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2022

Online at <https://mpra.ub.uni-muenchen.de/116649/>
MPRA Paper No. 116649, posted 14 Mar 2023 06:08 UTC

Demand for Maternal Health Care in The Eastern States of India:
Evidence From A National Health Survey

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Demand for Maternal Health Care in The Eastern States of India: Evidence From A National Health Survey

Abstract

Using NFHS-4 data, this study explores the determinants of maternal health care programs for eastern states of India, which include pre- natal care and hospital delivery. To reduce unobserved heterogeneity in the analysis, we employed the Full Information Likelihood Method (FILM), also known as the Joint Estimation Technique, in conjunction with individual probit models. Like other studies we found place of residence, wealth, caste, religion and, level of education as significant contributor for demand for both services. But, in contrast to earlier studies, we discovered that women's age increases the use of prenatal care and hospital delivery, and the child's birth order influences getting prenatal care. To increase the utilization of maternal health care services, we recommend investing in health infrastructure, increasing the JSY subsidy amount and coverage of the JSSK subsidy, and promoting awareness about these government programs among women through ASHA workers.

Keywords: Maternal health, Women's health, Newborn health

JEL Classification: I140, I150, I180, O150

1. Introduction

The quality of life of the future generation is associated with the well-being of both the mother and the newborn. For this reason, Millennial Development Goals by the United Nations focused on increasing hospital delivery and reducing catastrophic events, which recently led to some improvement in the maternal and newborn mortality figure. However, in developing countries, apart from many supply-side constraints, many healthcare services meant for women and children are still underutilized, despite the critical need for those services. As a result, these countries still experience considerable cases of maternal complications and fatalities, which need to be urgently addressed. As a woman has to go through different stages during childbirth, in each stage, it is absolutely necessary that the mother gets total care for her and for her baby. That is, care is required not just during childbirth, but also for ante-natal and post-natal care, which are intertwined and essential for both the mother and her child's well-being. Failure to arrange proper delivery care, and lack of appropriate pre-natal and post-natal care might result in maternal and newborn death. Thus, the primary goal of this paper is to identify various socio-economic factors that influence the demand for various maternal healthcare services in Eastern Indian states, viz. West Bengal, Bihar, Jharkhand, and Odisha. For this, two essential maternity care services are considered here as outcome variable, which are the demand for pre-natal care and the demand for institutional delivery. Like other studies, we found the place of residence, wealth, caste, religion, and level of education as significant contributors to demand for both these services. But in contrast to other studies, we discovered that the woman's age increases the use of prenatal care and hospital delivery, and the birth order of the child influences receiving pre-natal care. We believe the results obtained in this study will thus assist policymakers to identify the factors that are crucial to improve the utilization of maternity care services, which will in turn improve maternal and newborn health to prepare the path for the long-term development of high-quality human capital.

The rest of the paper is arranged as follows. The introduction is followed by a brief literature review. The third section gives information about data sources & methodology. Next, we present the results and discuss the findings. Concluding comments are placed in the last section.

2. Brief literature review

In most underdeveloped nations, including India, we encounter significant maternal complication rates, frequently resulting in high-risk births. The MCH (Maternal and Child Health) program was introduced in India in the 1970s to reduce maternal deaths, vaccine-preventable infant casualties, and related morbidities. The MCH initiative was supposed to be implemented to obtain effective women's healthcare exposure in 1980. This revamped strategy, however, has failed to revitalize the success of India's socioeconomically backward states. Then, as a promising program, the safe womanhood and RCH (Reproductive and Child Health) program was introduced in the mid-1990. Under the RCH initiative, MCH programs have been extended to include the entire maternal health plan, which included the earlier elements for healthy motherhood services.

