Structured Inequalities—Factors Associated with Spatial Disparities in Maternity Care in India

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Research on India documents considerable heterogeneity in health and health care across states. However, while regional differences are well established, factors underlying these differences have received little attention. This paper seeks to explain disparities in delivery care across districts by focusing on three factors: (1) marriage and kinship patterns; (2) district wealth; (3) governance and quality of services. Using data from the nationally representative India Human Development Survey *2005 (IHDS) it examines the probability that the 11,905 women who had a child between 2000 and 2005 delivered in a hospital or received care from a doctor or a nurse while delivering at home. The results suggest that 47 per cent of the variation in delivery care in India is between districts while 53 per cent is between women within district. Although compositional differences in education and household wealth explain some of the variation between districts, marriage and kinship patterns, district wealth and governance each has a significant impact on shaping between-district variation in maternity care.*

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JEL Classification: *I1: Health; R2: Household Analysis*

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1. Introduction

Spatial disparities in access to medical care and health outcomes—both across and within nations—are well-documented in the demographic literature. They are particularly striking in a diverse country like India. For example, National Family Health Survey-III conducted in 2005–06 documents striking variation in hospital delivery across Indian states; while 99 per cent of the deliveries in Kerala take place in a hospital, the comparable percentage is only about 21 per cent in Uttar Pradesh (International Institute for Population Sciences and Macro International, 2007). In spite of the vast quantities of literature documenting spatial disparities in health and health care, in India and elsewhere, an assessment of US and international literature by Barbara Entwisle in her 2007 presidential address to the Population Association of America notes (Entwisle, 2007),

> Given the size of the literature, it is surprising that as a field, we have not made more progress. Research appears to be guided more by the availability of data and statistical packages than a clearly articulated theory about macro and micro processes and their integration. (p. 694)

In this paper, we seek to fill some of these gaps by focusing on spatial disparities in maternity care in India. We argue that while some of the regional disparities may be due to differing characteristics of the individuals living in different areas, geography often serves as a proxy for deeper historical, social and political chasms separating populations in different areas. Without a better understanding of spatial differences in health care utilisation it would be difficult to develop policies to reduce spatial inequalities. Using data from the India Human Development Survey (IHDS), we explore three aspects of spatial inequalities in maternity care: (1) regional economic development; (2) marriage and kinship patterns; and, (3) functioning of political systems and governance.

2. Individualistic Explanations of Health Care Utilisation

Research on health care utilisation has been implicitly or explicitly influenced by two major, to some extent overlapping, models, the Health Belief Model targeting behaviour and prevention (Rosenstock, 1966) and the Socio-Behavioral Model, targeting illness behaviour and overall use of medical care. The Socio-Behavioral Model (Andersen, 1968; Andersen, 1995), has been particularly influential, since

it focuses on three intuitively appealing sets of determinants of health service utilisation: (1) characteristics that predispose individuals to use formal health care systems such as age, gender, education, ethnicity, social networks, health beliefs, etc.; (2) enabling resources which allow individuals to use health care if they so choose, such as money, time, transportation and availability of health services; and, (3) actual or perceived need for health care. In a way, this is a highly comprehensive model. Virtually any precursors to health care utilisation can be fit into this structure.

However, in practice, these models direct our attention to individuals, rather than social structures. As Anderson (1995) indicates,

> The model of health services' use initially focused on family as a unit of analysis because the medical care an individual receives is almost certainly a function of the demographic social and economic characteristics of the family as a unit. However, in the subsequent work, I shifted to the individual as the unit of analysis because of difficulties of developing measures at the family level.

Given the difficulties of incorporating family processes, it is not difficult to see why incorporation of broader social structures such as communities and states may be even more problematic.

Research on maternal health care and health care utilisation continues to build on this tradition. Consequently, the focus seems to be on the impact of individuals' characteristics on utilisation of prenatal and maternity care (Abbas and Walker, 1986; Elo, 2009; Obermeyer and Potter, 1991). In explaining regional variation in maternal care usage, this approach leads us to control for as many individual and service availability variables as possible to see if much of the regional variation disappears. Unfortunately, empirical research focusing on individual characteristics and health service availability has not been sufficient to explain the spatial variation in maternal care utilisation in India (Navaneetham and Dharmalingam, 2002; Sunil, Rajaram and Zottarelli, 2006). This leaves us searching for a better conceptual framework for explaining these regional differences.

In recent years, researchers working in countries such as India, where substantial regional inequalities have been observed, have begun to grapple with spatial inequality, particularly focusing on uneven availability of community-based services (Stephenson and Tsui, 2003; Sunil et al., 2006). While this is a welcome change, as we document below, regional socio-political processes shape delivery care utilisation in myriad ways—service availability is just one of these pathways.

3. Contextual Influences

If individual-based models of health behaviour fail to explain regional impacts, attempts at developing contextual models have also faced formidable challenges. A review of literature based on World Fertility Surveys, one of the first attempts at obtaining village based information on health facilities, documents a palpable sense of disappointment resulting in calls for better articulation of a theory of communities (Entwisle, 2007).

