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Barriers of Maternal Health Seeking Behavior: A Bayesian Analysis

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Abstract

Health outcomes depend on availability of and actual usage of formal institutional facilities. In this context, perhaps the most primary decision from a patient's point of view is to seek institutional care. The present study attempts to delineate main barriers of maternal health seeking behavior from select villages of Assam, an Indian state exhibiting highest MMR in spite of relative improvement in supply side scenario. Using multistage and snowball sample techniques, 169 interviewees are selected which include mothers who have children aged 0-24 months, subjects who are pregnant as well as members of families that have experience of maternal death. Data is analyzed with a Bayesian logistic regression model. Our analysis posits that non-availability of ambulance and female health providers; ignorance and hesitation; long queue at facilities, non-availability of supporting persons at home and heavy workload are main barriers to maternal health seeking behavior. Policy wise, the paper highlights the areas in which scarce public money should be spent.

Keywords: Maternal health; Maternal mortality; Pregnancy; Treatment

Introduction

Globally, about 830 women die in a day from pregnancy and childbirth related complications [1]. At the country level, India accounts for one-third of all global maternal deaths (ibid). At the national level, state of Assam has the dubious distinction of highest maternal mortality ratio of 300 per 1,00,000 live births (SRS, GOI 2013). Since 1997-98, Assam has always been one of the top (above the 3rd quartile) Indian states with MMR. The trend of Assam vis-a-vis India can be shown in the following graph (Figure 1), and a comparison with selected states of India is shown in Table 1.

This persistently high MMR cannot be explained solely in terms of supply side constraints. If one compares data from 2007 (facility health survey) vis-a-vis District Level Household Survey (DLHS)-IV (2012-2013), one can see that the number of facilities have increased across all the districts of Assam (Table 2A). District Level Household and Facility Survey (DLHS) IV (2012-2013) of Assam reveals that number of government health institutions have been increasing in 2014 compared to those reported existing in 2007, i.e. DLHS III (Table 2B).

Such expansion of formal facilities is incompatible with high (relative) MMR, and therefore we look into other explanations. One key variable is, of course, the demand side (e.g. utilization pattern). DLHS III shows that among currently married women aged 15-44 years, 35.3% of women had institutional delivery and 40.9% have safe delivery including either institutional delivery or home delivery attended by skilled health personnel. Further, 74.8% receive the minimum antenatal care during pregnancy. The same source reveals that about 60.2% of women of Assam had faced complications during pregnancy. However, only 45% of such women, who had reported at least one complication of pregnancy, sought treatment from the formal system.

This implies poor utilization of reproductive healthcare services and a low status of healthcare seeking behavior. Based on the observations, we propose the hypothesis that ceteris paribus, poor maternal outcomes result from inadequate utilization of facilities. Low utilization, in turn, is caused by significant barriers to Maternal Health Seeking Behaviour (MHSB) at the micro level. The paper seeks to explore such barriers in a systematic way. Understanding Maternal Health Seeking Behavior (MHSB) (or lack thereof) in Assam is crucial for improving the outcome of pregnancy and childbirth and thereby unlocking a key element of its development potential.

States/Years	Assam	Bihar	Kerala	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal	India	Q1 (India)	Q3 (India)
1997-98	568	531	150	508	131	606	303	398	226.5	549.5
1999-01	398	400	149	501	167	539	218	327	192.5	450.5
2001-03	490	371	110	445	134	517	194	301	164	467.5
2004-06	480	312	95	388	111	440	141	254	126	414
2007-09	390	261	81	318	97	359	145	212	121	338.5

2010-12	328	219	66	255	90	292	117	178	103.5	273.5
2011-13	300	208	61	244	79	285	113	167	96	264.5

Table 1: Maternal mortality ratio in India in selected states (Per 1, 00,000 live births) [Source: Registrar General of India, Ministry of Home Affairs (SRS bulletins) Note: Q1 is the first quartile (25%); Q3 is the third quartile (75%)].

