Multiple Vulnerabilities in Access to and Utilizing of Maternal and Child Health Care Services in India: A Spatial-regional Analysis

Abstract

Although there are multiple-vulnerabilities in access to MCH services in India, the research has always been focussing on single dimension vulnerabilities like economic vulnerabilities or social vulnerabilities. Individuals who are poor may also face other types of vulnerabilities that together affect access to health services. This paper, therefore, investigates the linkages between multiple-vulnerabilities and utilization of maternal and child-care services. Data from DHS (2015-16) for India and states were used for analyzing the key outcomes variables namely women received four antenatal care (ANC), institutional-delivery-care, post-natal care (PNC) and full-immunization for children age-groups 12-23 months. Bivariate analysis and binomial-logistic regression analysis were employed to examine the multiple-vulnerabilities on utilizing MCH care services across three-dimensions of vulnerabilities such as education, wealth, and caste.

Paper identifies strong linkages between multiple-vulnerabilities and the utilization of MCH services. Women with multiple-vulnerabilities were less likely to utilize essential maternal and child health care services. The utilization of antenatal care and postnatal care services declines with increasing vulnerabilities. Women who face vulnerabilities in all the three-dimensions were less likely to have received full-ANC and postnatal care than those who were not deprived of any (0.3 vs. 0.9 and 0.4 vs. 0.8). They were also less likely to deliver in health facilities and for child-immunization (0.5 vs. 0.8 and 0.3 vs. 0.7). In India, 34 percent of the ever-married women were not deprived of any of the three dimensions. A multi-sectoral approach is therefore required to dealing with the issues of low-access and under-utilization of MCH in India.

Key Words: Caste and Class, Multiple Vulnerabilities, Universal vs. Targeted approach, MCH care, India-Region

1. Introduction

Providing universal or targeted services to the population across states, regions or small administrative areas is made solutions in the low-and-middle-income countries. Despite these approaches, there are huge inequities in accessing and utilizing the services and moreover, it has led to inequalities in MCH outcomes across socioeconomic groups. Although India has made

considerable progress in achieving the Millennium Development Goals (MDGs), progress of the several maternal and child health (MCH) indicators are still not at the expected levels. Higher maternal and child deaths are caused by low-access and under-utilization of essential health services. Several studies in India have reported that inequities exist in access to maternal healthcare between states and within states and across regions (Navneetham K. & Tharmalingam A. 2002; Subramanian et al. 2006; Deaton and Dreze 2009). Further, the variations in access to MCH services can also be seen across different segments of the population. Low education, poverty, and social class have been shown to be significantly associated with lower utilization of MCH services. The studies have also shown that variation across income groups in access to maternal care is widening with poor women receiving fewer services than those who are better off (Pandey, et al., 2004; Pathak, P. K. et al., 2010).

Further, north Indian states like Uttar Pradesh, Bihar, and Jharkhand also have lower levels of utilization of MCH services as compared to most of the south Indian states (Dehuri R. K. & Samal, J. 2016). The MCH care services in Northern state are particularly poor and it has been seen highly inequitable across socio-economic groups. Empirical evidence suggests that although maternal care has improved in the states over the last decades, but the progress has been slow and uneven within and between the states. For example, the proportions of women in Uttar Pradesh (northern state) who received antenatal care for their last pregnancy and institutional delivery has increased between 1992 and 2015, from 44.7 percent to 72 percent and from 11.2 percent to 67.8 percent, respectively; however, there is also the rich-poor gap (i.e., the ratio of the richest to the poorest wealth quintile) for the use of antenatal care remained at high over the period, while the proportion for institutional delivery declined (IIPS, 1995; IIPS & ICF, 2017). Similarly, the illiterate-literate ratio and Schedule Caste/Schedule tribes to others ratio for the use of antenatal care has widened over the same period.

Although the proportion of women receiving medical assistance at delivery has increased from between 1992 to 2015, there is a huge gap in receiving medical assistance among poor women and non-poor women. Similarly, the educational differential in institutional delivery in 1992 was 11.8 percent for women with no education and 75 percent for those with 10 or more years of schooling. The same figure in 2015 was 56 percent for women with no education and 85.8 percent for women with 10 or more years of schooling indicating a faster improvement among

women with no education (IIPS, 1995; IIPS & ICF, 2017). Further, a study conducted in 2005-06 also showed that the proportion of births between 2005 and 2006 that were delivered in a health institution varied from 31 percent for women with no education to 68.8 percent for women with 12^{th} and more years of schooling (Mohanti S K. 2012). Likewise, the proportion of full ANC coverage and institutional delivery variations across social groups show slow progress among socially disadvantaged groups like SC/ STs (Scheduled Caste/ Schedule Tribe) than the other groups.