There are strongly marked geographical disparities in reproductive healthcare exposure in India. In addition to these geographical disparities, there are also significant socio-economic gaps, which have differed throughout areas. The lack of reproductive healthcare services can be observed by the high prevalence of maternal and childhood mortality and morbidity in the states of Bihar, Jharkhand, Orissa, and West Bengal. Precisely for this reason, we have conducted our study for the states of Bihar, West Bengal, Jharkhand, and Odisha. We emphasize the determinants of both pre-natal care and institutional delivery- characterized by required counseling of mothers, care during and after maternity, utilization of safe delivery procedures, using services of trained doctors and health professionals, and an environment conducive to develop sufficient immunity for the new-born. It is important to understand that the infrastructural facilities, availability of health professionals, educational achievement of women decline the undesired complications during pregnancy, and childbirth. But still, pre-natal care and delivery care are not yet institutionalized in many developing countries. It leads to complications of pregnancy and high-risk delivery. Pre-natal care is important for recognizing high-risk pregnancies through routine blood pressure, weight, hemoglobin measurements, abdominal exams, and tetanus immunization. This would not only minimize the danger to the mother's health from pregnancy-related issues, but it would also resolve the child's birth-related difficulties (Mosley and Chen, 1984). Acton (1975) mentioned an important role of non-

monetary factors like travel distance, travel time, waiting time, and so on in shaping the demand for maternal health care. Halim et al. (2011) have documented the beneficial impact of various socio-demographic parameters like the literacy level of parents on the utilization of maternal health care in Nepal. Mekonnen and Mekonnen (2002) have explained that women's marital status, maternal education, the location of residency, educational level, and religion were all important factors in determining use of maternal health care services in Ethiopia. In Ethiopia, Birmeta et al. (2013) emphasized the importance of community knowledge for the health of the mother and new-born. They discovered that despite mothers having necessary maternal literacy-poor quality of health care, inadequate referral policy, high out-of-pocket expenses for travel and private consultations were the factors behind the underutilization of maternal health care in Nepal. Some studies, such as Ensor and Cooper (2004), have tried to find supply-side variables that may impede maternal healthcare demand. According to Lawn (2005), good coverage and quality of required healthcare packages may save around 67 percent of new-born and infant mortality in more than 60 countries. To secure the health of both the mother and the newborn, a package-based health care model is adopted (Kerber et al. 2007). Healthcare, hospital, and postnatal services, as well as comprehensive education and social care, were all included in this package. We have also discovered pieces of several country-level studies. Becker et al. (1993) studied the influence of family planning, pre-natal care, childhood vaccinations, and oral rehydration salts (ORS) in the Philippines on maternal health care programs. Celik and Hotchkiss (2000) investigated the impact of socio-economic factors to influence the usage of maternal healthcare in Turkey. Babalola and Fatusi (2009) focused on the usage of maternal health care services in Nigeria, emphasizing on individual, family, community, and state-level factors. The influence of educational attainment on the utilization of maternal and child health care by Thai women during pregnancy was examined in Raghupathy's (1996) study. Short and Zhang (2004) investigated the utilization of maternal health care in rural China in detail. In Pakistan, Agha (2000) looked at the issue of gender disparities in healthcare usage. Makate and Makate (2016) have investigated the impact of elementary schooling on child mortality in Malawi. Makate (2015) conducted a thorough investigation on Zimbabwe's health services and the sustainability of new-borns. Ensor and Ronoh (2005) provided a respectable review of the current research on healthcare finance. Pre-mature birth, stillbirth, pneumonia, complications during pregnancy and during delivery, malaria, and diarrhea are the leading causes of mortality among children under