Since the early 1980s, considerable advances have taken place in our theoretical and methodological sophistication in research on spatial disparities in diverse fields such as theories of fertility behavior (Cleland and Wilson, 1987), effects of neighborhood poverty on individual outcomes (Jencks and Mayer, 1990) and school efficacy (Raudenbush and Willms, 1995). In this paper, we draw two lessons from these diverse streams of literature. The first lesson suggests selecting an appropriate unit to define the context (Sampson, Morenoff and Gannon-Rowley, 2002). Although villages have often been used to measure context, particularly when using datasets that include village-level community modules, these are not necessarily the natural units for health care utilisation. Indian villages tend to be frequently contiguous, especially in densely populated central plains or coastal areas. Hence, residents often cross village boundaries for health care services. One study estimates that about 42 per cent of the short-term illnesses and 62 per cent of the long-term illnesses in India were treated outside the immediate local area (Desai et al., 2010). Hence, we argue that rather than focusing on village as the immediate context for delivery care, it makes sense to focus on a broader geographic area—district—for service utilisation.[1]

The second, and far more important, lesson of the earlier literature is that different aspects of context matter for different outcomes and these relationships tend to be complex. For example, research on the impact of neighborhood affluence on school outcomes has documented both advantages and disadvantages. For outcomes such as a desire to attend college, affluent neighbors create institutions that benefit all students and having affluent neighbors is an advantage; but for outcomes where affluent neighbors create greater competition, such as grades, affluent neighbors can be a disadvantage (Mayer and Jencks, 1989).

[1] Empirical data strongly supports this argument, in a three-level model on maternity care, the standard deviation of the random effect for district intercept is nearly twice the size of the intercept for village or block level intercept. This suggests considerably greater variation between districts than within villages or blocks in a district.

Building on this observation, we pay special attention to developing a theoretical framework that tries to clearly specify the aspects of contextual characteristics that are hypothesised to influence health behaviours. We focus on three dimensions of contextual characteristics, marriage and kinship patterns, district wealth, and governance and quality of service.

3.1 Marriage and Kinship Patterns

A vast body of literature on intra-household gender inequality suggests that household wealth does not necessarily trickle down to women (Blumberg, 1991; Dwyer and Bruce, 1988; Jain and Banerjee, 1985; Kabeer, 1994; Tinker, 1990). This suggests that household wealth may not be sufficient to increase health care utilisation for women. A number of empirical studies have examined the association between women's education, employment, bargaining power within the household or the closeness to their natal family and their use of maternal health care services in India and other developing countries (Beegle, Frankenberg and Thomas, 2001; Bloom, Wypij and das Gupta, 2001; Miles-Doan and Brewster, 1998; Mistry, Galal and Lu, 2009; Obermeyer and Potter, 1991). Nevertheless, these studies have tended to see empowerment as a property of individuals and focused on such factors as control over resources and freedom of movement (Bloom, Wypij and das Gupta, 2001; Mistry, Galal and Lu, 2009).

Research that explicitly focuses on women's empowerment has increasingly begun to suggest that instead of seeing empowerment solely as characteristics of individuals, we need to see social contexts as empowering or disempowering women (Kabeer, 1999; Narayan, 2006; Presser and Sen, 2000). This argument is bolstered by the observation that there are far greater differences in women's empowerment across different cultural contexts than between women within the same context (Jejeebhoy and Sathar, 2001; Mason, 1995) and empowerment measures at community level are often more important than those at an individual level (Desai and Johnson, 2005). This then suggests that models which simply include gender-related variables in analysis at an individual level are misspecified (Smith, 1989).

In the Indian context, some of the earliest research examining differences in gender relations across regions began with a focus on differences between the Dravidian kinship system in southern India and the rest of the country (Karve, 1965; Oberoi, 1998). Following this line of argument, a seminal article by Dyson and Moore suggested that regional differences on demographic outcomes such as fertility, age at first marriage, infant and child mortality, sex ratio and utilisation of maternal health care correspond with the north-south contrast on women's status resulting from the differences on marriage pattern

(exogamy vs endogamy) and the consequential kinship structure (Dyson and Moore, 1983). In North India, men and women within a closely related group of villages are considered to be close kin and marriage within this cluster is prohibited, while marriage within the extended family (e.g., between cousins) would be unthinkable (Chowdhry, 2007). In contrast, endogamous marriage is preferred in South India. There is virtually no prohibition to women marrying within their own village and often they tend to marry cross-cousins or even maternal uncles (Bittles, 1994). The North Indian insistence on marrying daughters outside the village and close kin group (referred to as exogamy) tends to distance women from their parents and increases their dependence on husband and his family and reduces their bargaining power, including claims to household resources.

However, empirical research often fails to find a strong relationship between kinship patterns and women's autonomy (Rahman and Rao, 2004). The inconclusiveness of these empirical studies may be at least partially explained by the disconnection between the theoretical argument and empirical specification. In theory, it has been suggested that the preference on endogamy versus exogamy has strongly affected gender norms in different regions of India (Dyson and Moore, 1983), which affect all women, regardless of their own marital relationships. A woman may or may not marry within her own family; actual marriage arrangements depend on availability of marriageable cousins or uncles. However, the fact that within-family marriages are prevalent may increase the cultural predisposition to invest in women's health and well-being.

