Decision Making authority of the women related to child's illness and freedom of movement to go to a health facility

Model 10: Adding all the Pathways	All the Controls, Human Capital, Social Capital, Cultural Capital and Empowerment

RESULTS: STEP 1

VARIABLES	Educational Variables	Regional Variables	Religion and Caste
Primary Education	0.750***	0.495***	0.437***
(Ref: Illiterates)	(0.088)	(0.0977)	(0.0978)
Upper Primary	1.174***	0.981***	0.906***
	(0.0977)	(0.111)	(0.111)
Secondary Education	1.324***	1.169***	1.059***
	(0.0982)	(0.116)	(0.118)
Senior Secondary	1.625***	1.429***	1.280***
	(0.133)	(0.15)	(0.151)
College	1.664***	1.457***	1.259***
	(0.12)	(0.138)	(0.145)
Dummy for ed missing	-1.009***	-0.686**	-0.708**
	(0.253)	(0.258)	(0.266)
Urban		-0.144*	-0.0987
(Ref: Urban)		(0.0671)	(0.0686)
Forward			-0.0869
(Ref: Brahmin)			(0.214)
Scheduled Tribe			-0.571*
			(0.235)

Scheduled Caste			-0.291
			(0.22)
Other Backward Caste			-0.165
			(0.211)
Muslim			-0.646***
			(0.0975)
Christian			0.186
			(0.199)
Sikh			-0.136
			(0.264)
Others			0.199
			(0.205)
Constant	-0.701***	1.030***	1.321***
	(0.0481)	(0.181)	(0.283)
Observations	8844	8844	8844

Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05

RESULTS: STEP 2

VARIABLES	Child Variables	Household Variables	Women's Characteristics
Primary Education	0.414***	0.295***	0.297***
(Ref: Illiterates)	0.0983	0.0987	0.0989
Upper Primary	0.881***	0.661***	0.664***
	0.112	0.119	0.119
Secondary Education	1.036***	0.691***	0.687***
	0.122	0.132	0.131
Senior Secondary	1.242***	0.775***	0.766***
	0.151	0.168	0.169
College	1.247***	0.685***	0.676***
	0.148	0.178	0.179
Dummy for education missing	-0.726**	-0.661*	-0.658*
	0.27	0.272	0.272
Urban	-0.116	-0.314***	-0.351***
(Ref: Rural)	0.0691	0.0813	0.0843
Forward	-0.0535	0.00514	0.0284
(Ref: Brahmin)	0.221	0.222	0.224
Scheduled Tribe	-0.517*	-0.269	-0.241
	0.242	0.248	0.249
Scheduled Caste	-0.239	-0.0685	-0.051
	0.226	0.23	0.231
Other Backward Caste	-0.117	-0.0157	0.00975
	0.219	0.221	0.222

Muslim	-0.592***	-0.551***	-0.566***
(Reference: Hindu)	0.0991	0.1	0.102
Christian	0.196	0.23	0.232
	0.2	0.204	0.202
Sikh	-0.13	-0.217	-0.247
	0.264	0.261	0.262
Others	0.195	0.177	0.185
	0.206	0.208	0.208
Age of Child (in months)	0.0377**	0.0385***	0.0383**
	0.0134	0.0133	0.0133
Childs Age Squared	-0.000380*	-0.000395*	-0.000390*
	0.000191	0.00019	0.000189
Number of children borne by mother	-0.0386	-0.0241	-0.0101
	0.0241	0.0262	0.0345
Girl	-0.161*	-0.155*	-0.153*
	0.0676	0.0675	0.0667
Standard of Living		0.0552***	0.0539***
		0.00973	0.00997
Log income Per Capita		-0.056	-0.063
		0.0492	0.0494
Income less than 1000 rupees		0.272	0.259
		0.303	0.304
Highest Education achieved by a men		0.0192	0.0188
		0.00986	0.00974
Dummy Imputation		-0.426*	-0.429*
		0.196	0.197
Joint Families		-0.00613	-0.00416
(Ref: Nuclear families)		0.0734	0.0728
Mother's Age			0.086
			0.0499
Women's Age Squared			-0.00152
			0.000816
Part- Time Employment			-0.0768
(Ref: Not working)			0.0902
Full-time Employment			0.223
			0.155
Missing values for work			-0.0494
			0.669
Animal Work			-0.0799
(Ref: No animal work)			0.0878
Missing Values for Animal work			-0.521
			0.296
Constant	0.701*	0.555	-0.559
	0.363	0.575	0.934

