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Public Health Insurance and Maternal Health Care Utilization in India: Evidence from a 2005-2012 Mothers' Cohort Study

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Abstract

Background: Janani Suraksha Yojana (JSY), a conditional cash transfer program in India, incentivized women to deliver at institutions and resulted in a significant increase in institutional births. Another major health policy reform, which could have influenced maternal and child health care (MCH) utilisation, was the public health insurance scheme called Rashtriya Swasthya Bima Yojana (RSBY) launched in 2008. However, there is lack of evidence on how RSBY impacted MCH utilisation in India. This study investigated the impact of health insurance (in particular, the public insurance scheme versus private insurance) on a continuum of MCH utilisation. We also investigated whether maternal empowerment was a significant correlate that affects MCH utilisation.

Methods: The study used a multilevel mixed effect ordered logistic regression modelling, using a cohort of mothers whose delivery was captured in both the 2005 and 2011/12 rounds of the Indian Human Development Survey (IHDS). We derived indexes for women's empowerment using Principal component analysis (PCA) technique applied to various indicators of women's autonomy and socio-economic status.

Results: Our results indicated, mothers' MCH utilization levels vary by district, community and mother over time. The effect of the public insurance scheme (RSBY) on MCH utilisation was not as strong as privately available insurance. However, health insurance was only significant in models that did not control for household and mother level predictors. Our findings indicated that maternal empowerment indicators – in particular, maternal ability to go out of the house and complete chores and economic empowerment - were associated with higher utilization of MCH services. Among control variables, maternal age, education and household wealth were significant correlates that increase MCH service utilization over time.

Conclusions: Change in women's and societal attitude towards maternal care may have played a significant role in increasing MCH utilisation over the study period. There might be a need to increase the coverage of the public insurance scheme given the finding that it was less effective in increasing MCH utilisation. Importantly, policies that aim to improve health services for women need to take maternal autonomy and empowerment into consideration.

Background

India has made significant progress in reducing maternal mortality ratio, which decreased from 370 to 145 per 100,000 live births between 2000 and 2017 [1]. This remarkable achievement can be attributed to the country's concerted effort during the Millennium Development Goal (MDG) era to increase women's access to maternal health services, in particular the initiative to increase institutional births [2]. Institutional births (both at public and private institutions) rose from 35 percent in 2005 to 79 percent in 2016 [3]. However, the rate of maternal mortality decline was inadequate to meet the global MDG target and India is still a significant contributor to global maternal deaths. Indeed, India has the second highest number of maternal deaths in the world, second only to Nigeria, accounting for 12% of global maternal

deaths in 2017 [4]. Projections indicate that India is off track to meet the sustainable development goals (SDG) target for maternal mortality ratio of 70 deaths per 100,000 live births by 2030 [5].

The renewed commitment to reduce maternal and infant mortality ratios under the SDG and the amount of resources the government is investing to improve maternal and child health outcomes underscore the need to understand the dynamics of maternal and child health care utilization beyond simply focusing on institutional births. Encouraging women to give birth in health facilities, where the delivery will be assisted by a skilled birth attendant, has been an important global strategy to reduce maternal and perinatal deaths in low- and middle-income countries [6-8]. Pregnant women require professional attention not only during the period of delivery but throughout the pregnancy and postnatal period. Evidence supports that, while most of the deaths during childbirth and post-natal period are due to preventable causes, institutional birth on its own does not provide adequate support to prevent maternal deaths due to pregnancy complications [9-11]. What is needed is the continuum of care [12] for maternal, newborn and child health whereby pregnant women are provided with antenatal care leading to institutional delivery, which is then followed by postnatal care for both mother and child.

The Indian government in 2005 rolled out a conditional cash transfer program – known as Janani Suraksha Yojana (JSY) - to increase pregnant mothers' access to maternal and child healthcare services with the aim of reducing maternal and neonatal mortality [13]. The program was implemented across 18 high-focus and 10 low-focus states, which were distinguished based on differences in economic and maternal and child health (MCH) indicators. Under the JSY program, pregnant women were given cash incentives to deliver in institutions. All pregnant women in high focus states were eligible to receive 1400 Indian rupees upon delivery while women below the poverty line and those belonging to scheduled castes and tribes in low focus states were eligible to receive 1700 Indian rupees [7]. Women below the poverty line (who had registered under the program) would also receive 500 Indian rupees to deliver at home with the assistance of trained professionals. Moreover, female community health workers (known as Accredited Social Health Activists (ASHA)) were paid to facilitate antenatal checkups, immunization of newborn babies and postnatal visits [14]. The program was designed to address inequality in access to maternal and child health care by mitigating financial barriers that thwarted poor women from accessing institutional care [15].

Several studies evaluating the JSY program had concluded that the program had been successful in increasing institutional births in India [16, 17]. However, there is evidence that inequality in institutional births has persisted [15] and that the level of maternal healthcare utilization, especially among the poor, continues to remain low. Saradiya and Singh [7] suggested that recipients of JSY still incur a significant out-of-pocket expenditure on maternal care despite the objective of the program to reduce the financial burden on poor pregnant women. Vellakkal et.al. [14] similarly argued that '….*the cash incentive played a lesser role in motivating the people to opt for institutional delivery care because of the higher associated opportunity costs*' (p. 61) including expenses on food and transport and forgone spousal wages. A study assessing maternity expenditure in India using data from 2014 found that the average spending on maternity care was ten times higher than the amount obtainable under JSY scheme [18]. High cost is a

major deterrent to service utilization among the poor [19, 20] and out-of-pocket expenditure may impose catastrophic burden on poor households further plunging them into poverty [21].

Given that out-of-pocket payments to finance healthcare could be catastrophic to poor households [18, 21], World Health Organisation (WHO) has identified universal health coverage as a key strategic priority for achieving equity in access and utilisation of healthcare. Following this both developed and developing countries around the world while have adopted UHC in different forms depending on their socio-cultural context and the stages of economic development. They use different financial mechanisms such as: private health insurance, public health insurance, social health insurance, community health insurance or a mixed of all or different combinations of health insurance schemes for achieving UHC. Historically India has adopted different mechanisms in different sectors however, the first pan Indian tax based public health insurance scheme: Rastriya Swasthya Bima Yojana (RSBY) was rolled out in 2008. RSBY is mandated to cover all territories of India and occupational groups [22] with the aim to protect poor Indian households from financial risks due to hospitalization. The insurance covers secondary inpatient care provided at community health centers, district hospitals, and medical colleges. Only poor households "Below the Poverty Line (BPL)" are covered under the insurance and they can receive up to 30000 Indian rupees (per annum) for hospitalization. Malhi et.al. [23] note that out of 65 million families who had been targeted for coverage, 41 million had enrolled by September 2016.