3.2 District Wealth

While wealthy households may be more likely to utilise health services than poor households, their ability to do so is conditioned by the environment in which they live. Access to roads, buses, taxis and other forms of transportation is particularly important for delivery care (National Academy, 1997). One study found that 9 per cent of the rural but none of the urban maternal deaths occurred on the way to hospital (Bhatia, 1993). Most obstetric emergencies require emergency transportation for travel to a hospital. Transportation systems are better developed in wealthy districts and neighbours are better able to loan cars or tractors when needed. A variety of other spillover effects are associated with regional wealth. Private maternity homes, i.e., small 2–10 bed hospitals, are more likely to spring up where more people seek hospital delivery; government doctors are more likely to live in villages with better-developed infrastructure. This suggests that regardless of family's own wealth, ability to access health care may depend on regional wealth (Chen, Xie and Liu, 2007).

3.3 Governance and Quality of Services

Although recent studies have attempted to incorporate availability of services in models for maternity care utilisation (Stephenson and Tsui, 2002), research in this area remains in infancy and focus has been mainly limited to the availability of services. Following recent thinking in medical anthropology (Yoder, 1997) and medical sociology (Pescosolido and Kronenfeld, 1995), we suggest that there is a need to take a broader look at the way in which state structures—of which health systems usually form a part—shape individuals' perceptions about the need for and utilisation of medical services, particularly preventive health care. Most families anticipate that a pregnant woman will need care during delivery. However, moving from a traditional *dai* or midwife to seeking care from a formally trained nurse or doctor requires a leap of faith which assumes that these providers are competent and will provide useful service. It also requires finding good providers, having faith that they will be available at the time of the delivery (often in the middle of the night or during the monsoon), and making connections in advance of the delivery. Recent research on functioning of educational and medical services in India has documented a high degree of absenteeism among teachers and health service providers (Chaudhury, 2006) as well as apathy and incompetence (Das, Hammer and Leonard, 2008). This suggests that variation in service quality may be one of the explanations of spatial disparities in maternity care.

Since maternal care remains an area where public services continue to play an important role (International Institute for Population Sciences and Macro International, 2007), we expect that quality of services would be associated with the general level of governance in an area. In areas where service delivery systems are poorly developed, holding individual factors and household wealth constant, women may be less likely to receive trained assistance during delivery. Research on good governance has increasingly begun to observe close linkages between a variety of public services and the nature of political systems (World Bank, 2004). Political patronage and corruption frequently result in a vicious cycle where public servants see their jobs as a sinecure and see little reason to be responsive to their clients. In this climate all services suffer, roads are not repaired, buses do not run on time, frequent electric outages are common and lack of courtesy to clients is common. In the arena of maternal and child health services, poor governance may result in lack of supplies in clinics, poorly staffed clinics and hospitals, poor training and supervision of doctors and nurses and frequent absenteeism (Das and Hammer, 2007; Filmer, Hammer and Pritchett, 2002; Gangolli, Duggal and Shukla, 2005).

4. Data and Measurement

In this paper, we analyse the impact of these three contextual factors—marriage and kinship patterns, regional wealth and nature of governance—on spatial disparities in maternity care using data from *India Human Development Survey 2004–2005* (IHDS). The IHDS is a nationally representative survey of 41,554 households in 33 states and union territories spread over 383 districts, 971 urban blocks and 1,503 villages (Desai et al., 2010). The survey includes a household module as well as a module administered to 33,510 ever-married women aged 15–49. This latter module collects data on prenatal and postnatal care for all births between year 2000 and the interview date.[2] For this analysis, we focus on the last birth, with analytical sample of 11,905. Given our interest in spatial disparities, the indicators for marriage and kinship pattern, district-level wealth and indicators of governance are aggregated from the household data at the district level.[3] Urban and rural aggregation is done separately yielding 504 'districts'.

The dependent variable for this analysis is whether the last birth was professionally attended. This variable is constructed from two sets of questions, described in Table 1. The first question provides a set of mutually exclusive categories, about where the delivery took place, with about 56 per cent of the deliveries taking place at home. The next question asked who attended the delivery and the respondent was allowed to check as many answers as she liked. We create an attended delivery variable by combining the two questions. Individuals who delivered in a hospital or nursing home are automatically coded as having attended delivery. Those who delivered at home but were attended by a trained nurse/midwife or doctor are also coded 1 on attended delivery. By this definition, 5,221 of the 11,905 births were attended by a professional, forming about 53 per cent of the weighted sample. Table 2 documents the variation in assisted delivery across states in the IHDS sample with tremendous variation across states, ranging from nearly all women in Kerala receiving trained assistance at delivery to less than 20 per cent of the rural women in Uttar Pradesh.

Our key independent variables can be divided in two categories: individual-level variables and district-level variables. Individual-level variables are age of the mother, education, whether this is the first birth, caste, religion, urban residence, and a household asset index as a measure of socioeconomic status. At the individual level, the two variables of particular substantive interest are

[2] Most interviews took place in the year 2005.