Observations	8844	8844	8844

Robust standard errors below the coefficient *** p<0.001, ** p<0.01, * p<0.05

RESULTS: STEP 3

VARIABLES	Human Capital	Social Capital	Cultural Capital	Empowerment	Full Model
Primary Education	0.290***	0.303***	0.262**	0.289**	0.258*
(Ref: Illiterates)	0.0995	0.0992	0.0998	0.0989	0.101
Upper Primary	0.638***	0.670***	0.634***	0.658***	0.619***
	0.121	0.119	0.118	0.119	0.119
Secondary Education	0.655***	0.671***	0.676***	0.679***	0.628***
	0.129	0.132	0.143	0.131	0.142
Senior Secondary	0.730***	0.744***	0.841***	0.746***	0.778***
	0.168	0.169	0.183	0.17	0.184
College	0.670***	0.660***	0.841***	0.649***	0.802***
	0.18	0.178	0.204	0.179	0.203
Dummy for ed missing	-0.623*	-0.672*	-0.704*	-0.644*	-0.680*
	0.272	0.271	0.274	0.271	0.273
Urban	-0.359***	-0.316***	-0.346***	-0.361***	-0.325***
(Ref: Rural)	0.0844	0.0855	0.084	0.0848	0.0864
Forward	0.0339	0.0384	0.00318	0.0212	0.00794
(Ref: Brahmin)	0.226	0.224	0.208	0.224	0.21

Scheduled Tribe	-0.209	-0.222	-0.199	-0.238	-0.162
	0.252	0.248	0.238	0.25	0.242
Scheduled Caste	-0.0338	-0.0353	-0.0681	-0.0478	-0.0365
	0.233	0.231	0.214	0.232	0.216
Other Backward Caste	0.0251	0.0227	-0.0031	0.00988	0.02
	0.223	0.222	0.206	0.223	0.207
Muslim	-0.543***	-0.541***	-0.558***	-0.528***	-0.471***
(Ref: Hindu)	0.103	0.103	0.103	0.104	0.105
Christian	0.252	0.25	0.25	0.204	0.266
	0.201	0.201	0.208	0.203	0.207
Sikh	-0.237	-0.241	-0.269	-0.254	-0.259
	0.256	0.261	0.258	0.263	0.254
Others	0.169	0.211	0.159	0.161	0.151
	0.208	0.21	0.212	0.211	0.217
Age of Child (in months)	0.0398**	0.0383**	0.0366**	0.0382**	0.0377**
	0.0133	0.0134	0.0133	0.0134	0.0133
Age of Child Squared	-0.000411*	-0.000390*	-0.000368*	-0.000388*	-0.000383*
	0.000189	0.000189	0.000188	0.000189	0.000188
Number of children borne by mother	-0.00995	-0.0111	-0.0227	-0.00992	-0.0232
	0.0345	0.0353	0.0336	0.0344	0.0342
Girl	-0.152*	-0.157*	-0.154*	-0.155*	-0.159*
	0.0667	0.0669	0.067	0.0668	0.0672
Standard of Living	0.0426***	0.0502***	0.0539***	0.0538***	0.0396***
	0.0108	0.01	0.0101	0.01	0.011
Log income Per Capita	-0.0693	-0.0688	-0.0719	-0.0656	-0.0857
	0.0492	0.0503	0.0484	0.0493	0.0491
Income less than 1000 rupees	0.262	0.252	0.226	0.25	0.215
	0.304	0.303	0.299	0.305	0.302
Highest Education achieved by a men	0.0178	0.0162	0.0189*	0.0196*	0.0161
	0.00972	0.0101	0.00963	0.00976	0.00992
Dummy Imputation	-0.409*	-0.396*	-0.444*	-0.423*	-0.373
	0.199	0.196	0.198	0.199	0.199

Joint Families	-0.00772	-0.0136	0.00213	0.000481	-0.0121
(Ref: Nuclear families)	0.0727	0.0737	0.0726	0.0727	0.073
Mother's Education	0.082	0.0801	0.0891	0.0809	0.077
	0.0497	0.0503	0.0508	0.0503	0.0511
Women's Age Squared	-0.00144	-0.00144	-0.00153	-0.00144	-0.00135
	0.000809	0.000823	0.000825	0.000822	0.000827
Part- Time Employment	-0.0808	-0.0918	-0.0925	-0.0882	-0.119
(Ref: Not working)	0.09	0.0905	0.0903	0.0902	0.0906
Full-time Employment	0.214	0.186	0.24	0.228	0.197
	0.155	0.155	0.154	0.157	0.154
Missing values for work	-0.0432	0.0671	-0.0727	-0.0288	0.0979
	0.698	0.679	0.694	0.664	0.701
Animal Work	-0.0676	-0.072	-0.0867	-0.0849	-0.0697
(Ref: No Animal work)	0.0876	0.0888	0.0876	0.0878	0.0885
Missing Values for Animal work	-0.512	-0.533	-0.565	-0.529	-0.584
	0.301	0.295	0.304	0.299	0.308
Social Networks		0.0703		0.0772*	
		0.0377		0.0377	
Dummy for imputation for social networks		-0.533*			-0.502*
		0.242			0.237
Religion and Caste social capital		-0.102			-0.106
		0.0666			0.0649
Dummy for imputation for social networks		1.099			0.848
		1.323			1.354
Development Social Capital		0.117*			0.123*
		0.0509			0.0499
Dummy for imputation for social networks		-1.246*			-1.184*
		0.59			0.591
Regular TV viewing	0.114*				0.101