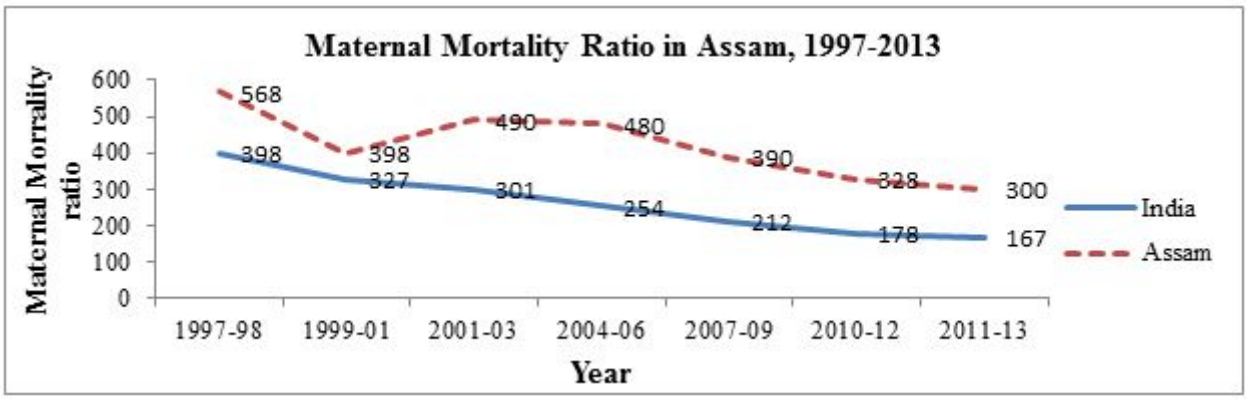

Figure 1: Maternal mortality ratio in Assam, 1997-2013 (Source: SRS reports).

PHC facilities	No. of PHC with facilities 07	No. of PHC with facilities 14
Medical officers	141	329
Lady Medical officers	29	119
ANM	146	359
Ambulance facility	60	175
Delivery services	63	186
Referral services	124	216

Table 2A: Availability of maternal care facilities at PHC in Assam between 2007 to 2014.

Health Institutions	DLHS IV	DLHS III
Community Health Center	214	83
Primary Health Center	375	195
Sub center	857	714

Table 2B: Number of health institutions in Assam as per DLHS III and DLHS IV.

Note that, such attempts have been made in different country or socio-economic contexts. For instance, Fenta et al. [2] suggests that maternal age, educational level, partner's attitudes towards health seeking care from doctors including the ignorance and lack of awareness about danger signs during pregnancy are major contributors to non-usage of maternal care services. Osubor et al. [3] showed that, in Nigeria, agents are more likely to prefer Traditional Birth Attendants (TBAs) due to greater accessibility, lower cost and more convenience. Further, local beliefs, perceptions, and knowledge of community members about maternal health problems also played an important role in MHSB. Koenig et al. [4] have examined MHSB in Bangladesh and identified that medical cost and socio-economic disparities are major factors. Tasnim et al. [5] in Bangladesh found that high cost, non-availability of drugs and beds, ignorance about complications, cultural norms and attitudes of health providers are major reasons for not availing health care services.

Jayaraman et al. [6] have revealed in Rwanda that the households with a female head and women with higher-order birth are less likely to access health care facilities. Further, supply side factors like availability, cost and quality of medical care also play an important role. Chomat et al. [7] in Guatemala have found poor utilization of maternal care services are caused by socioeconomic disparities, ethnic and linguistic differences, personal experience with health institutions and health providers, influence of husband and other family members. Benova et al. [8] has stressed that economic resourcefulness (household asset ownership, access to agricultural production and household consumption), and socio-cultural resourcefulness (woman years of education, literacy, male head of household occupational category, identity documents among members of the household) are positively associated with MHSB.

A limited number of similar studies are available for India. Navaneetham et al. [9] carried out their studies in Southern India (states of Andhra Pradesh, Kerala, Karnataka and Tamil Nadu). They showed that utilization pattern of maternal care varies due to variations in the implementation of maternal health care program and differences in availability and accessibility of the maternal services between the states as well. Agarwal et al. [10] examined the utilization pattern of maternal care in an urban slum in Delhi. Their results reflect that awareness and knowledge about maternity care and accessibility of modern maternity facilities have significant influence. Similarly, Mahapatro et al. [11] found that in Odisha, transportations and

financial constraints, community perceptions and attitudes towards maternity care, influence of elderly person and other family members are the major barriers and determinants of maternal seeking behavior. Bhattacherjee et al. [12] found that in tea gardens of Darjeeling district of West Bengal, ignorance and distance to health care institutions are main reasons for non-utilization of health care services. Srivastava et al. [13] showed that in Rohilkhand Region of Uttar Pradesh that mother's education and husband's occupation are the strong predictors of utilization of maternal health care services. Likewise, Tiwari et al. [14] showed that accessibility and availability of maternal care services increased the utilization of healthcare facilities in Madhya Pradesh.

A few case studies regarding utilization of reproductive healthcare are available in the context of Assam, or North East India in general. For instances, Khound et al. [15] in Jorhat district of Assam found that socio-economic barriers (such as: lack of awareness, financial constraint, does not think it as necessary) are the major factors in decreasing the utilization of these services. Another study was done by Mazumder et al. [16] among the Karbis of Guwahati city revealed that mother's education is positively related to awareness of antenatal care and place of delivery. Yet, to the best of our knowledge, very little attention has been given to figure out determinants of barriers of MHSB in Assam (or anywhere in North East India) in a comprehensive manner. Studies carried out by Khound (op. cit) and Mazumder (op. cit) are case studies with limited scope. The current paper provides broader perspectives and hence has more precise policy prescriptions. Based on Mackin et al. [17], we considered the following variables to be significant barriers to MHSB (Table 3).