Several studies have contributed to understanding the income disparities in maternal health care utilization (Houweling TAJ et al., 2007; Mohanty S. K. and Pathak P. K. 2009; Mohanti S K 2012). Several studies analysed various rounds of DHS (demographic and health survey) data to understand the inequalities in maternal and child health across household wealth quintiles after controlling for other social and demographic variables (Hong R. et al 2006; Ladusingh L and Singh C. H, 2007; Mohanty S. K. and Pathak P. K. 2009; Mohanti S K 2011; Mohanti S K 2012). In addition, some outlined the contextual determinants of maternal and child care in different Indian states (Ladusingh L and Singh C. H, 2007). Apart from economic status, there are several other factors that determine the vulnerability, i.e. social determinants (Mechanic, D. 2002; Phelan, J. C. et al., 2010; Balarajan Y. et al., 2011; Borooah et al., 2012). Two important factors such as poor education, lower caste are typical in Indian conditions which add vulnerability too in seeking maternal and child care services (Ekta Saroha, et al., 2008; Gupta A. et al., 2016). Many studies have independently demonstrated the effect on each of these factors on maternal and child health (Goli S, Doshi R, Perianayagam A, 2013; Mohanti S K 2012; Borooah, et al., 2012). However, very few studies have looked at the effect of multiple vulnerabilities and their linkages on the utilization of health services. For example, a poor woman may also be poor educationally, or she may also belong to a disadvantaged caste group.

The concept of multiple vulnerabilities has received recent attention from both researchers and policymakers because the use of individual-level socioeconomic indicators alone may fail to capture the health impacts of contextual factors. Approaches covering multiple vulnerabilities can take into account the effects of the individual as well as the household and contextual disadvantages that impact on health.

Equity in health is the absence of systematic disparities in health (or in the major social determinants of health) between groups. Knowledge of the aggregate effects of multiple vulnerabilities is needed to shed light on the determinants of growing health inequities. The objective of this paper is to understand the linkages between multiple vulnerabilities and maternal and child healthcare utilization in India and across regions

Multiple Vulnerabilities: Issues and Concerns

The association between vulnerabilities and health outcomes have always focussed on single vulnerability like income or education and is linkages with health outcomes. However, in any society, poor people may also have lesser education or poorer health, or they are from socially disadvantaged groups. Those individuals who face more than one vulnerability may have a greater burden than those who face single vulnerability. For example, women who belong to poorer households are more likely to have adverse health outcomes than those who are from wealthier households. If those poor women also lack education or if they are from socially disadvantaged groups, their burden increases and they may have lower utilization of health services than those face only single vulnerability (Mohanti, S K 2012; Mohanti, S K. 2011). Therefore to address the health inequality in health care access and service utilization, there is a greater need to understand this using the lens of multiple deprivations of wealth, education, class, caste, and regional status. Studies have demonstrated that women belong to the disadvantaged groups remained disadvantaged in health care access and utilization of health services (Anand & Yusuf, 2011; Ekta Saroha, et al., 2008; Mohanti, 2012 Prusty, R. K., et al., 2015).

The disadvantaged groups of people can be identified in relative terms, such as socially disadvantaged, economically disadvantaged, disadvantaged concerning gender, and geographical disadvantaged. The disadvantaged groups of people can also be recognized in three ways; firstly, at the individual level, secondly, at the family or household characteristics level and thirdly the social-economic groups' characteristics level (Brook R H, Williams KN 1975).

India is a caste driven society, and caste plays a significant role in defining the socio-political and economic structure of the particular society. In the hierarchy of social status scheduled caste (SCs) or Dalits, Adivasis or scheduled tribes (STs) are the most disadvantaged groups. There is literature to support the view that probably social deprivation may affect more than wealth and

health (Ekta Saroha, et al., 2008; Mosse, D. 2018). In the economic class, there is a hierarchy in which poorest, poorer are more deprived of accessing public resources than richer and richest class. In India, socio-economic status determines the health status of the particular individual or community (Bhatia et al., 2006; Montagu, D. 2011).

A multi-dimensional vulnerability identifies clusters of vulnerability. While measuring multiple vulnerabilities, there are theoretical and methodological challenges which include contextualizing the dimensions and indicators in order to fix the cut off point for "poor" and "non-poor", aggregation of multiple dimensions into a single index, weighting of dimensions and choosing the unit of analysis (Sen, A. K. 1992; Alkire, S. 2007; Alkire, S. and Foster, J. 2009; Mohanti, S.K. 2012).

This paper, therefore, understands the three-dimensional vulnerability; wealth, education, and caste and its linkages with the utilization of maternal and child health services in the country.