the age of five globally. However, the reasons for child mortality differed by area. In Sub-Saharan Africa, one out of every twelve children died before age five, with infectious illnesses such as malaria, HIV/AIDS, pneumonia, and pre-term birth problems being the leading causes of death. Liu et al. (2015) discovered around one-third of the worldwide burden of under-five mortality was found in South Asia, owing mostly to pre-mature delivery issues, pneumonia, and intrapartum-related difficulties. In what follows, we can see that all the research explicitly links to institutional or hospital delivery for both mother and child health outcomes. An increased demand for maternal health care should have a long-term impact on both maternal and infant health. A healthy mother and child certainly go a long way toward guaranteeing human capital generation and, as a result, increasing economic growth. Because this paper is centered on several East Indian states, we must also look into studies carried out for some Indian states. Maitra (2004) utilized the NFHS-2 (National Family Health Survey) in India to highlight how the status of women in the home becomes a key determining factor as they redirect resources to be spent on improving their quality of life and the resultant health of their newborn. Maitra and Pal investigated the relationship between several healthcare variables and child mortality in Bangladesh (2007). In the aforementioned work, they also addressed the issue of unobserved heterogeneity. Bloom et al. (2001) investigated women's autonomy and focused on its impact on the need for maternal health care services in Varanasi. Anderson and Eswaran (2009) in a study of Bangladesh argued that enhancing woman's liberty led to a long-term decrease in fertility, greater child survival rates, and efficient utilization of funds inside the household benefiting the kids. Grabowski and Self (2013) investigated the case of women's autonomy and argued it might provide high-quality child health care in the Indian states of Bihar and Uttar Pradesh. They also looked into the gender bias in these northern states and tried to find whether it influences the demand for child health care services. Shroff et al. (2011) attempted to investigate the impact of the autonomy of mothers in breastfeeding habits and newborn development. According to the findings, women with a high degree of financial liberty were more likely to nurse their children, and moms with a greater level of autonomy in decision-making had fewer malnourished and underdeveloped kids.

Navaneetham and Dharmalingam (2002) used NFHS-2 data to evaluate the socio-demographic factors that influence the utilization of maternal health care in several south Indian states.

Chakrabarti (2012) in similar way investigated the factors influencing utilization of different maternal health services in case of rural India. The impact of gender differences in health care usage in India is studied by Roy and Chaudhuri (2008) using various survey data. Sarkar and Halder's (2014a, 2014b) work provides us with an overview of such issues at the national level in detail, and one may consult these studies for a better understanding.

But given this, we are unaware of any study that has been conducted on maternal health care usage and its influence on maternal and child mortality, specifically focusing on Eastern Indian states such as West Bengal, Bihar, Jharkhand, and Odisha. These states have a colonial past and have been governed for a long period by a steady coalition administration. West Bengal, Bihar, Jharkhand, and Odisha has a population share of 8%, 9%, 3%, and 3% of the country's total population, respectively, and have seen a significant decrease in fertility in 2001–2011 compared to the preceding decade. In comparison to other Indian states, these states have been effective in lowering maternal and child mortality. Thus, while these states may brag about low fertility and maternal mortality, maternal problems are relatively common in these states. As no studies at least to our knowledge, has focused on the issues of demand for maternal, new-born, and child health care in eastern parts of India, we have focused on the determinants of maternal health care programs in our study, using a joint estimation approach. The technique's specifics and the relevance of application to such analysis are discussed in the methodology section.

3. Data & Methodology

The National Family Health Survey (NFHS) program, which began in the early 1990s, has become a major source of data for health and nutrition for the Indian population. The program specifically focuses on the topic of maternal and child health, and collects a vast amount of data, including prenatal care (PNC) and place of delivery from five years leading up to the survey. Given its universality and international repute, we have used the individual-level data of NFHS-4 accessed from the DHS website. We have considered only married women for our analysis, and the never-married group has been excluded from this chapter as maternal health is the main

topic. Also, in this study, we have focused only on the Eastern states of India, the reason for which is already been covered in the preceding section.

In our study, we focus on two outcome variables whose utilization is important for the health of the mother and newborn. These are:

The utilization of Prenatal care (PNC): Prenatal care is important for recognizing high-risk pregnancies through routine blood pressure, weight, hemoglobin measurements, abdominal exams, and tetanus (TT) immunization. In 1994, the WHO recommended at least one ANC health check-up during the first trimester, a minimum of four ANC visits, and two doses of TT vaccination to avoid tetanus infections. As PNC offers continuous doctor-patient interactions, it makes it easier to recognize and track people who meet established risk thresholds and eventually refer them to higher-order child delivery facilities to reduce adverse outcomes. During PNC appointments, it is also possible to identify and treat pre-existing and current medical conditions such as malaria, anemia, and syphilis. When an emergency occurs, medical providers can establish partnerships with women; and patients are more likely to seek help through labor and childbirth.