Category	Barriers	Measures	Variables
Geographical	Distance and physical access	Far from home	FH
		Bad roads	BR
Organizational	Quality care	Doctors not responsive	DnR
		Non availability of ambulance	NAmb
		Non availability of Female health provide	NFhP
Cultural	Knowledge and perceptions	Husband restriction	HR
		Hesitation	Hesi
		Ignorance	Ign
Socio-economic	Social structure and economic cost	Cost of drugs	CoD
		Cost of transportation	CoT
		Long queue	LQ
		Non availability of person at home	NPaH
		Heavy workload	HW
		Income level	Y
		Age of marriage	AoM
		Land ownership	LO
		Literacy	Lit

Table 3: Framework for maternal health seeking behavior.

Our study finds that non-availability of female health providers and ambulance reduces the probability of maternal health seeking care. In addition, ignorance, hesitation, long queues at formal facility, non-availability of persons at home to taking care of pregnant women as well as heavy workloads are barriers to MHSB. The rest of the paper is organized as follows. Section 2 discusses methodology of data collection and statistical analysis. Section 3 focuses on maternal healthcare in sample areas and presents the result and interpretation of statistical analysis. Section 4 and 5 provides the interpretation and discussion of our results. Section 6 concludes the whole paper and offers some policy implications.

Methodology

Selection of the study areas and data collection

Since secondary data (for example, DLHS IV data regarding utilization pattern in Assam) is non-existent, we carried a primary survey in order to get more insight about barriers to MHSB.

The survey was carried out in eight villages of four districts of Assam that are identified by multi-stage sampling. By using stratified sampling methods, all districts under four Administrative Divisions of Assam have been arranged as highest to lowest based on maternal mortality ratio (MMR) for the period of April 2013 and March 2014. This helps us to identify four districts with highest MMR. From each

district, we have selected that Block Primary Health Centres (BPHC), which have reported the highest maternal death. Finally, as per reference with the Medical Officer (MO) from selected BPHC, two villages from each BPHC (total 8 villages) are selected purposively for carrying out the survey. The details are in Table 4.

District	Maternal Mortality Rate in Districts	Name of BPHC	Maternal Death at BPHC	Name of Village
Kamrup	230.1539	Chhaygaon	7	Muhimari, Patgaon
Dibrugarh	413.3103	Barbaruah	86	Janzimukh, Lepetkatta TE
Sonitpur	297.3435	Biswanath Chariali	14	Kadamani, Sakumato TE
Cachar	516.6315	Sonai	10	Motinagar, Silcoorie TE

Table 4: Selected districts and villages of Assam based on highest maternal mortality ratio reported in the period of 2013-2014.

Employing snowball sample techniques, we interviewed the following from each sample village

- Currently pregnant women
- Mothers who have children aged 0-24 months
- Members of a family that has experienced of maternal deaths.

We interviewed 169 subjects. The survey period was September 2014 to February 2015 with the reference period of 365 days preceding the date of the survey. The objective of the questionnaire was to obtain information on maternal health status and in-depth information on maternal deaths cases; socio-demographic characteristics of subjects; reproductive history as well as their attitude towards reproductive health and utilization of the maternal services from the health system. Our primary focuses being the socio-economic and cultural.

Maternal Healthcare in Surveyed Area

Maternal health outcome

It is clear from the Table 5 that along with the maternal deaths cases, there are reported cases of high-risk pregnancy and other complications during pregnancy. High-risk pregnancy is associated with conditions like preterm labour, preeclampsia, edema and problems with uterus and placenta. Complicated pregnancy refers to problem such as severe lower abdominal pain, vision problem, severe nausea, swelling of body etc. during pregnancy.

Maternal Outcome	No.	(%)
Maternal deaths	17	10.1
High risk pregnancy	29	17.2
Complications	27	16
Normal pregnancy	96	56.8
Total pregnancy	169	100

Table 5: Maternal health outcome at study villages (Source: Field data 2014-2015).

Socio-economic characteristics

Table 6 provides the detailed profile of the socio-economic and demographic characteristics of the respondents.

Socio-economic variables	No.	Percentage (%)	Socio-economic variables	No.	Percentage (%)
Age at Marriage			Family structure		
>18	28	16.6	Nuclear family	101	59.8
19-29	121	71.6	Joint family	68	40.2
Above 30	20	11.8			
Literacy			Housing condition		
Illiterate	88	52.1	Kutcha	139	82.3
Literate	61	36.1	Pucca	20	11.8
Only sign	20	11.8	Semi-pucca	10	5.92
Birth order			Drinking water facilities		
1	66	39.1	Pump tube well	92	54.4
2 to 3	76	45	Well	38	22.5
4 to 5	22	13	Pipe water	30	17.8

6 to 7	5	2.96	Stream water	9	5.33
Haemoglobin level			Income level		
<7	29	17.2	Below average	110	65.1
7 to 9	67	39.6	Above average	59	34.9
10 to 12	73	43.2	Average income	39615. 38	

Table 6: Selected socio-economic variables (N=169) (Source: Field data 2014-2015).