[3] In creating these district level averages, we use all 41,554 households.

Table 1 Place of Delivery and Delivery Assistance

		Professionally Attended Delivery[b]	
	Total	*Yes*	*No*
Place of delivery			
Government hospital or clinic	22	100	0
Private nursing home	21	100	0
Home	56	18	82
Other	1	22	78
Who assisted with the delivery[a]			
A doctor	42	100	0
A nurse/ANM	39	100	0
A traditional midwife/Dai	44	23	77
A friend/relative	31	28	72
Other	12	36	64
Number of observations	11,905	5,221	6,715

Notes: Percentages are weighted, and frequencies are unweighted.
[a]Categories are not mutually exclusive.
[b]A birth delivered at government hospital/clinic or private nursing home, or was assisted by a doctor or a nurse/ANM is considered as professionally attended delivery; otherwise, it is not.

Table 2 Proportion of Women with Assisted Delivery by Urban/Rural Residence and State

	Proportion of Women with Assisted Delivery		
	Rural	*Urban*	*All*
Jammu & Kashmir	0.72	0.81	0.74
Himachal Pradesh	0.41	0.84	0.46
Uttarakhand	0.42	0.62	0.46
Punjab	0.66	0.81	0.72
Haryana	0.42	0.82	0.51
Delhi	0.68	0.70	0.70
Uttar Pradesh	0.19	0.48	0.24
Bihar	0.38	0.62	0.40
Jharkhand	0.36	0.75	0.42
Rajasthan	0.34	0.61	0.41
Chhattisgarh	0.39	0.63	0.44
Madhya Pradesh	0.32	0.60	0.39
Northeast	0.65	0.81	0.69
Assam	0.19	0.53	0.24
West Bengal	0.42	0.89	0.51

(*Table 2 continued*)

(*Table 2 continued*)

	Proportion of Women with Assisted Delivery		
	Rural	*Urban*	*All*
Orissa	0.40	0.72	0.44
Gujarat	0.49	0.90	0.66
Maharashtra, Goa	0.65	0.90	0.76
Andhra Pradesh	0.83	0.91	0.86
Karnataka	0.60	0.87	0.71
Kerala	0.99	1.00	0.99
Tamil Nadu	0.86	0.99	0.93
All India	0.44	0.79	0.53

endogamy (defined as whether the woman is married to her cousin, uncle or other relatives and/or married into her natal village/town) and residence just before delivery (marital home, natal home, or other).

Additionally we also control for distance to the government facility providing delivery services from the village. For urban residents, it is assumed that they have delivery services locally available. We also include controls for urban and rural residence, dividing urban areas into large metropolitan cities (Mumbai, Kolkata, Delhi, Chennai, Bangalore and Hyderabad) and smaller cities; and dividing rural areas into those with high levels of infrastructure facilities and those without. Indian villages tend to be highly diverse. Some are located close to towns and are blessed with a variety of facilities; others are remote and tend to be poorly connected to the world. In this paper, we expect that highly connected villages will have greater access to health services. Hence, we differentiate between villages based on their level of infrastructure development. Villages with at least six of the following 10 facilities are considered developed. This list of 10 infrastructure facilities includes electricity, paved road, kirana (grocery) shop, bus stop, landline and mobile access to telephone, post office, police station, bazaar and bank. Note that while we include village-level infrastructure and access to health facilities as control variables, they are also important markers of social context and are shared by women within a village or an urban area. However, some of these factors have formed the focus of other studies (Mistry, Galal and Lu, 2009; Stephenson and Tsui, 2002) and our goal is to move beyond access to focus on issues of quality and governance. Hence, we include them as control variables in our baseline models.

The main focus in this paper is on the role of three sets of contextual factors:

- **Marriage and Kinship Patterns:** We have argued that in areas where endogamous marriages occur frequently, social norms have evolved

placing greater value on women's health. In order to measure endogamous marriage patterns, we create a composite variable based on two items: (1) when the respondent got married, she and her husband lived in the same town/village; and/or (2) her husband is related to her (cousin, uncle, other). The marriage is defined as being endogamous, if the response is yes for either question. District-level endogamy is defined as the proportion of respondents in the district who had endogamous marriages.

- **District Wealth:** A household wealth index is created to reflect asset ownership and housing quality using 30 items. These items include ownership of such common durables as a cot and chair, as well as rare possessions like a car and air conditioner. Great attempt was made to include items owned by poor people (footwear and two sets of clothing) as well as rich people (car and colour television). The index also includes housing quality such as indoor toilet and running water.[4] District-level wealth is defined as the mean of household wealth index over all households.
- **Governance and Quality of Care:** We focus on three indicators of governance. The IHDS includes visits to the nearest government health facility with an outpatient clinic. The interview included a checklist, which recorded the availability of 13 items in stock on the day of the visit. These items include common vaccines such as DPT and polio, iron tablets and antibiotics. This stock is aggregated at the district level. About 5 per cent of the respondents live in districts where no facility data was collected. This is indicated with a dummy variable noting no facility data.