This study investigated if the introduction of RSBY in 2008 as a pan-Indian health insurance scheme improved the overall utilization of maternal and child healthcare (MCH) services in terms of improving their access to the 'continuum of care' for maternal, newborn and child health. Against the backdrop of significant improvement in institutional births during this period, the study cross-examined if pregnant women in 2012, compared to 2005, had improved in utilizing a wider coverage of antenatal care leading to institutional births, followed by postnatal care for both mother and child. The period of study (2005 - 2012) also coincided with the rolling out of the JSY scheme, which was intended to boost institutional births and women's engagement with maternal care services. While this study did not have information on those women who had accessed JSY, it is highly likely that JSY would have influenced institutional births during this period. We used information on women who gave birth both before and after the introduction of the RSBY. RSBY covers maternity benefits and all expenses related to delivery at the hospital, including transportation charges of 100 rupees paid to the beneficiary [24]. In particular, hospitals will be paid 2500 rupees for natural delivery and 4500 rupees for C-section delivery, but prenatal expenses are not covered under the scheme. The maternity benefits may encourage more women to take-up institutional births. Moreover, if the scheme reduces the household overall out-of-pocket expenditure on healthcare (which was the goal of the government in rolling out the public insurance scheme in the first place), then it would help pregnant women (enrolled in the program) to cover expenses related to antenatal care and other MCH services which are not covered by RSBY. Whereas the literature is rife with articles analyzing the effect of the JSY cash transfer program on maternal care [14-16], the effect of the public health insurance (RSBY) on MCH service utilization has not been investigated. Studies on RSBY have mainly focused on patterns of enrollment to the insurance scheme, its utilization and effect on out-of-pocket expenditure of households [20, 22-25].

We used the 2005 and 2011-2012 rounds of the Indian Human Development Survey (IHDS) for our analysis. An important difference between the two rounds of the IHDS was the introduction of the RSBY insurance scheme across India. The insurance and financial assistance schemes available in 2005 included private insurance schemes, various public sector schemes offered to employees, specific state government insurance schemes offered to residents in their states, and other schemes focussed on specific groups (such as JSY for pregnant women). RSBY was added on top of these various schemes in 2008. We matched women who had given birth before each of the two survey rounds to examine how health insurance had influenced their utilization of MCH services over time. Since the publicly funded health insurance scheme was not rolled out until 2008, those women whose delivery was recorded in the 2005 round had not benefitted from RSBY. However, the 2005 IHDS data captured if surveyed households had availed themselves of private health insurance. Our analysis was intended to show if health insurance, in general, has been a significant factor in increasing women's MCH utilization and, in particular, if the public insurance funded by the government has been effective compared to private health insurance.

Another objective of the paper was to investigate the relationship between maternal and child health care utilization and empowerment of women. The wider literature showed that giving women more decision-making power in the household leads to better educational and health outcomes for children since women have been shown to allocate more household resources towards children [26-31]. Similarly, we would expect empowered women to utilize more MCH services given their role as primary caregivers of children. However, women continue to have little household decision-making authority in many developing countries including India. We constructed indexes to measure empowerment of women using principal component analysis and determined the extent to which changes in maternal empowerment have affected MCH utilization.

Our study combined three indicators of maternal and child health outcomes – institutional births, antenatal and postnatal checkups – and examined how the behavior of women in accessing these services have changed over time. It is important to study how MCH utilization has changed over time in India, especially in the era when the Indian government has invested considerable resources in the sector, including launching the conditional cash transfer program (JSY) and rolling out a public health insurance scheme (RSBY) to incentivize women to access MCH services.

Data And Methodology

Data source: The 2005 and 2011-12 survey rounds of the Indian Human Development Survey

The Indian Human Development Survey (IHDS) is a nationally representative survey covering 41,554 households in 2005 and 42,152 households in 2011-12. The 2005 survey consisted of 26,734 rural and 14,820 urban households while the 2011-12 survey covered 27,579 rural and 14,573 urban households. Both the rural and urban samples were drawn following a stratified random sampling technique. There

were a panel of 40,018 households surveyed in both 2005 and 2011-12 rounds [32, 33]. The surveys collected information on a range of topics including household and family structure, consumption and standard of living, social and cultural capital, income, education, employment, health and gender relations. There were also a set of questions on fertility history and preferences of women including questions on the status of women in the household such as their freedom of mobility and involvement in household decision making. The dataset provides a unique opportunity to study the dynamics of maternal and child health care utilization in India due to its panel structural component. Detailed information about survey sample design and implementation are contained in Desai et al. [34].

For our analysis, we identified mothers who had given birth in the two survey periods covered in the IHDS. In particular, the women's questionnaire had detailed questions about children born in the few years preceding the two surveys. For example, the 2005 survey had questions about children born 'since January 2000', while the 2011-12 survey asked similar questions of children born 'since January 2005'. The type of questions asked in the survey pertained to place and type of delivery, whether the mother had antenatal and postnatal checkups, complications during the pregnancy, breastfeeding and immunization, presence and type of insurance and so forth [34]. We were able to identify 4,289 mothers who had given birth both in the 2000-2005 and 2005-2012 periods, allowing us to compare changes in maternal and health care service utilization across the two survey rounds.

Outcome Measure: Maternal and child health care utilization

The first indicator used in our study to measure maternal and child health care (MCH) utilization was whether the mother had delivered at an institution. The relevant question in the IHDS survey questionnaire asked mothers '….at what kind of place…' they had delivered, and they had to choose between the following answers: i) Government hospital or clinic; ii) private nursing home; iii) Home; and iv) others. We considered a mother to have had institutional birth if she had delivered at government hospital or clinic or private nursing home. The second indicator of maternal and child health care utilization used in the study was the number of antenatal checkups the mothers had received during their pregnancy. The aim of antenatal care (ANC) is to identify and manage obstetric complications, such as pre-eclampsia, and infections, such as HIV and other sexually transmitted infections (STIs). Tetanus toxoid immunization and intermittent preventative treatment for malaria during pregnancy (IPTp) are also administered during ANC visits. Moreover, ANC presents with the opportunity to promote institutional delivery and healthy practices such as breastfeeding, early postnatal care and birth spacing [35]. WHO [36] guidelines on maternal and neonatal care suggested that pregnant women should receive at least four antenatal care (ANC) visits prior to delivery. However, WHO recently upgraded its recommendation to at least 8 ANC visits. Therefore, in our study, we considered four to be the minimum number of ANC visits pregnant women should receive. The third indicator was whether the mother had postnatal checkups (for herself and her child). The postnatal period is crucial for the lives of mothers and their newborn babies since lack of appropriate care during this period could result in serious illness or even death [37]. Postnatal care

involves systematic review of the health of the mother and baby and provision of appropriate advice to the mother. The recent guidelines by WHO [37] recommended having the first postnatal contact within 24 hours of birth followed by at least three more postnatal checks on day 3, between days 7-14, and six weeks after birth. The IHDS questionnaire didn't ask mothers about the number of postnatal checkups they have had, although there is a question on 'how soon after birth…..did you first get a checkup?'. For our study purposes, we used the question that asked mothers if '…a doctor or other health professional…' had checked their health or that of their baby in the 2-month period after the delivery. Having had a postnatal checkup completed by a doctor or health professional was considered as appropriate indicator of MCH utilisation.