The utilization of Hospital Delivery:

Institutional delivery is defined as giving birth in a health facility (which could be any of public/ private/ NGO, or primary, secondary, or tertiary care) or under the supervision of recognized medical staff (medical practitioners or midwives). Childbirth at hospital thus significantly reduces obstetric complications and maternal and neonatal fatalities. Childbirth in this way also influences follow-up of post-childbirth care and hence fulfills another aim of healthy motherhood program.

Given the relevance of these maternal health care programs, we focus on the role of different socioeconomic factors that impact the utilization of these services. Thus, two binary probits; PNC (whether the respective mother received prenatal care from trained health personnel or not) and HD (denoting whether the mother had given birth in a hospital/health center or not) are used here, following Maitra (2004), Maitra and Pal (2007), Mandal (2015), Chaudhury and Mandal (2020). HD is considered as final outcome variable in this case.

Now assume the following regression equations:

$$PNC = \alpha_0 + \alpha_1 X_p + \mu_p + \varepsilon_p \quad (1)$$

$$HD = \beta_0 + \beta_1 X_h + \mu_h + \varepsilon_h \quad (2)$$

The parameters of prenatal care and hospital delivery are expressed respectively by the subscripts p, and, and on the other hand α_0 and β_0 are the constant terms for the same. We have used α_1 and β_1 for the coefficients for different independent variables respectively, X_p and X_h cover all the possible covariates. Therefore, the binary outcomes are represented as

$$PNC = \begin{cases} 1 & \text{if taken} \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

$$HD = \begin{cases} 1 & \text{if delivery is done in hospital} \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

The error term, μ_i ($i = p, h$) is expected to consider unseen diversity associated with the mother. So $\mu_i \sim N(0, \delta^2)$; σ_i^2 is the variance of unobserved heterogeneity, if any ε captures all residual variables and follows $\varepsilon_i \sim \text{IID } N(0, 1)$; $i = p, h$. Here IID indicates random variables which are independent and distributed identically.

In this chapter, we have applied a Full Information Likelihood Method (FILM) known as joint estimation technique to eliminate the issue of endogeneity, which is common in this type of study. As a result, this is a step forward from regression approaches such as Logit and Probit, where the dependent variables are categorical rather than continuous. It's worth noting that the Conditional Mixed Process (CMP) we're using is also based on the Probit estimation approach. However, due to the presence of variability in the design, the basic Probit regression model frequently overestimates or underestimates the findings (as seen by the values of Model I and Model II coefficients). CMP, thankfully, takes care of this issue.

It is now important to discuss the origins of heterogeneity that may form inside this framework. Certain mother-related factors cause expected difficulties during pregnancy and childbirth. Such mother-specific issues can go completely unnoticed by the researchers. But the mother facing these difficulties will choose to use numerous inputs for her well-being. As a result, it's a one-of-a-kind non-observed heterogeneity of the mother in which PNC is essentially endogenous in the

HD regression equation. The following are two probable sources of bias and types of self-selection as described in the present literature: Underestimating the outcomes when a pregnant woman in poor health chooses to receive more antenatal care and overestimating the consequences when a healthy and trained woman chooses to receive superior quality treatment because of her previous experience with the potential benefits of prenatal care. It's also worth noting that PNC is a good predictor of HD demand, as PNC-related medical help allows women to choose safer and more effective childbirth. As a result, the approach is recursive, and we must utilize a joint estimation methodology; else, our estimation findings would be incomplete and imprecise.