Past research on impact of services on utilisation (Angeles, Guilkey and Mroz, 1998; Tsui, 2001) has been concerned with the endogeneity of service placement/quality. Areas with greater demand may induce greater supply. In order to address this endogeneity, we focus on two other aspects of governance which are unrelated to health services. These include the number of hours electricity is available in electrified households and proportion of households in the district receiving government housing assistance in the preceding five years. We choose these two indicators because they have different associations

[4] The IHDS data contain household income as well as consumption expenditure. Our preliminary analysis found that of the three markers of household wealth asset index, reflecting long-term household economic status has a greater correlation with maternity care than either income or consumption.

with household wealth. Hours of electric supply is positively correlated with household wealth; utilisation of a government housing scheme is negatively correlated with household wealth.

Management of electric supply has emerged as a major governance challenge in recent years in India. Poor management of electric supply, distribution losses and power theft often leads to frequent and unscheduled electricity outages. Hence, the average hours of electric supply per day are an important indicator of governance. Housing assistance is a programme set up by the central government but administered by state and local governments. Although housing assistance retains a bias towards the poor, middle-class households also receive housing benefits through a variety of schemes. Middle-class households can get highly subsidised loans and a large number of urban cooperative housing societies are thriving. Private sector mortgages in the housing sector are very low since commercial banks have not tended to provide housing loans. By some accounts, the mortgage-to-GDP ratio in India is only 2 per cent as opposed to 51 per cent for the US and 15–20 per cent for Southeast Asian countries (Karnad, 2004). Where financing is used, the government sector plays a far greater role than the private sector and although private financing is increasing, as of 2004, government housing finance corporations provided more than 56 per cent of all loans (Karnad, 2004). Poor households can get outright grants and land, particularly for additions like toilet construction. However, substantial red tape is involved in programme administration, with local officials receiving large kickbacks. Hence, whether these programmes function well is an interesting marker of state functioning.

Variable definitions and descriptive statistics for all variables of interest are provided in Table 3. The state-wise variation in contextual variables is presented in Appendix Table 1. Note that while the sample was selected in a stratified design with states and districts forming a primary axis of stratification, the regression analysis is based on an unweighted sample since the stratification design is incorporated into our analytical design due to the use of a hierarchical linear model. However, the descriptive statistics are presented using sampling weights.

5. Statistical Model

The results presented in the paper are based on the hierarchical linear model which views births as being nested in a district (treating urban and rural areas separately). Multilevel (random effects) models can be conveniently expressed

as a system of equations at separate levels (Bryk and Raudenbush, 1992; Goldstein, 1995).

The most basic equation partitions the variance in assisted delivery across individuals and districts:

$$\ln(P_{in}/1–P_{in}) = \beta_{0n};$$
$$\beta_{0n} = \partial_{00} + \mu_{0n} \quad (1)$$

Where P_{in} reflects the probability of ith woman in nth district obtaining an assisted delivery. The logit of assisted delivery is a function of a randomly varying district specific component $\beta_{0n.}$ The district-specific component is determined by the size of the random effects term μ_{0n}. An intra-class coefficient (ICC) can be calculated to estimate the importance of clustering in assisted delivery (Snijders and Bosker, 2000) using the following formula:

$$ICC = \Gamma_0/(\Gamma_0 + \Pi^2/3)$$

Where Γ_0 is the estimated variance of the random effects term μ_{0n} and Π is the quantity 3.14159. Using IHDS data, we find that without including any covariates, the ICC is 0.47. This suggests that for assisted delivery about 47 per cent of the variance lies between districts and 53 per cent is between women in a district. The goal is to reduce this unexplained between-district variance through inclusion of individual and household factors that account for compositional differences between districts and through inclusion of district-level factors that explain some of the between district variance.

The next step adds a series of individual- and household-level control variables to take into account the compositional differences between districts. This equation includes:

$$\ln(P_{in}/1–P_{in}) = \beta_{0n} + \beta_{1n}X_{1i} + \beta_{2n}X_{2i};$$
$$\beta_{0n} = \partial_{00} + \mu_{0n} \quad (2)$$

Where X_1 represents woman-specific characteristics, such as birth cohort(age), parity and education; X_2 represents the substantive variables of interest that are operationalised at an individual level (e.g., household wealth, whether the woman herself is endogamously married and distance from the public medical facility offering child birth services). A change in the between-district variance

Table 3 Sample Means for the Variables Included in the Analyses

Variable	*Mean*	*Variable*	*Mean*
Assisted Delivery	0.53		
Individual Variables		**District-level Variables**	
urban4		Average asset index	7.58
Metro city	0.06	Prop. in endogamous marriage	0.19
Other urban	0.20	No information on health facility	0.05
Developed villages	0.32	No. of medicines in public facility	8.97
Less developed villages	0.42	Prop. receiving housing aid	0.09
Age of the Woman	27.51	Avg. no. of hours of electricity/day	14.06
Parity 1	0.24		
Educational Categories		**Number of districts**	**504**
No education (Omitted)	0.46	(Urban and rural areas separate)	
1–4 Std	0.07		
5–9 Std	0.28		
10–11 Std	0.09		
Higher sec/some college	0.05		
College graduate	0.05		
Education missing	0.02		