Utilization of maternal health care services

Figure 2 depicts the selected maternal health care services in the studied areas. The coverage of full antenatal care (those women who completed their three trimesters of pregnancy till the date of survey) is only 57%. The figure also shows that the institutional delivery (women who delivered till the date of survey) in studied villages is less than 80 %. Further, the use of contraceptive methods among studied population is also found very low i.e. only 11%.

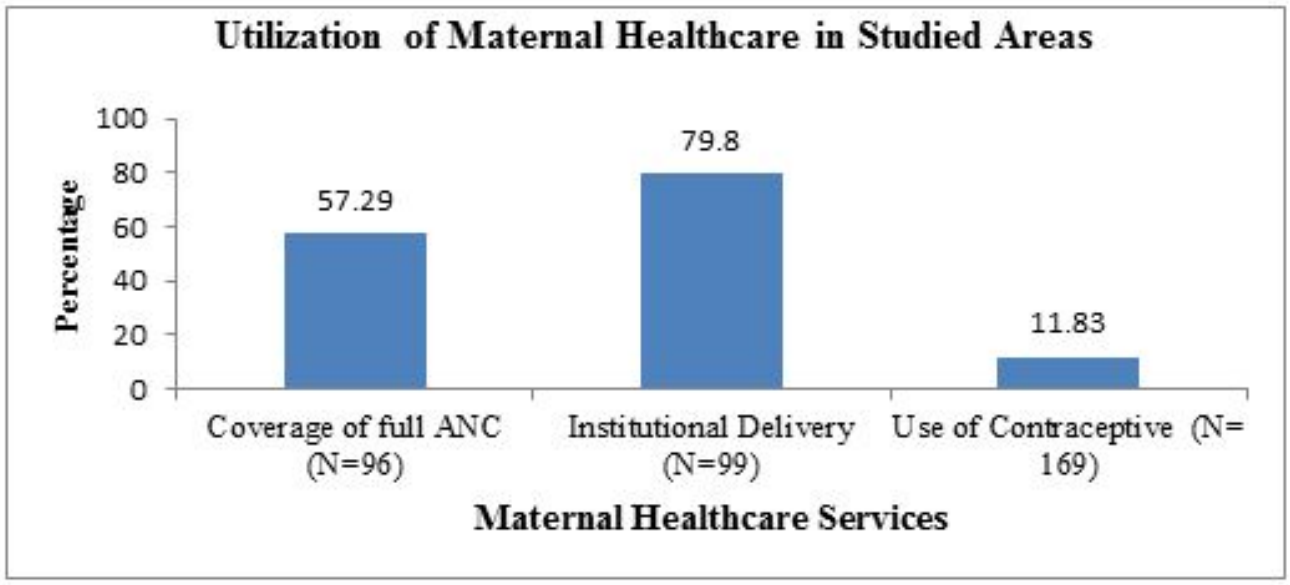

Figure 2: Utilization of maternal healthcare in studied areas (Sources: Field data 2014-2015).

Occupational profile

Occupational distribution is shown in Figure 3. This figure reflects that daily wage labour is the main source of the income of the larger sections of the sample households and very few are engaged in cultivation, own farming and business.

Apart from the socio-economic characteristics of the studied villages, interviews with pregnant women and health providers highlighted that although the pregnant women are familiar with the use of available facilities of sub-centre at the village level. On the other hand, they ignore referral advice provided by ANM's to seek medical help from nearby health institutions with better facilities.

Bayesian Logistic Regression

To assess the association of the outcome variable namely Not Seeking Care (NSC) with the selected independent variables one proceeds with standard logistic model:

$$\text{Logit}(NSC_i) = \alpha + \beta_1(GEO_i) + \beta_2(ORG_i) + \beta_3(CUL_i) + \beta_4(SOCECO_i) + \mu_i \quad (1)$$

In the left-hand side of the equation, NSCi denote the response of i^{th} respondent regarding decision to seek care. It is a dummy variable such that NSC=1 implies "not seeking care" and zero otherwise. In the right-hand side of equation (1), α is the constant; β is the vector of coefficients and the independent variables are Geographical parameters (GEO), Organizational parameters (ORG), Cultural parameters (CUL) and Socio-economic parameters (SOCECO) which are coded as 1 for "if the factor causes problem in accessing health facilities" and zero otherwise. However, the parameters included in SOCECO land ownership, income level and age of marriage have continuous values (Table 7).