	0.0528				0.0529
Dummy for missing regular TV	-0.0851				0.0371
	0.265				0.264
Health Knowledge q.1	0.266***				0.238**
	0.0808				0.0842
Health Knowledge q.2	0.109				0.0842
	0.0795				0.0795
Health Knowledge q.3	0.0922				0.091
	0.0757				0.0759
Cultural Capital Scale			0.651***		0.652***
			0.0964		0.0988
English Abilities			-0.383**		-0.384**
			0.132		0.133
Dummy for imputation for English abilities			-0.0827		-0.113
			0.22		0.222
Purdah				-0.124	-0.145
				0.0785	0.0798
Decision about Child Sickness				0.201*	0.0898
				0.0893	0.0916
Dummy for imputation for child sickness				-0.211	-0.0103
				0.183	0.188
Health Centre Permission				0.0799	0.088
				0.0844	0.0841
Constant	-0.799	-0.501	-1.675*	-0.645	-1.859*
	0.942	0.946	0.949	0.944	0.975
Observations	8844	8844	8842	8844	8842

Robust standard errors below the coefficient *** p<0.001, ** p<0.01, * p<0.05

References

Basu, A. M. 1994. “Maternal Education, Fertility and Child Mortality: Disentangling Verbal Relationships.” *Health Transition Review* 4:207–215.

Basu K, A Narayan, M Ravallion, Is Knowledge Shared Within Households? *Policy Research Working Paper*, World Bank , 'Literacy and Child Labor' December 1999.

Basu, Alaka Malwade, and Kaushik Basu (1991): Women's Economic Roles and Child Survival: The Case of India, *Health Transition Review,* 1: 83-103.

Bhuiya, A., Bhuiya, I., & Chowdhury, M. (1995). Factors affecting acceptance of immunization among children in rural Bangladesh. *Health Policy and Planning,* 10(3), 304–312.

Bicego, G.T. and Jan T. Boerma. 1993. “Maternal Education and Child Survival: A Comparative Study of Survey Data from 17 Countries.” *Social Science and Medicine* 36:1207-27.

Bisht, S., & Coutinho, L. (2000). When cure is better than prevention: Immunity and preventive cure of measles. *Economic and Political Weekly*, February 19–26, 697–708.

Bloom, Shelah, David Wypij and Monca Das Gupta. 2001. "Dimensions of Women's Autonomy and the Influence of Maternal Health Care Utilization in a North Indian City." *Demography* 38:67-78.

Babalola, Stella. (2009) Determinants of the Uptake of the Full Dose of Diphtheria–Pertussis–Tetanus Vaccines (DPT3) in Northern Nigeria: A Multilevel Analysis *Maternal and Child Health Journal* (13:550–558

Bourdieu, Pierre. 1977. "Cultural Reproduction and Social Reproduction." Pp. 487-511 in Jerome

Karabel and A. H. Halsey (ed.), *Power and Ideology in Education*. New York: Oxford.