Caste/Religious Group	
Forward caste	0.17
Other backward classes	0.36
Scheduled caste	0.23
Scheduled tribe	0.09
Muslim	0.14
Christian, Jain, Sikh & others	0.02
Asset index	7.44
Endogamy	0.19
Residence at deliveray	
Marital home (Omitted)	0.75
Natal home	0.21
Other place	0.04
Access to Public Delivery Care Facilities	
Missing village health facility data	0.02
Facility 5+ km away (Om.)	0.20
Facility within 5 km	0.24
Facility in the village (or urban res.)	0.56
Number of Births	**11,905**

reflects the importance of compositional differences across districts. The next step adds district characteristics to the estimation of district-level intercept using:

$$\ln(P_{in}/1-P_{in}) = \beta_{0n} + \beta_{1n}X_{1i} + \beta_{2n}X_{2i};$$
$$\beta_{0n} = \partial_{00} + \partial_{0w}W_{wn} + \partial_{0c}W_{cn} + \partial_{0g}W_{gn} + \mu_{0n} \quad (3)$$

where W_w represents district-level wealth, W_c represents district-level gender and kinship norms and W_g represents indicators of governance. This equation models the impact of district-level characteristics on intercept across districts (i.e., the district-level random effect), further reducing variance across districts and size of the standard error of the district-level random effect or intercept.

6. Results

Results from the step-wise random effects model described above are presented in Table 4. Model 1 is the most basic model without any individual or district-level predictors with only district-level random effects. This model allows us to obtain baseline estimates of the standard deviation of random effects term and the ICC with the goal of reducing their magnitude through the addition of successive variables of interest. The ICC of 0.47 in this model suggests that about 47 per cent of the variation in assisted delivery is between districts while 53 per cent is between women residing in the same district.

Model 2 adds a set of control variables as well as variables of substantive interest that are measured at an individual level. Most of the control variables operate in the expected direction. Education, urban residence and first birth increase the likelihood of assisted delivery. Caste and religion also appear to be associated with access to assisted delivery with upper caste Hindu women and women from Christian, Jain or Sikh households more likely to receive care than other women. Scheduled tribes seem to have particularly low access to delivery care.

Community infrastructure plays an important role in assisted delivery with women from urban areas being most likely to receive care and those from rural areas being the least likely to receive maternity care. Interestingly, the difference in coefficients within urban areas (between metropolitan cities and smaller cities) and within rural areas (between developed and less developed villages) is rather small. The distance from health facility seems to be unimportant.

Substantively, two markers of gender relations at the household level are of interest. The role of endogamy in shaping gender relations has been discussed above but it should be noted that there are two components to endogamy as far as delivery care is concerned. The first relates to the investments made by husband's family in a woman's health, the second relates to the ability of her natal family to provide for her care. We incorporate both in our model. The interest of the husband's family in investing in women's health is hypothesised to be associated with whether the marriage was endogamous. The ability of the natal family to contribute to women's care is indexed by whether the delivery took place at the natal home. Results suggest that neither endogamy nor delivering at the natal home is associated with assisted delivery. About 4 per cent of the sample women report that they were in some other place besides their marital home or natal home. These women are significantly more likely to have assisted deliveries, but this may be due to the fact that high-risk women may be more likely to move to a location where they can receive care (such as a relative's home closer to a hospital or be admitted in a hospital).

While the addition of individual-level variables in the model reduces the standard deviation of the random effect coefficient from 1.79 to 1.28 and ICC from 0.47 to 0.34, these impacts appear to be associated with education and household wealth rather than with the presence or absence of health facilities or marriage patterns.

In model 3, we add district-level variables of interest. The results show that all three factors discussed above—marriage and kinship patterns, average district wealth and indicators of governance—have a statistically significant impact on assisted delivery and their combined addition reduces the standard deviation of random effect to 1.07 and ICC to 0.26.

Living in a district with a high proportion of women entering into endogamous marriages has a strong and statistically significant effect on improving access to assisted delivery. Compare this with the small and statistically insignificant coefficient for woman's own marriage arrangements. The greater importance of community-level gender norms compared to an individual's own experiences in our results is consistent with other empirical studies (Desai and Johnson, 2005) as well as theoretical expectations (Kabeer, 1999). Inasmuch as marriage and kinship patterns affect household behaviours and valuation of women's health, this process appears to operate at a societal rather than individual level. In areas where endogamy is prevalent, norms regarding appropriate treatment of women may develop over decades, if not centuries, which may affect all women, regardless of whether they themselves are in an endogamous marriage or not. It is important to note that this analysis has been conducted at a pan-India level.