For our analysis, we created an outcome variable that combined all three indicators above, given that, improving maternal and child health outcomes requires not only that women deliver in institutions but that they receive appropriate antenatal and postnatal care. Our categorical outcome variable – MCH utilization- was coded as zero – if a mother does not meet any of the three indicators – i.e. she did not deliver at an institution; she had less than four ANC visits; and didn't receive any postnatal checkup. The MCH utilization was coded as 1 – if the mother meets the best outcome in only one of the indicators above. For example, a mother had delivered at an institution but didn't have the minimum recommended number of ANC visits and had no postnatal checkup. Similarly, a mother who had a minimum of 4 ANC visits but didn't deliver at an institution and had no postnatal checkup received a score of 1 as well. The MCH utilization- was coded as 2 – if the mother meets the best outcome in two of the indicators above. For example, a mother had delivered at an institution and received 4 ANC visits but had no postnatal checkup. A mother who had delivered at an institution and had postnatal checkup but didn't receive 4 ANC visits also received a score of 2. The MCH utilization- was coded as 3 – if the mother meets the best outcome in all three indicators above, that is, she had delivered at an institution; she had received 4 or more ANC visits; and she had postnatal checkups. Therefore, our categorical outcome variable is ordered in nature and ranges from 0 (where the mother does poorly under all three indicators) to 3 (where the mother meets the best outcome for all three indicators).

Exposure and Confounding Variables

Our main exposure variable in this study was the household health insurance coverage status, assessing whether the household had benefitted from health insurance in the five years prior to the survey [33]. The health insurance variable captured only private health insurance in 2005 (since the publicly funded health insurance RSBY hadn't been rolled out) but included both private and public insurance in 2011-12.

Besides the mother's self-assessed health status used as a confounder, our study controlled for a range of other confounders, which were believed to affect women's utilization of MCH services in the wider literature. Maternal age is one of the variables that has been controlled for in the literature (see for instance [38, 39]). If older women are more influenced by tradition, then they may be less likely to access MCH services. Alternatively, women may be more likely to utilise MCH care with age as they gain more

experience and become more informed about maternal and child health [39]. Maternal educational attainment is another variable which has been shown to be a significant correlate of healthcare utilization with educated mothers more likely to access MCH care services [40-42]. Household size and number of children may adversely affect women's utilisation of MCH care "due to excessive demand of their money, time and other resources" [43] (p.3). Household economic status was measured using quintile of consumption per capita as well as by the below poverty line status. Poor household economic status has also been associated with low use of health care services in the literature. Nwosu and Ataguba [44], for example, found that rich women had more ANC visits than poor women in Nigeria. Similar patterns were observed in Ghana [45]. Arthur [46] noted that economically better off women would be in a better position to utilize ANC and other services because they would be able to afford expenses related to using these services.

On the important role that women's empowerment plays in accessing MCH services, Chol et al. [47] found that there was a statistically significant but weak association between measures of women's autonomy and utilisation of maternal health care services across 31 sub-Saharan African countries. Haider et al. [48], on the other hand, concluded that women's autonomy was an important correlate of maternal healthcare utilisation in Bangladesh with more autonomy associated with increased utilisation of MCH services. Moreover, Mohanty and Gebremedhin [31] found that having an empowered mother, with the ability to move around independently and more exposure to the outside world, significantly raised the probability of childbirth registration.

We assessed women's empowerment in our study using 11 indicators found in the dataset to be common to both survey rounds (and not heavily affected by missing values). Principal component analysis applied to these indicators led to three different underlying factors which we have named as: mother's bargaining power (first component); mother's autonomy (second component); and mother's lack of freedom or restriction of movement (third component). The mother's bargaining power was mostly explained by questions pertaining to whether the mother is involved in decisions on what to cook; how many children to have; what to do when children fall sick; whom children should marry; and decisions to buy expensive items. The mother's autonomy was mostly explained by questions pertaining to whether the mother can go alone to a health centre; can go alone to visit a friend; and whether she goes out with the husband or children to cinema or restaurants. The mother's restriction of movement was mostly explained by questions pertaining to whether the mother needs permission to visit a health centre; and whether she needs permission to visit a friend. One indicator, pertaining to whether the wife's name is on the ownership papers or rental agreement of their property, didn't load into any of the three factors and was considered as a separate covariate. The set of variables grouped under each factor, their rotated factor loadings (pattern matrix) and unique variances are presented in tables 1 and 2 below.

Table 1
Mother's bargaining power, autonomy, and restriction of movement: Rotated factor loadings (pattern matrix) and unique variances – 2005 round

Variables	Factor 1: Mother's bargaining power	Factor 2: Mother's autonomy	Factor 3: Mother's restriction of movement	Unique variation in variables
1. Mother has most say or decides jointly on what to cook on a daily basis	0.511	0.321	0.148	0.614
2. Mother has most say or decides jointly on purchasing expensive item	0.850	0.101	0.159	0.243
3. Mother has most say or decides on number of children she has	0.771	-0.007	-0.045	0.403
4. Mother has most say or decides jointly on what to do if a child falls sick	0.759	0.191	0.153	0.364
5. Mother has most say or decides jointly to whom her children should marry	0.861	-0.015	0.181	0.226
6. Mother can visit Health Centre alone	0.102	0.556	-0.258	0.614
7. Mother can visit relative/friend alone	0.072	0.883	0.281	0.136
8. Mother goes out with husband for meals, cinema	0.049	0.849	0.286	0.194
9. Mother does not need permission/must inform to visit Health Centre	0.204	0.281	0.865	0.131
10. Mother does not need permission/must inform to visit relative/friend	0.085	0.161	0.931	0.100
Note: We have used Factor analysis with method: principal-component factors, rotation: orthogonal varimax (Kaiser off) and have retained 3 factors.				