4. Results & Discussion:

4.1 Summary Statistics

Summary results show different background information of women who gave birth in the four years preceding the survey. We found that around 85 percent of the mothers are between the ages of 18 and 30 years old, while approximately 13 percent are under the age of 18. The demand for maternal health care is directly connected to education levels. And according to the data, almost 31% of women are illiterate, only 15% have completed elementary schooling, 45% have completed secondary, and only 9% have higher education. Approximately 76 percent of mothers are unemployed, except for their household job, and only 22 percent of mothers work and get paid. We also found that approximately 6% of pregnancies terminated in miscarriage and 3% ended in abortion. 39 percent of mothers did not seek prenatal care, and 25 percent did not use hospital delivery (public or private). We found that 72 percent of women are Hindus, 15 percent are Muslims, and 12 percent are Christians. Regarding wealth distribution, approximately 35% of mothers are impoverished, whereas 20% and 44% of the population are from middle-income and higher-income classes, respectively. The data showed that a great bulk of the population

resides in rural areas (76 percent) compared to urban areas. Furthermore, given that a child's birth order is a crucial predictor of demand for prenatal care and hospital delivery, we discovered virtually equal proportions of children born first, second, third, and so on.

Table 4.1: Summary statistics of the explanatory variables for the states of Bihar, Jharkhand, Odisha, and West Bengal in India

Variable	Percentage (%)	Mean	SD
State			
West Bengal	9.85		
Bihar	47.04		
Orissa	20.54		
Jharkhand	22.57		
Individual Characteristics			
Age of the women at survey			
<18 years	12.61	0.90	0.38
(18-30) years	84.53		
More than 30 years	2.87		
Termination of pregnancy			
Miscarriage	6.41	.14	.5
Abortion	2.63		
Stillbirth	0.92		
Normal delivery	90.04		
Women's education			
uneducated	31.23	1.32	1.01
Completed primary	14.61		
Completed secondary	44.93		
Higher education	9.23		

Mother's occupation			
unemployed	76.90	1.5	0.97
Professional/sales/technical	3.06		
Agricultural	13.20		
HH service/manual	6.84		
Household level characteristics			
Place of residence			
Rural	76.36	1.76	0.42
Urban	23.64		
Religion			
Hindu	72.25	1.39	0.69
Muslim	15.77		
Christian & others	11.98		
Standard of living			
Low	35.29	2.08	0.88
Good	20.48		
Very good	44.23		
Husband/partner education			
uneducated	18.39	1.60	0.92
Completed primary	14.57		
Completed secondary	54.24		
Higher education	12.80		
Husband/partner's occupation			
unemployed	4.29	3.15	0.89
HH service & Manual	32.34		
Agricultural	43.58		
Professional/sales/clerical/	19.79		

technical			
Caste/ Tribe			
SC	19.77	2.84	1.15
ST	21.04		
OBC	41.03		
General	18.15		
Child specific characteristic			
Birth order			
1 st order	37.06	.95	.93
2 nd order	30.69		
3 rd and more order	32.26		
Prenatal care			
No	39.43	.60	.49
Yes	60.57		
Place of delivery			
Others	24.69	.75	.43
Hospital	75.31		

4.2 Demand for Prenatal Care:

Table 4.2: Demand for prenatal care

Variable	Model -1(Exogenous)		Model -2(Endogenous)	
	Coefficients	Marginal effects of respective covariates	Coefficients	Marginal effects of respective covariates
State (W.B^{rc})				
Bihar	-1.1270*** (.06)	-0.4019	-1.1295*** (.06)	-0.4025
Odisha	-.0250 (.06)	-0.0047	-0.0192 (.07)	-.0054
Jharkhand	-.6172*** (.06)	-0.2271	-0.6690*** (.07)	-.2281
Place of residence (rural^{rc})				
urban	.0560 (.06)	0.0192	0.0566** (.05)	0.0194
Standard of living(low^{rc})				
Good	.1565*** (.04)	0.0545	.1585*** (.04)	0.552
Very good	.2478*** (.04)	0.0860	0.2507*** (.01)	0.0870
Women education(illiterate^{rc})				
Completed primary	0.1301*** (.04)	0.0462	0.1297*** (.04)	.0461
Completed secondary	.3183*** (.04)	0.1125	0.3177*** (.04)	0.1123
Higher sec & above	0.6696*** (.11)	0.2287	0.6639*** (.11)	0.2269