Table 4 Hierarchical Logistic Regression for Assisted Delivery with District-Level Random Effects

	Mod.1 No Covar.	*Mod. 2 Indiv. Vars. Only*		*Mod. 2 Indiv. & District Vars.*	
Residence (metro city omitted)		–0.138		–0.100	
Smaller city		–0.943	**	–0.578	
Developed village		–1.050	**	–0.647	
Least-developed villages		0.005		0.005	
Age of the woman		0.715	**	0.715	**
Whether first birth					
Woman's education (none omitted)		0.291	**	0.246	*
1–4 std		0.635	**	0.600	**
5–9 std		0.965	**	0.903	**
10–11 std		1.438	**	1.395	**
Higher sec/some college		2.643	**	2.595	**
College graduate		0.031		0.064	
Education missing					
Caste/religion (forward caste omitted)					
Other backward classes		–0.189	*	–0.183	*
Scheduled caste		–0.172	*	–0.182	*
Scheduled tribe		–0.782	**	–0.812	**
Muslim		–0.403	**	–0.384	**
Christian, Jain, Sikh & others		0.523	*	0.484	
Household asset index		0.126	**	0.124	**

Delivery services loc. (> 5 km omitted)						
Missing village data			0.002		–0.021	
Facility within 5 km			–0.143		–0.125	
Facility in the village/town			0.102		0.125	
Husband from same village or related			–0.003		–0.111	
Delivery place (marital home omitted)						
Natal home			0.106		0.093	
Other place			1.803	**	1.780	**
District Level Variables						
Average asset index					0.102	**
Proportion of endogamous marriages					2.251	**
Missing health facility data					0.012	
Mean no. of medicines in public facilities					0.076	*
Prop. of households using housing benefits					3.099	**
Average no. of hours of electricity					0.055	**
Constant	0.74	**	–0.990	**	–3.652	**
Random effect (SD)	1.703		1.285		1.071	
rho–conditional ICC	0.469		0.334		0.259	

Endogamy may have different implications across states and even across caste groups within particular states. A nuanced analysis of the impact of endogamy on gendered outcomes remains an area of future research.

District-level wealth also has a statistically significant positive impact on the likelihood of assisted delivery. This impact is independent of household's own wealth. These results suggest district wealth has an impact on both rich and poor households in the district. While household wealth increases the likelihood that individuals may obtain health care, even rich households may be helpless if adequate care in not available in the area. This is where regional wealth may play a role. Usually, regional wealth is associated with a higher level of infrastructure development such as better roads, more assured electricity supply and somewhat higher presence of small towns and cities. All these may make it a more attractive place for medical personnel to live and work. Consequently, there may be a greater supply of hospitals and clinics. Even the government facilities may be able to provide higher quality care. When the nurse-midwife is able to travel easily between her home and the sub-centre, she may be more punctual. Greater and better quality supply of health services is only one of the ways in which regional wealth influences health care utilisation. Living in proximity to wealthier households may also affect households' desire as well as ability to use maternal health care.

Our indicators of governance also have a strong and significant impact on assisted delivery. Each indicator of governance—medicine stock in public health facilities, average number of hours of electricity for electrified households in the district and proportion of households benefitting from government housing programmes—has a strong positive impact on access to trained delivery assistance. Moreover, this effect is net of the presence or absence of public health facility in the village.

The comparison of ICC across successive models (Appendix Table 2) provides a measure of the impact. The addition of individual-level variables to the model reduces ICC from 0.47 to 0.34, a 29 per cent decline between the null model and model A. The addition to all-district level further reduces the ICC to 0.26, a 45 per cent decline between the null model and the full model. Thus, a substantial proportion of inter-district variation in assisted delivery is associated with the included variables. Appendix Table 2 further shows changes in ICC when various district-level determinants are added in a stepwise fashion. The result suggests the greatest decline in the inter-district variation with our indicators of governance, followed by district-level endogamy, with district wealth having a significant but small impact.

7. Discussion

Research on health outcomes and health care utilisation in India has documented vast spatial inequalities in health. While these differences are well recognised, the mechanisms through which they operate remain poorly explored. In this paper, we have examined the predictors of inter-district differences in women's access to maternity care and found three sets of variables to be highly predictive of these differences. These relationships are important in the context of the current emphasis on improving delivery care.

Other studies have documented linkages between women's autonomy and maternal care (Bloom, Wypij and Das Gupta, 2001; Mistry, Galal and Lu, 2009). However, when distinguishing between different components of maternal care, it is observed that although women's autonomy is associated with prenatal and postnatal care, its association with delivery care is quite weak (Mistry, Galal and Lu, 2009). This is not surprising—when women are in labour, their welfare depends on husbands, mothers-in-law and other family members and household decision-making is affected less by their autonomy and more by what is considered culturally appropriate. These normative patterns are not easily amenable to what happens within the household but are shaped over time with marriage and kinship patterns playing an important role. As our results document, a woman's own endogamous marriage does little to increase her chances of having a delivery attended by trained providers, as does delivery at the natal home. However, living in an area where endogamous marriages are common increases this likelihood.

This observation has interesting implication for government policies. In recent years, the Indian government has placed particular emphasis on improving maternity care and put in place a variety of schemes including the Janani Suraksha Yojana (Maternal Protection Scheme). This scheme provides cash incentives to women, of Rs 700 (about 15 USD), for hospital delivery. These schemes also distinguish between high- and low-priority areas with special attention being directed to areas with low maternity care usage. Our finding suggests that if appropriately delivered, these incentive schemes may be particularly relevant in areas where endogamous marriages are rare.