Table 2
Mother's bargaining power, autonomy, and restriction of movement: Rotated factor loadings (pattern matrix) and unique variances – 2011/12 round

Variables	Factor 1: Mother's bargaining power	Factor 2: Mother's autonomy	Factor 3: Mother's restriction of movement	Unique variation in variables
1. Mother has most say or decides jointly on what to cook on a daily basis	0.528	0.098	0.163	0.685
2. Mother has most say or decides jointly on purchasing expensive item	0.832	0.103	0.104	0.287
3. Mother has most say or decides on number of children she has	0.753	0.114	0.008	0.420
4. Mother has most say or decides jointly on what to do if a child falls sick	0.822	0.127	0.143	0.288
5. Mother has most say or decides jointly to whom her children should marry	0.852	0.021	0.163	0.247
6. Mother can visit Health Centre alone	0.044	0.507	-0.509	0.481
7. Mother can visit relative/friend alone	0.118	0.875	0.204	0.179
8. Mother goes out with husband for meals, cinema	0.079	0.870	0.257	0.171
9. Mother does not need permission/must inform to visit Health Centre	0.268	0.225	0.839	0.174
10. Mother does not need permission/must inform to visit relative/friend	0.057	0.259	0.876	0.163
Note: We have used Factor analysis with method: principal-component factors, rotation: orthogonal varimax (Kaiser off) and have retained 3 factors.				

Statistical Methods

As mentioned earlier, women's empowerment measures were assessed using the Principal component analysis (PCA) technique applied to various indicators of autonomy/restriction, decision-making status and bargaining power. Since these indicators were all on a categorical scale as opposed to a continuous scale, PCA was based on estimated polychoric correlation coefficients among all selected indicators [31].

Women’s maternal and child health care services (MCH) utilization changes over time and the impact of insurance status were assessed using multilevel modelling approach, allowing us to consider the hierarchical and nesting structure in our data (clustering), thereby, enabling to estimate individual heterogeneities, as well as heterogeneities between clusters in which individuals are nested in, using specific random components at each level of analysis [49].

For this hierarchically structured data, surveyed women were nested within households, which in turn were nested within communities. Pregnant women living in the same communities are subjected to similar enabling factors or barriers that affect their utilization of maternal and child health care services than women living in other communities [31]. Similarly, communities were nested within districts which means pregnant women living in the same districts would face similar policy and health care infrastructures than women living in other districts. It has been established that individual, community and district level factors were important in explaining maternal health care service use in India [50]. Moreover, previous studies in the Indian context have found significant disparities in MCH service coverage and efficiency in service delivery across districts in India [51, 52].

Given the ordered nature of the response or dependent variable, we used multilevel mixed-effects ordered logistic regression models to estimate changes in maternal and child health care service utilization in India between 2005 and 2012 [53]. We have considered village (community entity) and district level variations in maternal and child health care utilization as random effects in the multilevel modelling. Our models also included a random effect at the women’s level to take account of changes in the behavior of the same mother across time (repeated measures).

The first step in our modelling was to fit a null model to mothers’ maternal and child health care (MCH) utilisation ordinal scores with an intercept term and random effects at the district, village and mother levels, but without any explanatory variables (Model 0). Model 0 (or variance components model) allowed to estimate the various sources of variability (variance components: district, village and mother) and to partition the total variance into the four levels of hierarchy (district, village, mother and within mother’s repeated measures residual variance). Notice that, according to Steele [54], level 1 residual variance (which capture the within-mother differences between 2005 and 2011-12) is 1 for a probit model and 3.29 for a logit model.

Six subsequent models were fitted to the data, all including random effects at the district, village and mother levels. Model 1 controlled only for year of survey as a specific fixed-effect factor. Model 2 added to Model 1 the Health insurance status as the main exposure factor, while Model 3 included the interaction between 'year of survey' and 'health insurance' to Model 2 to capture the differential due to health insurance in 2011-12 round compared to 2005. In Model 4, maternal empowerment variables (i.e. mother's bargaining power; maternal autonomy; Restriction on maternal movement; Having name on rental/property document) were added into Model 3, while Model 5 added the interaction between 'year of survey' and 'maternal empowerment variables' to Model 4. The final model, Model 6, considered Model 5

(but with only those interaction terms between 'year of survey' and 'maternal empowerment variables which were significant) and added household and mother's level covariates.

Estimated coefficients were reported along with associated 95% confidence interval. Log-likelihood and Wald Chi-square statistics were also reported. All the analyses were performed using Stata 16 (Statacorp, USA).

Descriptive statistics

Tables 3 and 4 below present the descriptive statistics of variables. We can see that the optimal MCH utilization (all 3 indicators used) rose from 16.1% in 2005 to 24.8% in 2011/12 indicating that access to maternal and child health care services had increased over the 2005 – 2012 period. Similarly, the percentage of households who had access to health insurance increased from a mere 1.7 percent in 2005 to over 10 percent in 2011/12. The average household size and percentage of households holding Below Poverty Line (BPL) cards were similar across the two time periods. Nor was there much difference between the average years of schooling indicating that mothers hadn't gone for additional years of schooling between 2005 and 2012.

However, the proportion of institutional delivery had significantly increased from 45.4 percent in 2005 to 63.1 percent in 2012. The incidence of having four or more antenatal checkups had similarly gone up from 39.3 percent to approximately 46.8 percent during the study period. There was also a remarkable increase in the proportion who had received postnatal visits, which rose from 34.1 percent in 2005 to 66.6 percent in 2012.

The average scores for the maternal empowerment indicators, mother's bargaining power and autonomy, had increased pointing out that mother's socioeconomic status within the household had improved during the period. There was also a fall in mother's restriction of movement showing improvement in mother's freedom to go out of the house.