Birth order of the child(1st order^{rc})

2 nd order	0.2623*** (.03)	0.0890	0.2642*** (.03)	0.0896
3 rd & more	0.3228*** (.03)	0.1094	0.3244*** (.03)	0.1100

Age of the women(less than 18 years^{rc})

(18- 30) years	.0226 (.04)	.0078	0.0254*** (.04)	.0087
More than 30 years	0.2339* (0.13)	0.079	0.2291*** (.13)	.0780

Religion(Hindu^{rc})

Muslim	-.0263 (.04)	-0.0090	-0.0284*** (.04)	-.0097
Christian & others	-.0820 (.07)	-0.0282	-0.0880*** (.07)	-.0303

Husband/partner education(illiterate^{rc})

Completed primary	.0828* (.04)	.0288	0.0805** (.04)	.0280
Completed secondary & above	.1388*** (.04)	.0482	0.1372*** (.04)	.0476

Caste (Gen^{rc})

SC	-.0802 (.05)	-0.0276	-0.0782*** (.05)	-.0269
ST	-.0011 (0.06)	-0.0004	-0.0057 (0.06)	-0.0019
OBC	-.0226 (0.04)	-0.0077	-0.0234 (0.04)	-0.0080

Pregnancy termination (uncomplicated pregnancy^{rc})

Miscarriage	0.1168*	0.0400	0.1185**	0.0406
	(.06)		(.06)	
Abortion	.0095	0.0032	0.0137	.0496
	(.06)		(.06)	
Stillbirth	0.4023***	0.1347	0.4030***	0.1348
	(0.15)		(0.15)	
Constant	0.2337***		0.2329***	
	(.08)		(.08)	

*Note: rc= reference category; standard errors are within parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

We have already stated that exogenous estimation of co-efficient may either be underestimated or overestimated due to presence of some endogeneity in the differences in the value of the coefficient of regressors. The endogenous estimation technique takes care of this problem and produces the desired impact (see Table-4.2). From table- 4.2 we find that, women in Bihar and Jharkhand are nearly 40 percent and 23 percent less likely to receive prenatal healthcare than in West Bengal (W.B.), while in Odisha, women are more or less the same as in W.B. to go for an antenatal check-up. This could be due to the lack of different state- specific supply-side factors viz., availability of physicians, hospitals and physical proximity to prenatal care centres (in Bihar and Jharkhand), which, other than pure demand-side factors like knowledge and wealth of women, lower antenatal care utilization. So, the state variable employed here is a good predictor for the utilization of PNC in our analysis. We also find that, rural women are almost 02 percent less willing to seek prenatal services than the urban women. Since PNC is largely dependent on certain supply-side variables- like, the availability of physicians and hospitals, accessibility to PNC services, and infrastructural facilities- the place of residence, for this reason plays a significant role in PNC utilization as these facilities are expected to be relatively more concentrated in the urban areas. So, people living in urban areas generally enjoy most of these facilities, whereas rural women are deprived of such facilities. Women's degree of education is also a significant covariate in having prenatal care. Women who have completed secondary education and higher level of education are almost 23 percent more likely to use prenatal care than illiterate women. Education also affects the demand for PNC, as educated women experience comparatively more freedom of movement to see physicians or to contact health

workers. They often become more aware of the risks associated during and before childbirth, and hence they demand PNC to get rid of those unexpected complications. Next, we find that, the likelihood of utilizing PNC is 09 percent higher for those whose living standards are very good compared to those with poor living standards, while the same is 6 percent higher for those women who belong to families with a decent living standard. For religion, it was found that Muslims women are less likely to use PNC whereas Christian women are nearly 3% behind Hindus to utilize prenatal care. The potential explanations could be due to various social constraints, and we think education also plays a major role in it.