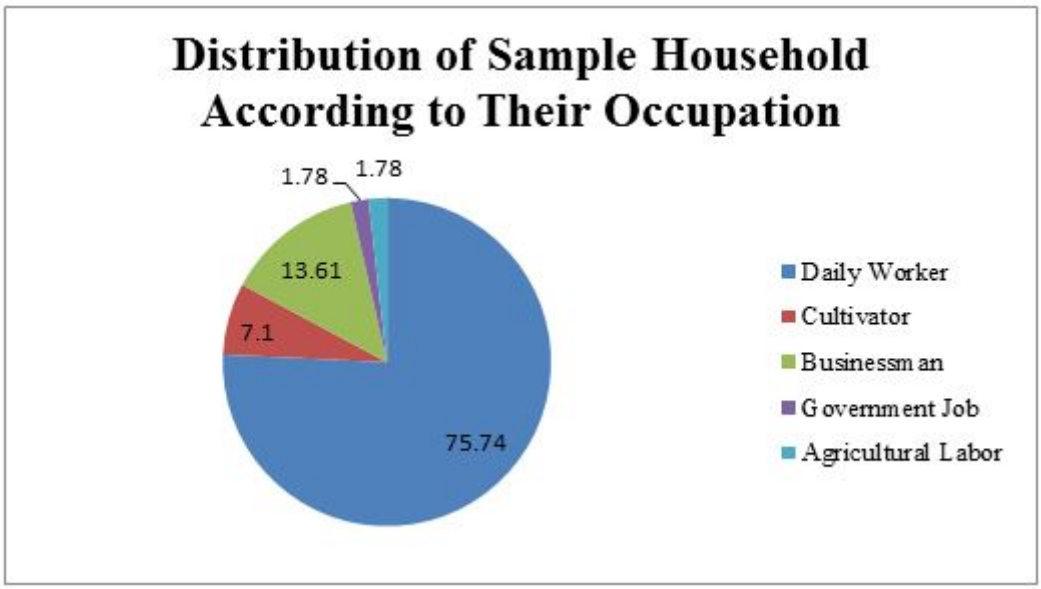

Figure 3: Distribution of sample household according to their occupation (Sources: Field data 2014-2015).

Measures	Variables	Mean	Std. Dev	Min	Max
Not seeking care	NSC	0.64497	0.47994	0	1
Far from home	FH	0.02959	0.16995	0	1
Bad roads	BR	0.00592	0.07692	0	1
Doctors not responsive	DnR	0.01183	0.10846	0	1
Non availability of ambulance	NAmb	0.02959	0.16995	0	1
Non availability of female health provides	NFhP	0.15385	0.36187	0	1
Husband restriction	HR	0.02959	0.16995	0	1
Hesitations	Hesi	0.05325	0.22521	0	1
Ignorance	Ign	0.0355	0.1856	0	1
Cost of drugs	CoD	0.11834	0.32397	0	1
Long queue	LQ	0.26627	0.44332	0	1
Non availability of person at home	NPaH	0.14201	0.3501	0	1
Heavy workload	HW	0.04734	0.21299	0	1
Literacy	Lit	0.39053	0.48932	0	1
Land ownership	LO	0.61462	1.09151	0	5.61
Income level	Y	39615.4	19011.9	10000	145000
Age of marriage	AoM	18	3.27872	12	28

Table 7: Descriptive statistics of the variables influencing maternal health seeking behavior.

Given the data set, a standard logistic regression cannot be estimated because of complete separation problem. The outcome variable separates a predictor variable or a combination of predictor variables completely. This result in very large standard errors the maximum likelihood estimate fails to converge [18-22]. In order to

circumvent the problem, our analysis applies the Bayesian approach to logistic regression [20,22-24].

To estimate such model by using M-H Markov Chain Monte Carlo algorithm and credible intervals, we have used Jeffreys' (uninformative) prior. For the sampling process in the MCMC method, burn-in of 5,000 iterations with MCMC sample size of 12,000 and finally total 17,000 MCMC iterations were selected for the posterior inference, which is accurate and efficient with higher effective sample size (ESS) of all the parameters. Use of MCMC method produces some level of autocorrelation. To evaluate statistical efficiency of such methods, effective sample size is calculated, which is the number of effectively independent samples from the total number of posterior samples.

Low ESS relative to MCMC sample suggests convergence problem. In this analysis, due to low ESS, income level and age at marriage are excluded. The detail of the effective sample size table is presented in Table 8 in Appendix. The acceptance rate of the Metropolis-Hastings algorithm is 43% out of 12,000 MCMC sample size where average efficiency is 13%. We have used the 95% highest probability density (HPD) region for each parameter in the model.