Table 3
Descriptive statistics 2005

Variable	Mean/Proportion	S. D.	Min.	Max.
MCH utilization outcome				
MCH = 0 (none of indicators)	0.369	0.482	0	1
MCH = 1 (only one indicator)	0.243	0.429	0	1
MCH = 2 (only 2 indicators)	0.228	0.420	0	1
MCH = 3 (all 3 indicators)	0.161	0.367	0	1
Household has Insurance				
No	0.983	0.130	0	1
Yes	0.017	0.130	0	1
Household size	6.556	2.715	2	22
Below Poverty Line (BPL) status				
No	0.617	0.486	0	1
Yes	0.382	0.486	0	1
Maternal characteristics				
Mother's Age (years)	25.489	4.938	15	48
Mother's Education (years)	4.695	4.793	0	15
Total Children born	2.311	1.662	1	11
Health status of mother (%)				
Good or very good	0.692	0.461	0	1
Ok	0.272	0.445	0	1
Poor or very poor	0.035	0.184	0	1
Indicators of MCH Utilisation				
Place of Birth (%)				
Non-Institutional delivery	0.546	0.497	0	1
Institutional delivery	0.454	0.497	0	1
Antenatal visits (%)				
Three or less	0.606	0.489	0	1
Four or more	0.393	0.489	0	1

Postnatal visits (%)				
No visits	0.658	0.474	0	1
Had visits	0.341	0.474	0	1
Maternal empowerment indicators				
Mother’s bargaining power	0.139	0.254	-0.250	1.336
Mother’s autonomy	0.731	0.484	-0.214	1.421
Mother’s restriction of movement	-0.054	0.401	-0.844	1.420
Mothers’ name is on rental/ownership document				
No	0.908	0.289	0	1
Yes	0.092	0.289	0	1

Table 4
Descriptive statistics 2011/12

Variable	Mean/Proportion	S. D.	Min.	Max.
MCH utilization outcome				
MCH = 0 (none of indicators)	0.119	0.324	0	1
MCH = 1 (only one indicator)	0.301	0.459	0	1
MCH = 2 (only 2 indicators)	0.332	0.471	0	1
MCH = 3 (all 3 indicators)	0.248	0.431	0	1
Household has Insurance				
No	0.897	0.304	0	1
Yes	0.103	0.304	0	1
Household size	6.397	2.308	2	22
Below Poverty Line (BPL) status				
No	0.656	0.475	0	1
Yes	0.344	0.475	0	1
Maternal characteristics				
Mother's Age (years)	32.106	4.701	20	56
Mother's Education (years)	4.777	4.741	0	15
Total Children born	3.690	1.803	2	15
Health status of mother (%)				
Good or very good	0.792	0.406	0	1
Ok	0.134	0.341	0	1
Poor or very poor	0.074	0.262	0	1
Indicators of MCH Utilisation				
Place of Birth (%)				
Non-Institutional delivery	0.369	0.482	0	1
Institutional delivery	0.631	0.482	0	1
Antenatal visits (%)				
Three or less	0.532	0.499	0	1
Four or more	0.468	0.499	0	1

Postnatal visits (%)				
No visits	0.333	0.472	0	1
Had visits	0.666	0.472	0	1
Maternal empowerment indicators				
Maternal bargaining power	0.216	0.299	-0.240	1.345
Maternal autonomy	0.903	0.412	-0.127	1.324
Maternal freedom of movement	-0.170	0.314	-0.598	0.976
Mothers' name is on rental/ownership document				
No	0.882	0.322	0	1
Yes	0.117	0.322	0	1

Results

Our first model (Table 5) fitted a four level variance components multilevel ordered logistic regression model to mothers' maternal and child health care utilisation ordinal scores. As shown in Table 5, the likelihood ratio test statistic is highly significant showing that the four-level model is a better fit to the data than the single-level model. Likelihood ratio tests further confirm that the four-level model is more preferred than three-level models or two-level models.

Thus, the odds of mothers' MCH utilization levels vary by district, community and mother over time and these variations needed to be considered in the analysis. Indeed, a decomposition of the total variance indicates that the between-district variance (level 4 residual variance) is estimated as 0.393, the within-district-between-villages variance (level 3 residual variance), on the other hand, is 0.389, while the within-villages-between-mothers variance (level 2 residual variance) is 1.312. Therefore, variance partition coefficients (VPC) showed that differences at the district level accounted for 7.3% of the total variation in MCH care utilization odds whereas differences at the community level accounted for 7.2% of the total variation. On the other hand, differences between mothers accounted for 24.4% of the variation, with the remaining 61.1% attributable to within mother differences across the two survey years. Thus, most of the variation in MCH care utilization was observed at the maternal level and our most comprehensive model below will control for maternal level predictors.

Table 5
Null model with district, community and mother random effects

	Coefficient (S.E)	95% Confidence Interval
Between District variance	0.393 (0.109)	(0.228, 0.677)
Between Community variance	0.389 (0.067)	(0.278, 0.545)
Between mother variance	1.312 (0.122)	(1.093, 1.575)
/cut 1	-1.410 (0.102)	(-1.610, -1.209)
/cut 2	0.197 (0.100)	(0.001, 0.393)
/cut 3	1.913 (0.105)	(1.706, 2.120)
Log likelihood = -9992.640 LR test vs. ologit model: chi2(3) = 654.49 Prob > chi2 = 0.0000		
Note: LR chi2(1)=70786.87 (Prob > chi2 = 0.0000) & LR chi2(1)= 87.86 (Prob > chi2 = 0.0000) are likelihood ratio test statistics from comparing the four level model with three level models with random effects at the community & mother levels, and random effects at the district and mother levels, respectively		

Results in Table 5 contain as well three estimated threshold points (or cut-offs) which allow to differentiate adjacent levels of mother's MCH. For instance, if a mother's estimated logit value is -1.410 or less, then she will be classified in the "no MCH service utilisation" category, while if a mother's estimated logit value is greater than 1.913, then she will be classified in the category of those utilising "all MCH services". The cut points may be used to determine the probability that mother's MCH utilisation will take on a given level of service utilisation. The first threshold point indicates that 80.4% of women recorded at least one MCH service used, implying that only 19.6% did not use any single service (i.e., no institution delivery, less than four ANC visits, no postnatal checkups). On the other hand, the second threshold indicates that 45.1% of women used at least two MCH services, while the third threshold indicates that only 12.9% of women used all the 3 MCH services available (i.e., they delivered at an institution, had at least four ANC visits, and received postnatal checkups).

Table 6 below presents results from estimation of six multilevel ordered logistic regression models with predictors, all allowing for random effects at the district, village and mother levels. The first column of results (Model 1) indicated that MCH utilization levels had significantly increased between 2005 and 2011-12. The odds of attaining a higher MCH utilization level increased by almost four-fold over the period of study (from 2005 to 2012). The second model controlled for year of survey and whether the household had benefited from health insurance schemes. The odds ratios associated to both year of survey and health insurance schemes were statistically significant. The odds of being in a higher MCH utilization level increased by 49% for those mothers from households with health insurance (either private or public). The third model included an interaction term between survey wave and health insurance, in

addition to the variables controlled for in model 2, which enabled to compare the impact of health insurance on MCH utilization levels before and after the publicly funded insurance scheme came into existence. The odds ratio associated to the interaction term indicated that the effect of health insurance on MCH service utilization in 2011-12 was 0.42 times weaker compared to 2005. In particular, our estimates showed that the odds of attaining higher MCH utilization levels increased by 3-fold for mothers who had (private) health insurance in 2005, whereas the corresponding figure for 2011-12 was 1.3 times.