2. Materials and Methods

The data were used from National Family Health Survey, fourth round 2015-16. In India, NFHS-4 (DHS-2015-16) has provided information on reproductive and child health care practices for all the states. The survey covered 6,99,669 households and collected information from 2,59,627 women in the age group 15-49. In the case of ever-married women, the sample is 259627 in the country who were interviewed in the age group of 15-49. The survey provides information on women's characteristics, marriages, fertility, contraception, reproductive health, children's immunizations, and treatment of childhood illnesses. In the previous round of the survey, all these information were available at the state and national level. The study uses NFHS-4 data to understand the current status of service utilization among the disadvantaged groups of people with multiple dimensions of deprivation in India and its states and its region. Only ever-married women who have given birth in the last five years have been considered for the analysis.

The level and the utilization pattern of MCH services across the region in India has been analysed by using multiple vulnerability approach. The outcome variables used here are four antenatal care (ANC), institutional delivery and postnatal care (PNC) as indicators of the utilization of maternal healthcare services and coverage of full immunization as child health care variable. Descriptive statistics, bivariate and logistic regression analysis are carried out to

estimate the level and pattern of multiple vulnerabilities and its linkages in the utilization of maternal and child healthcare services. Results are shown as predicted probabilities which derived from logistic regression and predicted probabilities adjust at the mean of all other independent variables.

Vulnerability Measures:

To understand multiple deprivations, a variable integrating the three dimensions of deprivation based on education, wealth and caste was constructed as they were used in the two Human Poverty Indexes and the Multidimensional Poverty Index (instead of caste they used health). The low education is classified as those women who did not complete five years of schooling. For education, a woman is considered to be deprived or vulnerable if she reported in her individual survey that she had not completed five years of schooling. This cut off is chosen because people with only a few years of education have been found to have health-seeking behavior similar to those with no education. As NFHS does not collect information on consumption or income of the household, household economic proxies such as housing quality, household amenities, and consumer durables were used to construct the composite wealth quintile. Those who are poorest or poorer from the wealth quintile per se has been considered as economically "poor" and middle, richer and richest are "non-poor."

For caste, a woman is considered vulnerable if she belongs to Schedule Caste or Schedule tribe. Using the three dimensions of vulnerability based on education, wealth and caste, eight categories of vulnerability are possible: education, wealth and caste; education and wealth; education and caste; wealth and caste; education only; wealth only; caste only and none. First four categories classified vulnerability in multiple dimensions, the next three in one dimension and the last category in none. The state-level data is sufficient to show differentials in MCH care for all eight categories of vulnerability/deprivation. However, the regional level data issued for only four groups- vulnerable in none, in one dimension, in two dimensions and vulnerable in three dimensions.

Dependent variables:

Full Antenatal care (ANC): In the NFHS-4 survey, the questions were asked to women whether they "had at least four visits for ANC check-up, received at least one TT (tetanus toxoid), and

consumed at least 100 IFA (Iron Folic Acid) tablets/syrup" for recent birth during the five years preceding the survey.

For this analysis, those pregnant women who have gone for four and more antenatal care have been included for the analysis.

Institutional Delivery: Institutional delivery is defined as the deliveries happened in the hospitals/health facilities, either public or private. In the survey, the question was asked to women for their current live births in the last five year preceding the survey that where their children were born.

***Postnatal care (PNC)*:** In the survey, women who had their last birth in five years preceding the survey were asked "Did you have any check-up within 42 hours after delivery?" and "How many days after delivery did the first check-up take place?" In this study, women who went for a check-up to any health facilities/doctors within two weeks of delivery are considered to have used postnatal care services.

***Full Immunization*:** A child in the age group of 12-23 months is fully immunised if she or he has received BCG, measles, and three doses each of DPT and Polio vaccine.

3. Analysis and Discussion

Dimensions of vulnerabilities in India and Its regions

Table1 shows the proportion of women by different types of vulnerabilities/deprivations in India and its regions. In India, 47 percent of the women are in poor category, 36 percent have low education, and 33 percent belong to schedule caste and schedule tribe category.

Table 1 Proportion of ever married women (age groups 15-49) with different types of vulnerabilities in India and Its Regions, 2015-16

Categories of Vulnerabilities	India	Its Region				
	Total	North	Central	East	West	South
Poor	47.32	29.86	57.74	72.3	29.18	20.15
Low Education	36.24	35.68	44.23	48.91	21.7	16.53
SCs/STs	33.23	35.59	32.66	34.6	31.82	29.42

Source: NFHS-4

The regional variations in different types of vulnerabilities indicate that income vulnerability is the highest in the east region with 73 percent followed by the central region 57.7 percent whereas the poverty level is least in the southern region with 20 percent of the women belonging to poor category. Educational vulnerability is lower in southern region followed by western region and socially disadvantaged groups are higher in northern region followed by east region as compared to other three regions.