ESS	Corr. time		Efficiency
Seeking care			
Far from home	2113.61	5.68	0.1761
Bad roads	2709.58	4.43	0.2258
Doctors not responsive	1941.9	6.18	0.1618
Non-Availability of ambulance	2158.74	5.56	0.1799
Non-Availability of female health provider	1357.69	8.84	0.1131
Husband restriction	2125.13	5.65	0.1771
Hesitation	1587.17	7.56	0.1323
Ignorance	1973.57	6.08	0.1645
Cost of drugs	1896.86	6.33	0.1581
Cost of transportation	1511.27	7.94	0.1259
Long queue	1123.91	10.68	0.0937
Non availability of person at home	1873.47	6.41	0.1561
Heavy workload	1729.66	6.94	0.1441
Land ownership	1313.51	9.14	0.1095
Literacy	787.4	15.24	0.0656

Table 8: Effective sample sizes of all variables.

Another important component of Bayesian inference is comparison of two models, say M1 and M2 which provides support for a model over another based on the Bayes' factor. The present analysis compares three models with three different prior distributions to find the one that best fits the data. In the first model (base l), we have considered normal prior with a fixed variance. Secondly, we compute the second model with uninformative prior and informative prior. For former one, we have used uninformative priors. To construct informative priors, we uses the information obtained for N~(μ, σ) from the former to replace the uninformative distributions N~(0, 1).

We add one final note regarding choice of variables to increase the parsimony of our model. It could be the case that many of the responses regarding different variables are not independent. If two variables are not independent, then we drop one of them.

We surmise that the following variables might be dependent:

- Far from home; Bad roads; Non-availability of ambulance; Cost of transportation.
- Unresponsive doctors, Non-availability of female health provider; Husband restriction; Hesitation; Ignorance
- Long queue; Non-availability of person at home; Heavy workload

Note that it could be the case that one group of variables (e.g. Organizational/Geographical) can have spillover effect on other group of explanatory variables (e.g. Cultural/Socioeconomic).

We performed Chi-square test for independence of variables.

Results are summarized in Tables 9-11. The results show that:

- Cost of transportation (as barrier of MHSB) is not independent to perception of roads and non-availability of ambulance are dependent. However, the latter two are independent (at least, the null could not be rejected). Therefore, we have dropped the variable Cost of Transportation, since its effect is likely to be captured in other two.
- Similarly, husband restriction is not independent to unresponsive doctors and non-availability of female health provider. Surprisingly, husband restriction is related to organizational factors, not hesitation

or ignorance. We have removed husband restriction and keep both organizational variables in our subsequent analysis.

- For the third group of variables, we could not reject the null of no independence. Hence, all of those are kept in subsequent analysis.

Variables	FH	BR	NAmb	CoT
Far from home (FH)	0	0.9	0.69	0
Bad roads (BR)	0.9	0	0.86	0.6
Non-availability of ambulance (NAmb)	0.7	0.9	0	0.3
Cost of transportation (CoT)	0	0.6	0	0

Table 9: Chi-squared (p-value): Variable group 1.

Variables	DnR	NAFhP	HR	Hesi	Ign
Doctors not responsive (DnR)	0	0.8	0	0.74	0.8
Non-availability Female health provider (NAFhP)	0.8	0	0	0.19	0.9
Husband restriction (HR)	0.01	0	0	0.59	0.7
Hesitation (Hesi)	0.74	0.19	0.6	0	0.6
Ignorance (Ign)	0.79	0.93	0.7	0.55	0

Table 10: Chi-Squared (p-value) test: variable group 2.

Variables	LQ	NAPaH	HW
Long queue (LQ)	0	0.23	0.9
Non-availability of person at home (NAPaH)	0.2	0	0.2
Heavy workload (HW)	0.9	0.24	0

Table 11: Chi-squared test (p-value) variable group 3.

Results

Table 12 provides the posterior probability distribution. The result shows that parameters of geographical determinants like far from home (distance), bad roads (road conditions); unresponsive doctors (organizational factor) and cost of drugs, land ownership and literacy (socio-economic determinants) have no significant effects on predicting the health seeking behavior. On the other hand, out of four categories of determinants, the HPD intervals of the factors of cultural determinants; parameters of organizational category such as non-availability of female health providers, non-availability of ambulance and variables of socio-economic determinants like long queue, non-availability of person at home and heavy workloads represent significant barriers to MHSB in the surveyed villages at Highest Posterior Density (HPD) of 95% credible interval for all parameters.