Model 4 included variables that control for empowerment of women. We could see from the results that three of our indicators - mother's autonomy, restriction on mother's movement and the mother having her name on property documents – were highly significant correlates of MCH service utilization. Mother's bargaining power was also significant, but only at the 10% level of significance. Maternal autonomy had the strongest impact in terms of magnitude followed by the mother having her name on property documents. We investigated if the effect of women's empowerment on MCH service utilization had changed over time by interacting year of survey with women's empowerment components in our model 5. The results indicated that the effect of maternal autonomy on increasing MCH utilisation weakened significantly over the 2005 – 2011/12 period. For example, a one-unit increase in the maternal autonomy index led to 2.6-fold increase in the likelihood of attaining higher MCH service utilisation level in 2005 compared to 1.4-fold increase in 2011-12. Conversely, restriction on maternal movement was shown to have a much stronger and significant impact in reducing MCH utilization in 2011/12 than in 2005. A one-unit increase in the maternal restriction of movement index resulted in a 49 percent decrease in the odds of attaining a higher MCH service utilisation level in 2011-12 compared to a mere 1.3 percent in 2005.

Our final model – Model 6 - controlled for a host of confounders at the maternal and household levels. The model also retained other variables included in model 5, in addition to those interaction terms between maternal autonomy and year of survey which were statistically significant. The year of survey or wave remained statistically significant with mothers in 2011-12 found to have a significantly higher odds of MCH service utilisation levels than mothers in 2005. However, the odds ratios associated to health insurance and its interaction with wave (or differential impact) were no longer statistically significant.

The host of confounders measured at the maternal and household level impacted the extent to which the mother's MCH service utilisation levels changed over time and the magnitude of the effect of health insurance on MCH service utilisation. Among these covariates, we could see that mother's age was a significant correlate positively associated with MCH service utilisation. Maternal education was also significant with mothers who have received more years of schooling more likely to utilize MCH services. Indeed, a one-year increase in maternal schooling was associated with a 16 percent increase in the odds of being in a higher MCH service utilization level. On the other hand, total children born was negatively associated with MCH utilization, decreasing the odds by 22 percent. It appeared from Model 6 that it was the number of children born, rather than household size, that was a significant predictor for maternal health care utilization.

Moreover, household consumption per capita was significant, the effect increasing with the quintile levels with mothers coming from higher quintiles more likely to utilize MCH services than mothers in the bottom quintile. For example, mothers coming from the top quintile were 2.5 times more likely to attain higher levels of MCH service utilisation than those in the bottom quintile, whereas those from the second quintile were 1.3 times more likely to achieve higher utilisation levels. Mothers from households that hold below poverty line cards (BPL) were also found to be more likely to access MCH services than those who do not possess BPL cards. Mother's health status, however, was not a significant correlate of MCH care utilization.

Lastly, results showed that, as we moved from Model 1 to Model 6, variance components decreased as we added more and more covariates, especially in Model 6, with the addition of household and mother's level predictors. Model 6 results suggested that these covariates play an important role in explaining all the three sources of variability in the ordered log-odds of MCH service utilisation.

Table 6
Multilevel ordered logistic regression with predictors

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Variables	**Odds Ratio (95% C.I.)**	**Odds Ratio (95% C.I.)**	**Odds Ratio (95% C.I.)**	**Odds Ratio (95% C.I.)**	**Odds Ratio (95% C.I.)**	**Odds Ratio (95% C.I.)**
Wave						
2005	Reference	Reference	Reference	Reference	Reference	Reference
2011-12	3.865*** (3.497 , 4.272)	3.762*** (3.398 , 4.165)	3.862*** (3.483 , 4.285)	3.492*** (3.106 , 3.928)	4.992*** (3.856 , 6.464)	6.674*** (5.104 , 8.727)
Health Insurance						
No		Reference	Reference	Reference	Reference	Reference
Yes		1.493*** (1.187 , 1.878)	3.100*** (1.761 , 5.454)	2.887*** (1.537 , 5.423)	2.805*** (1.495 , 5.264)	1.275 (0.668 , 2.434)
Wave*Health Insurance			0.418*** (0.226 , 0.774)	0.434** (0.220 , 0.858)	0.443** (0.225 ,0.875)	0.886 (0.444 , 1.767)
Mothers age						1.026*** (1.010 , 1.043)
Mothers education						1.155*** (1.136 , 1.175)
Total Children born						0.781*** (0.744 , 0.822)
Household size						0.995 (0.970 , 1.021)
Consumption per capita Quintile						
First quintile						Reference
Second quintile						1.289***

			(1.085 , 1.531)
Third quintile			1.718*** (1.430 , 2.065)
Fourth quintile			2.324*** (1.911 , 2.825)
Fifth quintile			2.529*** (2.027 , 3.157)
Mother's health status			
Good or very good			Reference
Ok			0.922 (0.794 , 1.071)
Poor or very poor			1.028 (0.800 , 1.322)
Holds Below Poverty Line card			
No			Reference
Yes			1.167** (1.029 , 1.324)
Mother's bargaining power (MBP)	1.236 * (0.999 , 1.529)	1.100 (0.793 , 1.524)	1.172 (0.950 , 1.446)
Mother's autonomy (MA)	2.031*** (1.769 , 2.332)	2.576 *** (2.153 , 3.081)	2.294*** (1.896 , 2.776)
Mother's restriction on movement (MRM)	0.791*** (0.667 , 0.938)	0.987 (0.799 , 1.219)	1.020 (0.814 , 1.279)
Wife's name on			