Our results also direct attention to issues of governance and quality of services. We are not the first to comment on the importance of quality of services in reproductive health care (Koenig, Gillian and Joshi, 2000), but much of the discourse on quality of care tends to be divorced from the broader discourse on governance. Our results show a relationship between the governance of health services (e.g., stock of medicines in clinics) and maternal care usage, but they

show an even stronger relationship between non-health-related indicators of governance, such as housing assistance and hours of electricity and assisted delivery.

As the developmental discourse grapples with challenges of governance, a considerable amount of attention is being directed towards failed states. We suggest that issues of governance are also important as we look at areas within a country.

Historical and social forces create an environment that either supports an efficient and well-functioning polity or remains mired in serving the interests of elites. Land tenurial patterns in India offer an intriguing example. During the time of early control of India by the East India Company and later by the British Crown, the colonial powers first experimented with revenue farming system where large landlords engaged in revenue farming from actual farmers on behalf of the government (Guha, 1982). Complications associated with this zamindari system led to simplified systems like ryotwari where the Crown entered into a direct relationship with farmers (Tomlinson, 1993). The zamindari system was far more hierarchical and subject to the elite capture of resources than the ryotwari system and even after 60 years of independence, its effect persists. Areas under the ryotwari system have higher investments in health and educational institutions than those under the zamindari system (Banerjee, Iyer and Somanathan, 2004).

The results presented in this paper suggest a need for substantial broadening of the framework for studying reproductive health. With respect to gender, these results suggest focusing on contextual aspects of gender, above and beyond the focus on women's agency and autonomy increasingly prevalent in demographic research (Kishor, 2005). Enhancing women's access to reproductive health care requires not only their ability to act in their own interests but also the willingness of their families to do so and a cultural context in which investments in women's health are deemed normal and natural. With respect to quality of services, these results emphasise the importance of governance and state functioning. Health systems are integral parts of a broader system of governance and areas where government institutions function efficiently in providing electricity, housing loans and a host of other services, maternal health care is also likely to be more reliable and more women will receive delivery care.

A focus on governance is particularly relevant as local governments or panchayati raj institutions (PRIs), are beginning to play an increasingly important role in a variety of health programmes, including the National Rural Health Mission. With one-third reservation of seats for women in PRIs, one

normally expects greater interest on the part of the PRIs in ensuring better quality services. However, the strengths of PRIs themselves lie in building governance capabilities which will impact all areas of functioning including health services.

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Appendix

Table 1 Distribution of Different Contextual Variables by State

	Asset Ownership Index	*Within Vill. or Family Marriage*	*No. of Medicines in Stock at Pub. Health Facility*	*Prop. of Households with Housing Assistance*	*Avg. No. of Hours Electricity is Available**
Jammu & Kashmir	7.74	0.39	7.54	0.01	12.66
Himachal Pradesh	9.84	0.09	6.15	0.06	22.59
Uttarakhand	8.03	0.08	6.75	0.11	11.13
Punjab	12.61	0.06	4.66	0.01	12.86
Haryana	11.51	0.04	6.01	0.02	13.40
Delhi	12.04	0.22	0.34	0.02	20.25
Uttar Pradesh	6.88	0.08	7.31	0.07	3.93
Bihar	5.14	0.10	7.66	0.11	1.45
Jharkhand	6.51	0.15	5.09	0.10	8.04
Rajasthan	7.36	0.11	6.97	0.02	8.20
Chhattisgarh	6.42	0.08	7.26	0.05	12.06
Madhya Pradesh	6.44	0.10	6.92	0.05	7.46
Northeast	8.43	0.41	6.62	0.02	13.32
Assam	6.28	0.29	6.52	0.05	5.99
West Bengal	5.71	0.26	5.47	0.07	8.30
Orissa	5.58	0.23	7.43	0.14	8.47
Gujarat	9.36	0.11	5.60	0.06	17.75
Maharashtra, Goa	9.23	0.35	7.54	0.07	16.61
Andhra Pradesh	7.91	0.36	9.59	0.24	12.67
Karnataka	7.16	0.32	8.36	0.14	13.34
Kerala	10.73	0.28	6.20	0.17	20.35
Tamil Nadu	8.59	0.38	5.28	0.10	19.75

*0 for unelectrified households.

Table 2 District Level Effects from Different Hierarchical Models

	Coefficients	*Random Effect Standard Deviation*	*ICC*
Base Model			
No covariates		1.79	0.469
Model A			
All individual level variables		1.288	0.336
Model B			
Individual level plus district level		1.282	0.333
Average asset index	0.888**		
Model C			
Individual level plus district level		1.174	0.295
Average level of endogamy	2.993**		
Model D			
Individual level plus district level		1.12	0.281
No facility data for the district	0.107		
Average no. of medicines in the public clinics	0.086*		
Prop. of households gettting housing assistance	3.756**		
Average no. of hours electricity is available	0.079**		
Full Model			
Individual level plus district level		1.07	0.259
Average no. of household assets	0.102**		
Prop. of women in endogamous marriage	2.251**		
No facility data for the district	0.012		
Average no. of medicines in the public clinics	0.076*		
Prop. of households getting housing assistance	3.099**		
Average no. of hours electricity is available	0.055**		