Categories	Measures	Posterior Means	Std. Dev.	MCSE	HPD	
					(95% Cred. Interval)	
Geographical	FH	1.3669	2.6288	0.055	-3.604	6.777
	BR	0.1478	3.0012	0.058	-5.603	6.171
Organizational	DnR	1.7078	2.5192	0.0532	-3.188	6.531
	NAmb	3.6275	1.9804	0.0396	0.0696	7.856
	NFhP	4.9924	1.8831	0.046	1.3603	8.68
Cultural	Hesi	5.4343	1.6388	0.0355	2.3477	8.701
	Ign	5.494	1.6705	0.0388	2.438	8.833

Socio economic	CoD	2.3415	2.1767	0.0502	-1.562	6.869
	LQ	6.4431	1.5276	0.0361	3.5282	9.377
	NPaH	6.4397	1.4361	0.031	3.9396	9.366
	HW	5.5274	1.6628	0.0361	2.5754	8.961
	LO	-0.0406	0.3289	0.0092	-0.705	0.597
	Lit	-0.2451	0.8	0.025	-1.796	1.351

Table 12: Posterior distribution for binary logistic regression model in response to health seeking behavior in surveyed villages, (Not Seeking care=1, seeking care=0) (Base model) [Source: Authors' estimation based on field data (2014-2015); Note: The dependent variable is women choice between not seeking care and seeking care. Not seeking care is coded as 1, 0 otherwise. "C.I." means credible interval. Statistically significant factors have been highlighted].

Table 13 presents the results from the second model using the uninformative priors, and Table 14 presents results with informative priors. The HPD level of the both models show that the effects of organizational parameters such as non-availability of female health providers; cultural determinants like hesitation and ignorance; and socio-economic determinants like long queue, non-availability of person at home and heavy workloads remain significant in these models. However, road conditions (geographical factor) in model of uninformative priors and non-availability of ambulance facilities (organizational factors) are significant in model of informative priors. The difference in results in Tables 13 and 14 indicates that the prior information regarding the mean and standard deviation of the parameter has an impact on the estimates.

Categories	**Measures**	**Posterior Means**	**Std. Dev.**	**MCSE**	**HPD**	
					(95% Cred. Interval)	
Geographical	FH	-3.7332	2.078	0.0557	-7.912	0.2081
	BR	-7.3065	2.3921	0.0588	-11.88	-2.469
Organizational	DnR	-3.0179	2.0642	0.0661	-7.065	0.9737
	NAmb	0.142	1.608	0.0384	-2.848	3.4049
	NFhP	5.707	1.7233	0.0597	2.303	8.9809
Cultural	Hesi	2.9595	1.158	0.0264	0.7871	5.2609
	Ign	2.9975	1.1156	0.024	0.8452	5.2511
Socio-economic	CoD	0.1339	1.436	0.0406	-2.498	3.0767
	LQ	4.9284	1.1346	0.0316	2.9163	7.2242
	NPaH	4.2514	0.9917	0.0218	2.5328	6.3405
	HW	2.9993	1.119	0.0245	0.8938	5.274
	LO	-0.0611	0.2624	0.0074	-1.591	0.4498
	Lit	-0.4774	0.5857	0.0176	-1.591	0.6883

Table 13: Posterior distribution for binary logistic regression model with uninformative priors in response to health seeking behavior in surveyed villages (Not Seeking care=1, Seeking care=0) [Source: Authors' estimation based on field data (2014-15)].

Categories	**Measures**	**Posterior Means**	**Std. Dev.**	**MCSE**	**HPD**	
					(95% Cred. Interval)	
Geographical	FH	2.0207	2.667	0.0542	-2.777	7.657
	BR	0.0427	3.0411	0.0576	-6.205	5.666

Organizational	DnR	2.2889	2.5527	0.0551	-2.603	7.246
	NAmb	4.1578	2.1078	0.0437	0.1621	8.235
	NFhP	5.2331	1.9747	0.0441	1.4814	9.004
Cultural	Hesi	5.8137	1.7912	0.0392	2.5277	9.28
	Ign	5.7952	1.648	0.0345	2.955	9.303
Socio-economic	CoD	2.8301	2.3509	0.0515	-1.593	7.367
	LQ	6.7153	1.5714	0.0352	3.8688	9.863
	NPaH	6.7932	1.537	0.0356	4.1089	9.937
	HW	5.7867	1.6602	0.0357	2.9572	9.136
	LO	-0.1884	0.8004	0.0246	-1.776	1.359
	Lit	-0.1884	0.8004	0.0246	-1.776	1.359

Table 14: Posterior distribution for binary logistic regression model with informative priors in response to health seeking behavior in surveyed villages (Not Seeking care=1, seeking care=0) [Source: Authors' estimation based on field data (2014-2015)].

Computation of Bayes factor indicates that the uninformative prior model performs worse than other two models. The value log (BF) 4.98 provides strong evidence in favor of the informative priors' model. Thus, the informative priors model (Table 14) is the best fit among the three (Table 15).

Variables	DIC	log(ML)	log(BF)
Uninformative Priors	68.2116	-133.27	-99.5461
Informative Priors	27.9266	-28.743	4.98422
Base Model	31.3606	-33.727	-

Table 15: Bayes factor of the considered models [Note: Marginal likelihood (ML) is computed using Laplace-Metropolis approximation].