We have seen in previous studies that child's birth order decreases the possibility of obtaining counseling by the trained health worker. However our result shows that women with 3rd & more child are almost 11 percent more likely to go for PNC during pregnancy. This is because women with child-birth experience may not always be able to manage all unexpected circumstances during pregnancy (previous childbirths provide an opportunity to instill this idea), and complications faced before influence the decision to go for PNC services. That is why we see a positive relationship between the child's birth order and PNC demand. Similarly, women whose pregnancies ended due to abortion and miscarriage are around 4% more likely to seek prenatal treatment, and women who experienced stillbirth are 11 % more likely to utilize PNC compared to the one who has no such experience. This strengthens our argument, as previous failed childbirth increases instances of using PNC at later childbirths. Next, women over 30 years of age are about 09 percent more likely than younger women to go to prenatal care. The level of education of the husband is also significant for the use of PNC. The probability of using PNC by the pregnant woman has increased approximately by 5 % for those whose husbands have education over and above secondary level. We also found that the scheduled caste women are about 03 % less likely to seek prenatal care than the general category women.

4.3 Demand for Hospital Delivery

Table 4.3.: Demand for Hospital Delivery (HD)

Variable	Model -1(Exogenous)		Model -2(Endogenous)	
	Coefficients	Marginal effects of respective covariates	Coefficients	Marginal effects of respective covariates
PNC	.4166*** (.03)	.1292	.3773 (.98)	.1173
State (W.B^{rc})				
Bihar	-0.0035 (.07)	-0.0011	-.3252 (.42)	-.1029
Odisha	.4377*** (.08)	.1229	.4045*** (.11)	.1039
Jharkhand	-.2277*** (.07)	-.0741	-.4015* (.21)	-.1289
Place of residence (rural^{rc})				
urban	.1558** (.05)	.0461	.1603** (.05)	.0489
Standard of living (low^{rc})				
Good	.2028*** (.04)	.0636	.2331*** (.04)	.0755
Very good	.3263*** (.05)	.0997	.3742*** (.05)	.1176
Women education(illiterate^{rc})				
Completed primary	.0578 (.05)	.0184	.0913 (.06)	.0302

Completed secondary	.2414*** (.04)	.0740	.3152*** (.08)	.0998
Higher sec & above	.5806*** (.14)	.1627	.7308*** (.19)	.2063
Birth order of the child				
(1st order^{rc})				
2 nd order	-.3733*** (.04)	-.1092	-.2747* (.16)	-.0836
3 rd & more	-.5031*** (.04)	-.1515	-.3782* (.20)	-.1177
Age of the women(<18 years^{rc})				
(18- 30) years	.1143* (.04)	.0351	.1130*** (.04)	.0357
More than 30 years	.1686 (.14)	.0512	.02207*** (.15)	.0683
Religion (Hindu^{rc})				
Muslim	-.4373*** (.05)	-.1398	-.4140*** (.08)	-.1355
Christian & others	-.1129 (.08)	-.0342	-.1306* (.07)	-.0409
Husband/partner education (illiterate^{rc})				
Completed primary	.0830 (.05)	.0260	.1009** (.05)	.0327
Secondary & above	.1809*** (.04)	.0557	.2078*** (.04)	.0660
Caste (Gen^{rc})				
SC	-.1790** (.06)	-.0532	-.1880*** (.06)	-.0579
ST	-.3445	-.1057	-.3187***	-.1000

	(.07)		(.09)	
OBC	-.0753	-.0219	-.0630	-.0189
	(.05)		(.06)	
Pregnancy termination				
(uncomplicated pregnancy^{rc})				
Miscarriage	.1403**	.0413	.1645***	.0497
	(.07)		(.07)	
Abortion	.0771	.0230	.0693	.0213
	(.12)		(.12)	
Stillbirth	-.0890	-.027	.0316	.0098
	(.15)		(.22)	
Constant	.3307***		.7591***	
	(.09)		(.14)	

*Note: rc= reference category; standard errors are within parentheses; ***p<0.01, **p<0.05, *p<0.10.*