Caldwell J.C. 1979. “Education as a Factor in Mortality Decline: An Examination of Nigerian Data.” *Population Studies* 33(3):395–413.
Caldwell JC. McDonald PF. Influence of maternal education on infant and child mortality: levels and causes. *Health Policy and Education*, 1982, 2:251-267.
Cleland, J.G., and J.K. Van Ginnekin. 1988. "Maternal Education and Child Survival in Developing Countries: The Search for Pathways of Influence." *Social Science and Medicine* 27: 1357-1368.
Cochrane SH, Leslie J, O'Hara DJ, Parental education and child health: Intracountry evidence, *Health Policy Educ*. Mar;2(3-4), 1982, 213-50. Review.
Desai Sonalde and Alva Soumya, Maternal Education and Child Health: Is There a Strong Causal Relationship? *Demography* 35, no. 1, 1998:7 1-81.
Desai, Vanneman et al, *Human Development in India: Challenges for a Society in Transition,* Oxford University Press in 2009 (forthcoming).
Sonalde Desai and Noon James 2009. “Who Gets Good Jobs? The Role of Human, Social, and Cultural Capital” *American Sociological Association, Paper Presentation*.
Desai, Sonalde, Amaresh Dubey, B.L. Joshi, Mitali Sen, Shariff, Abusaleh, and Reeve Vanneman. India Human Development Survey (IHDS) [Computer file]. ICPSR22626-v1. Universityof Maryland and National Council of Applied Economic Research, New Delhi [producers], 2007. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2008-07-08.
DiMaggio, Paul. 1982. "Cultural Capital and School Success: The Impact of Status Culture Participation on the Grades of U.S. High School Students." *American Sociological Review* 47(April): 189-201.
Farkas, George, Robert P.Grobe, Daniel Sheehan, and Yuan Shuan. 1990. "Cultural Resources and School Success: Gender, Ethnicity, and Poverty Groups within an Urban District." *American Sociological Review* 55(February): 127-142.
Frost M, Frost R, Haas D, Maternal education and child nutritional status in Bolivia: Finding the links, *Social Science and Medicine*, Volume 60, Issue 2, January 2005, Pages 395-407.
Fuller, Bruce and Stephen Heyneman. 1989. "Third World School Quality: Current Collapse, Future Potential." *Educational Researcher* 18:12-19.
Gage, A. J., Sommerfelt, E., & Piani, A. (1997). Household structure and childhood immunization in Niger and Nigeria. *Demography*, 34(2), 295–309. doi:10.2307/2061706.
Gittlesohn, Joel et al. 1994. *Listening to Women Talk About their Health: Issues and Evidence from India*. New Delhi: Har Anand Publications.
Govindasamy Pavalavalli and B.M. Ramesh, 1997. “Maternal Education and the Utilization of Maternal and Child Health Services in India” *National Family Health Survey Subject Reports* Number 5, IIPS and ORC Macro.
Hobcraft, John. 1993. "Women’s Education, Child Welfare and Child Survival: A Review of the Evidence." *Health Transition Review* 3: 159-172.
International Institute for Population Sciences. 1995. National Family Health Survey: India, 1992-93. Bombay: IIPS.
International Institute for Population Sciences and ORC Macro. 2000. National Family Health Survey (NFHS-2), 1998-99. India, Mumbai: IIPS.
International Institute of Population Sciences (2006). India Data. 2005-2006 National Family Health Survey (NFHS-3), Mumbai: IIPS.

Kravdal, Ø. (2004). Child mortality in India. The community- level effect of education. *Population Studies*, 58(2), 177–192.
LeVine, Robert. Women's Schooling, Patterns of Fertility, and Child Survival. *Educational Researcher,* Vol. 16, No. 9 (Dec., 1987), pp. 21-27
Jain, Anrudh K.. 1994. "Maternal Education and Childcare." *Health Transition Revie*w 4(October): 206.
Jamil K, Bhuiya A, Streatfield K and Chakrabarty N. The immunization programme in Bangladesh: impressive gains in coverage, but gaps remain. *Health Policy and Planning*, Vol 14, 49-58.
Jejeebhoy, Shireen and Zeba Sathar. 2001. "Women's Autonomy in India and Pakistan: The Influence of Religion and Region." *Population and Development Review* 27:687-712.
Pebley Anne R., Goldman Noreen and German Rodriguez. *Prenatal and Delivery Care and Childhood Immunization in Guatemala: Do Family and Community Matter?* Demography, Vol. 33, No. 2 (May, 1996), pp. 231-247.
Parashar, S. (2005). Moving beyond the mother-child dyad: Women's education, child immunization, and the importance of context in rural India. *Social Science and Medicine*, 61(5), 989– 1000.
Putnam, Robert D. 2000. Bowling Alone: The Collapse and Revival of American Community. New York: Simon & Schuster.
Streatfield, K., Singarimbun, M., & Diamond, I. (1990). Maternal education and child immunization. *Demography,* 27, 447–455.
Steele, F., Diamond, I., & Amin, S. (1996). Immunization uptake in rural Bangladesh: A multilevel analysis. *Journal of the Royal Statistical Society,* Series A, 159(2), 289– 299.
UNICEF (2008). *State of the World's Children 2008*. New York: UNICEF.
World Bank. 1997. *Primary Education in India. Washington*, D.C.: The World Bank.
Maternal Education and Child Healthcare in Bangladesh
Huq Mohammed Nazmul and Tasnim Tarana, *Matern Child Health J* (2008) 12:43–51