rental/property document						
No				Reference	Reference	Reference
Yes				1.449*** (1.196 , 1.757)	1.276* (0.955 , 1.706)	1.276** (1.056 , 1.542)
Wave *MBP					1.179 (0.773 , 1.799)	
Wave *MA					0.557*** (0.427 , 0.726)	0.507*** (0.389 , 0.662)
Wave *MRM					0.517*** (0.367 , 0.729)	0.676** (0.482 , 0.948)
Wave * Wife's name on rental/property					1.184 (0.806 , 1.738)	
B/n District variance	0.556 (0.326 , 0.948)	0.570 (0.335 , 0.970)	0.559 (0.329 , 0.952)	0.527 (0.302 , 0.918)	0.526 (0.302 , 0.917)	0.136 (0.066 , 0.283)
B/n Community var.	0.508 (0.362 , 0.714)	0.508 (0.361 , 0.715)	0.501 (0.355 , 0.706)	0.443 (0.299 , 0.655)	0.428 (0.288 , 0.636)	0.109 (0.051 , 0.231)
B/n mother variance	2.167 (1.868 , 2.515)	2.179 (1.878 , 2.530)	2.165 (1.864 , 2.514)	2.158 (1.816 , 2.564)	2.101 (1.764 , 2.503)	1.019 (0.773 , 1.344)
/cut 1	-0.927*** (-1.164 , -0.690)	-0.917*** (-1.156 , -0.678)	-0.904*** (-1.142 ,, -0.667)	-0.283*** (-0.541 , -0.026)	-0.144 (-0.416 , 0.127)	0.804*** (0.335 , 1.272)
/cut 2	0.955*** (0.717 , 1.192)	0.971*** (0.731 , 1.211)	0.982 *** (0.744 , 1.221)	1.617*** (1.355 , 1.879)	1.752*** (1.476 , 2.029)	2.706*** (2.229 , 3.183)
/cut 3	2.912*** (2.657 , 3.167)	2.934*** (2.677 , 3.191)	2.943*** (2.688 , 3.199)	3.633*** (3.346 , 3.921)	3.763*** (3.463 , 4.063)	4.722*** (4.220 , 5.224)

Log likelihood	-9602.158	-9566.514	-9562.649	-8275.384	-8261.028	-6839.440
Wald chi2(1)	701.43	711.09	717.95	739.48	761.28	180.94
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000
Notes: ***, ** and * refer to significant effect at the 1 percent, 5 percent and 10 percent levels of significance respectively.						

Discussion

We investigated women's maternal and child healthcare (MCH) service utilization behavior and assessed the factors affecting the odds of being in high levels of service utilization in India over the 2005 – 2012 period using data from the Indian Human Development Surveys. All our models consistently indicated that mothers were more likely to access a wider set of MCH services in 2011-12 than 2005. This result is consistent with the various government initiatives and overall concerted effort to increase pregnant women's access to quality maternal health services in India since 2005 [11, 16]. Literature supports that institutional birth rates, for example, had sharply increased from 38% in 2005 to 74% in 2013 and this success was attributed to the conditional cash transfer program (JSY) launched in 2005 [13, 15, 55]. It was argued that the cash incentive offered under the program may have incentivized more women to take up institutional births [56, 57]. However, the role of the cash transfer in motivating women to access a wider set of maternity services defining the continuum of care during the period of pregnancy, childbirth and post-natal may not have been significant given that studies have established that JSY entitlements were not enough to cover out-of-pocket expenditures related to childbirth itself [14, 18].

The increased utilization of MCH services over our study period (2005 -2012) may reflect changing attitudes among women (and society) about the importance of professional care during pregnancy. A socio-cultural preference for home-based childbirth and viewing childbirth as a natural occurrence not needing professional assistance have been prevalent in India [14]. Garcia-Prado (p.96) [58] notes that "With respect to demand, the biggest challenge is to change behavioral patterns related to maternity and childbirth and promote the use of health services that can reduce maternal and neonatal deaths". There is evidence that Accredited Social Health Activists (ASHAs), who provide counselling to pregnant women and arrange for their care, have helped to change the society's attitude towards maternity care. Sidney et.al. [57] conducted in-depth interviews with women who had delivered in Madhya Pradesh and found that social norms about institutional births were changing in India and that pressure from ASHAs had helped to shape pregnant women's and societies attitudes.

Access to health insurance was shown to be statistically significant for MCH service utilization in Model 2 (all women in both survey rounds). Although in our models 3 – 5, the marginal effects in 2005 round were significant, the negative differential effects (i.e., the variable and its interaction with year of survey) between 2011-12 and 2005 rounds were strong and statistically significant. This shows that the public

insurance scheme (RSBY), mostly prevalent in 2011-12, didn't have as strong impact as privately available insurance in the market (in 2005) in encouraging women to access MCH services. Both 2005 and 2011-12 insurance marginal effects decreased and lost their statistical significance when adjusting for household and mother level covariates in our estimation (Model 6), suggesting that these covariates were more important in affecting the odds of high levels of MCH utilization than the insurance. Health insurance is expected to reduce the burden of costs associated to institutional births, ante- and post-natal services, encouraging more mothers to access MCH services [16]. Our finding that health insurance increased the odds of MCH utilization aligns with this expectation. However, our results indicated the marginal effect of health insurance on MCH service utilization is smaller in 2011-12 than 2005. As noted above, the health insurance variable captured the availability of private insurance in 2005 but included both private and public insurance in 2011-12. However, in 2011/12, out of 438 mothers who had health insurance, only 54 had private insurance. This means that the marginal increase in MCH utilization among those benefitting from the publicly available insurance scheme (2011/12) is less compared to those accessing private insurance (2005).

Studies have found that RSBY had not provided poor Indian families with any significant protection from financial risks and that families were still incurring significant out-of-pocket expenses for inpatient hospital care (which the public insurance scheme was meant to cover) [25]. More worryingly, there is evidence that the financial burden on disadvantaged groups such as scheduled castes and tribes had increased and that there was little to no change in their utilisation of health services in spite of the public insurance [20, 21]. The increase in out-of-pocket expenses may likely be a result of enrolled households utilizing hospital services either not covered by RSBY or beyond the stipulated RSBY cap [59]. It has also been pointed out that some hospitals requested patients to purchase expensive medicines from elsewhere [60]. The RSBY scheme has also been criticized for its poor strategies to targeting poor families noting that the BPL list which is used to enroll families into the program is notorious for excluding disadvantaged groups such as scheduled tribes, scheduled casts, agricultural laborers and landless households [20]. These drawbacks of the scheme may explain why the effect of RSBY has been found to be weaker in our study.

As noted above, the health insurance variable was no longer statistically significant when other household and mother level confounders were added into our model, implying that these other predictors (such as mother's age, education and household wealth quintile) were more significant in determining access to MCH services over time than health insurance in India. Indeed, our finding that more educational attainment leads to more utilization of MCH services is supported by other studies in the literature (see for instance, [6, 19, 61]). Education increases mothers' awareness of health-related information which makes them more predisposed to access MCH services [62]. Ali and Chauhan [61] also noted that "educational attainment is critical in imparting the feelings of self-worth and self-confidence which are critical in bringing the changes in health-related behavior" (p.9).