The coefficients and marginal effects of various independent variables for the demand for hospital delivery are given in table 4.3. Women belonging to Bihar and Jharkhand are approximately 10% and 13% less likely to deliver their child at a health care institution (e.g., hospital) than those belonging to West Bengal. On the other hand, Odishan women are nearly 10 percent more likely to go to the hospital to deliver their babies. Various socio-economic aspects, cultural and religious beliefs, educational preferences, and other things might all have a role. As in the case of PNC, here too, rural women are 5 percent less likely to take up institutional delivery compared to the urban women. Religion also tends to be a significant determinant of demand for hospital delivery. Muslim and Christian women are nearly 14% & 4% less likely than Hindu mothers to choose to deliver their child in hospital as in case of PNC. Education and living standards also played an important role, and induces the tendency to deliver child in a health facility. Women's age also plays a crucial role in utilization of hospital delivery. Women of over and above the 30 years of age are around 7 percent more likely than younger women to choose a hospital to deliver their child safely. This result contrasts interestingly with the results of Elo, 1992; Raghupathy, 1996; where younger women are more likely than older women to utilize institutional delivery, given their willingness to use modern medical services. But, as

older women face a lot of obstetric emergencies during childbirth and underlying disease like PCOS (Polycystic Ovary Syndrome) & PCOD (Polycystic Ovary Disorder)- overweight, uncontrolled blood pressure and sugar level, anaemia are some of the reasons which may aggravate these complications during pregnancy and can be life-threatening for the pregnant women and for her baby. So, hospital care is crucial as much as of younger women, and the older women, for these reasons may need specialist care and extended hospital stay. Also, a good indicator of the demand for maternal health care is women's education. Women with more than 10 years of schooling are about 09 % and 20% more likely to go to the hospital than illiterates. Women who belong to higher-income groups are around 12 percent more likely than the lower-income group to go to the hospital to deliver their baby. The likelihood of using hospital delivery facilities are about 12 percent more for the women who have taken PNC from trained health workers. Next, we find that, from the third child onwards (birth order 3 or higher), a woman's likelihood of delivering her child in a hospital is decreased by 12 percent relative to the first child. The possible reasons could be: financial obstacles increasing with higher birth orders, increased risk-taking tendency due to perceived gain in knowledge from previous births, and lastly could be due to family's negligence. But, women who have a history of pregnancy termination are more likely to utilize hospital delivery compared to women who have not undergone such complications. The caste system also plays a significant role in using maternal healthcare demands. Women who belong to the SC / ST group are 05 % and 10 % less likely to go to the hospital for childbirth than the general category.

5. Conclusion

The next generation's health depends on the well-being of both the mother and child. Hence, we need to be focused not only on institutional delivery but also on prenatal and postnatal care as the birth of a child takes place in this transition. For this, we have tried to find out a variety of socioeconomic factors that are expected to influence the demand for prenatal care and hospital deliveries. The application of joint estimation techniques helped to overcome the biased estimation which may arise due to unobserved factors. The demand for both maternal and newborn healthcare is significantly influenced by the mother's place of residence, standard of

living, and educational level. Other major indicators of the demand for maternal and newborn child healthcare include the mother's age, religious belief, and the child's birth order. Due to various state-specific reasons, women of Bihar and Jharkhand are found to utilize PNC and HD less, compared to the women of Bengal and Odisha. We hope these findings will help the policymakers in identifying areas where they should intervene for increasing the utilization of prenatal care and hospital delivery, to make the mother's and her child's life safer. The findings of this paper lead to a comprehensive suggestion of infrastructure development, increasing the availability of trained health workers and emphasizing women's educational attainment. The barriers to avail the care of health personnel and access to the education system can be removed by investing in infrastructure. The infrastructural development of schools and provision of mid-day meals might be beneficial to bring the girls student in school premises and hence the rate dropout of girls' student could be reduced. Also, the government should enact legislation that requires families to use the institutional child delivery system instead of depending on indigenous practices since this would significantly reduce maternal and neonatal mortality rates.

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