Analysis based on our sample thus demonstrates that non-availability of female health provider and ambulance facilities increase the probability of not seeking care for maternal health. Similarly, this probability tends to increase in presence of hesitation and ignorance (which is quite intuitive).Additionally, long queues in hospital, non-availability of person at home and heavy workload are significant barriers to MHSB.

Discussion

Barriers of maternal health seeking behavior

The result of posterior probabilities indicates that out of four broad categories of determining factors of MHSB, the parameters of geographical factor (distance and road conditions) have no significant effects on shaping MHSB among studied population. Previous studies such as Gleia et al. [25] and Chomat et al. [7] also have found similar results, suggesting that accessibility might not necessarily translate into increased utilization of services if these facilities are lacking of essential infrastructure.

In the context of organizational determinants, non-availability of female health providers has significant effects on discouraging person to seek maternal healthcare from health facilities. It may be the case that respondents are not comfortable to share their reproductive problem with male doctors. This observation is consistent with observation from Schepper et al. [26] Singh et al. [27] and Qureshi et al. [28]. Our study also indicates that non-availability of ambulance at the time of emergency is a critical factor. The respondents argued that they do not have financial resources to afford a vehicle in a short notice. Further, other than the delivery of a baby, ambulance services are not free for the patients. Frequently they use bicycle, but it is not convenient during last trimester or with newborn. This result of our study also found consistent with findings from the studies of Ruth et al. [29] and Munguambe et al. [30].

The parameters of cultural determinants namely hesitation and ignorance have a strong influence on MHSB. Such factors have a large impact on shaping wider health seeking behavior [9,31]. Ignorance and hesitations for maternal healthcare during pregnancy are common factors that develop due to cultural practice and beliefs [2,12,32].

Other factors such as long queue in hospital, non-availability of helping persons at home and heavy workloads are found to be significant. About 26 percent of respondents want to avoid standing in a long queue. Heavy household responsibilities prevent women from visiting health institutions for regular checkup. Pregnant women do not want to stay longer in health institutions after her delivery (required for minimum time frame is 48 hours after delivery), because of non-availability of attendants in the hospitals, cost of lodging and

foods of attendants. Similar result has found in studies of Yiran et al. [33] and Simkhada et al. [34]. Our study has also identified that patients often do not find any person to accompany her to the hospitals at the time of emergency or for a regular check-up in the last month of her pregnancy: husbands are not available at home during daytime and neighbors are busy with their daily household activities.

Conclusions

The paper has discussed the factors influencing MHSB of the population in selected districts of Assam based on the primary data collected from field observations. The results indicate that the MHSB of an individual is influenced by

- Organizational factors such as non-availability of female health providers and ambulances.
- Cultural factors viz. ignorance, hesitations and
- Socio-economic factors such as long queue, non-availability of persons at home, heavy workloads.

To be sure, sometimes distinctions between the various factors are blurred, or point to some other problems. Long queue, for example, can be result of inadequate provision of medical facility compared to number of patients. Non availability of female health providers could be a problem with organization as well as a cultural factor. Cultural factors point to a social setting where the "value" of women is less as a person due to (already entrenched) patriarchal biases. Such patriarchal biases work through heavy workload which nobody is willing to share because the workload is a "woman's job and duty" at the same time.

As Millennium Development Goals (2000-2015) unraveled, one distinct pattern emerged. It is comparatively easy to make progress where a material change is required: for example, providing safe drinking water or reducing poverty. However, shortfalls do remain where the target includes a significant behavioral change. The same parallel can be drawn in case of our survey. Provision of adequate, low cost and quality healthcare, tracking and monitoring pregnant women throughout pregnancy, improvement in connectivity etc. although difficult, are not insurmountable hurdles for government. The main challenges are probably poverty coupled with women's "perceived" place within a patriarchal society.

Apart from regular awareness camps, a tentative prescription is substantial social insurance targeted to the patients. This may help to increase the value of women and prove beneficial in long run. However, Central Schemes like Janani Suraksha Yojana (JSY) are inadequate and ineffective to an extent. A report on assessment of JSY in Assam during 2007 revealed that the cash assistance under JSY to pregnant women is not sufficient to cover all the expenses for institutional delivery. Further, the report also suggested for improving the quality care at PHC and sub-centre to provide services to normal deliveries, making payment on time to JSY beneficiaries, proper arrangement for transport facilities (CORT) [35]. Moreover, to encourage people to seek medical help, ensuring availability of physical infrastructure and female health providers, community level awareness and maternal education are much needed. This will help the population to upgrade their knowledge and perception towards women reproductive health issues. Broad conclusions from the study can be strengthened with a survey which must be covering more districts and more participants [36-42].

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