Moreover, our results indicated that mothers' utilization of MCH services decreases with total children born (but not household size). As the number of children born to a mother increases, there would be more

demand for the mother's time at home adversely affecting her utilization of MCH services [63]. The lack of time, due to household chores and other responsibilities, was one of the factors Joshi et al. [64] identified as barriers to MCH utilisation in Uttarakhand, India. Household wealth is another factor that has been identified in the literature as a significant correlate of MCH utilization [65, 66]. Our results indicated a clear increasing trend in the odds of reaching a higher MCH utilization level as we move from the lowest to the highest quintiles of consumption per capita. Mothers from lower consumption quintiles may face financial difficulties when trying to access MCH services. Although the government health care system is meant to provide maternal and child health care services free of charge, significant direct and indirect costs are involved as discussed earlier. These costs include expenses on medicine, cost of transportation to and from public health facility, informal payments at the health facility (such as bribes) and forgone wages of husband and wife [7, 67]. These costs may push vulnerable and poor households into deeper poverty. Indeed, Zodpey and Farooqui [68] noted that around 50 million households slip into poverty each year due to out-of-pocket health expenditures.

Interestingly, our results also showed that households holding BPL cards were more likely to access MCH services compared to non-BPL households. We re-run the model by interacting 'year of survey' with BPL (result not reported here) and found that BPL was not a significant correlate of MCH utilisation in 2005 but in 2011/12. This might be capturing the fact that BPL households were the primary target of all government initiatives to boost MCH service utilisation including the JSY cash transfer program [16] and RSBY public insurance scheme [23].

Among variables that capture the empowerment of mothers in the household, results showed that the index of "maternal autonomy" was associated with more utilization of MCH services. This variable reflects the mother's self-determination and power to make her own decisions/choices. This may include her capacity to go out of the house on her own and complete tasks (such as visiting health centers) without assistance. The wider literature attributes higher maternal mobility to greater decision-making ability within the household [31, 69]. A mother who can go out and move freely is more likely to come across valuable information and advice on various aspects of maternal and child health in addition to being able to visit health centers for necessary health checks including antenatal and postnatal checkups [70]. Bloom et al. [29] had similarly established that women with greater freedom of movement were more likely to access maternal health care in North India. Mohanty and Gebremedhin [31] had also found that the marginal effects of the maternal autonomy indicators on birth registration varied across districts in India. Our findings indicated that the effects of these maternal empowerment variables were stronger in 2005 compared to 2011-12 which may be a reflection of the changing socioeconomic environment in India requiring more women agency and enterprise. Having a mother with her name on the rental/ownership document of their residential property was also a significant correlate increasing mother's utilization of MCH services. This variable captured economic empowerment and economically empowered women are more likely to make decisions on health care and other aspects of life that would benefit them and their children. Other studies in the literature have similarly established that women with more autonomy and decision-making capacity are more likely to access MCH services [47, 71].

Strengths And Limitations

Strengths:

The publicly funded health insurance scheme (RSBY) covers all expenses related to hospital delivery, but there is lack of studies investigating its effect on institutional delivery in India. Most studies in the literature have focused on the impact of RSBY on out-of-pocket expenses and whether the scheme has been successful in preventing households from incurring catastrophic health expenditures. On the other hand, several studies have looked at the impact of JSY, the cash transfer, on maternal care. Another strength of the study is that it matches mothers whose delivery had been captured by two rounds of IHDS data allowing to capture changes over time, whereas most other studies use a cross-section of mothers whose delivery had been recorded at one point in time. The use of multilevel models is another strength of the study because our analysis takes into account clustering at the district, village and individual mother levels.

Limitations:

We were not able to identify from the IHDS data which women had received JSY cash transfer for delivery. Nor were we able to determine from the data if those accessing antenatal and postnatal services had been assisted by ASAHs as part of the JSY program. As a result, we were not able to explicitly control for JSY in our regression models, although the time fixed-effect included in our model would have captured some of the effects of the conditional cash transfer program. In addition, we were not able to take into account the cost of delivery and other costs associated with maternal and childcare because the data did not contain such information.

Conclusions

We studied the factors associated with the utilisation of maternal and child health care services in India over the 2005 – 2011/12 period, with special emphasis on the effect of a publicly funded health insurance scheme (RSBY) launched in 2008 and specific maternal empowerment measures. Our models consistently showed that women were more likely to utilize MCH services in 2011/12 compared to 2005. This is most likely the result of change in women’s and societal attitude towards maternal care from one that viewed delivery as a natural event that didn’t require the assistance of a skilled birth attendant to one that increasingly recognized the importance of professional care for the health and safety of both mother and child.

Our results also indicated that access to health insurance increased MCH utilisation, although its effect was no longer statistically significant when we controlled for other confounding factors such as maternal education and household wealth in our final model. Interestingly, we found that the publicly funded health insurance scheme (RSBY) was less effective in increasing MCH utilisation compared to private insurance. Given the evidence that the public insurance scheme has failed to protect households from high cost of

hospitalization, the scheme may need to be overhauled to increase the level of coverage and reduce costs of health care. Maternal empowerment indicators were also found to be significant correlates of MCH utilisation in India. In particular, mother's autonomy (capturing her ability to leave the house and complete tasks) and whether the mother's name is on the rental or property ownership documents (capturing mother's economic empowerment) increased the odds of high levels of MCH utilisation. This points to the need to take maternal autonomy and empowerment into consideration when designing programmes and policies that aim to improve health services for women. Other significant correlates of MCH utilisation in our study included maternal education, household wealth quintile and number of children born to the mother.

Declarations

Ethics approval and consent to participate

This study requires no ethics approval for the authors as the analysis used only de-identified existing unit record data. The data underlying this study are third party and were collected by the India Human Development Surveys (IHDS) 2005-2006 and 2011-2012. We obtained the raw survey data from Data Sharing for Demographic Research (DSDR) website. These data are available at the following link: http://www.icpsr.umich.edu/icpsrweb/DSDR/studies/36151#datasetsSection. The authors confirm that others would be able to access the data in the same manner and that the authors did not have any special access privileges that others would not have.

Consent for publication

Not Applicable.

Availability of data and materials

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Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

TAG, IM and TN conceptualised and designed the research project. TAG undertook initial statistical analyses and drafted the manuscript. Both IM and TN contributed to the interpretation of results. IM and TN reviewed the initial draft and provided important intellectual insights. TAG revised the manuscript for important additional intellectual content. All the three authors approved the final manuscript.

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