Table 2. Proportion of ever-married women (age groups 15-49) with different types of vulnerabilities in India and major states, 2015-16

India and its States	Category of Vulnerabilities		
	Education	SCs/STs	Poor
Haryana	27.04	30.53	11.64
H P	6.15	31.37	11.67
J& K	35.9	45.18	34.36
Punjab	17.68	42.91	4.89
Rajasthan	47.73	36.48	45.59
Uttarakhand	26.25	28.39	24.99
Chhattisgarh	32.3	48.05	58.42
M P	40.66	42.31	59.2
UP	47.24	26.9	57.09
Assam	36.77	29.36	70.16
Bihar	63.8	26.07	81.03
Jharkhand	46.31	41.51	73.27
Orisha	37.44	50.77	65.82
W B	32.12	41.86	59.62
Gujarat	31.6	29.38	30.88
Maharashtra	16.6	33.09	28.3
A P	26.12	28.13	21.87
Karnataka	21.7	35.51	26.86
Kerala	0.8	11.64	1.94
T N	7.57	32.59	18.03
Telangana	24.1	26.85	23.37
Total	36.24	33.23	47.32

Source: NFHS-4

Note: H P (Himachal Pradesh), J&K (Jammu and Kashmir), MP (Madhya Pradesh), UP (Uttar Pradesh), WB (West Bengal), AP (Andhra Pradesh), TN (Tamil Nadu),

Table 3 represents the state-wise variations in different dimensions of vulnerabilities, which are as none, one, two and three. Overall, 34 percent of the women in India do not face any type of vulnerabilities while seeking maternal and child health care services whereas 12.4 percent of the

women face all the three categories of vulnerabilities. The proportions of women with anyone or any two vulnerabilities are 27.5 percent and 26 percent respectively.

Similarly, regional variations in levels of vulnerability show that multiple vulnerabilities are higher in eastern region and central region followed by northern region than southern and western regions. State-wise variations also shows that the states like Orisha, Jharkhand, MP, Bihar, Chhattisgarh, Rajasthan and UP are the highest in all the three dimensions of vulnerabilities which is much more above the national average (12.4), whereas the states such as Kerala, Punjab, HP, TN, AP, Haryana and Uttarakhand which are the lowest in that category of vulnerability. However, inter-state variations can be seen in all the levels of vulnerability. The proportion of women do not deprived in any category, ranging from 13 percent in Bihar to 87 percent in Kerala state. Huge variations can be seen across the states in India in other dimensions of vulnerabilities.

Table 3. Percentage distribution of ever-married women by dimension of vulnerabilities in India' regions and with major states, NFHS-4, 2015-16

India' regions	India and major states	Dimensions of Vulnerability			
		None	One	Two	Three
North region	Haryana	51.54	30.29	15.55	2.63
	H P	60.57	30.88	7.24	1.31
	J& K	31.44	31.23	22.97	14.37
	Punjab	50.53	36	10.9	2.57
	Rajasthan	31.02	25.41	26.24	17.33
	Uttarakhand	45.73	33.31	16.51	4.46
	North Total	**40.22**	**28.84**	**20.32**	**10.62**
Central region	Chhattisgarh	26.76	25.76	29.37	18.11
	M P	25.89	26.38	26.93	20.8
	U P	26.57	28.07	32.97	12.39
	Central total	**26.42**	**27.44**	**31.14**	**15**
Eastern region	Assam	22.28	33.54	36.05	8.14
	Bihar	13.25	21.28	46.75	18.72
	Jharkhand	18.13	26.23	31.99	23.65
	Orisha	23.13	25.29	25.53	26.05
	W B	24.93	31.17	28.67	15.23
	East Total	**18.1**	**25.35**	**37.85**	**18.71**
Western region	Gujarat	44.23	28.45	18.22	9.11
	Maharashtra	48.58	30.86	14.26	6.3
	West Total	**47.09**	**30.04**	**15.61**	**7.26**

Southern region	A P	50.97	26.87	17.24	4.92
	Karnataka	45.31	30.12	17.55	7.02
	Kerala	87.4	10.92	1.41	0.27
	T N	56.02	31.3	11.06	1.62
	Telangana	53.14	25.42	15.09	6.36
	South Total	**55.12**	**27.29**	**13.49**	**4.1**
	India/All Total	**34.0**	**27.54**	**26.17**	**12.39**

Source: NFHS-4, 2015-16

Table 4 presents the different dimensions of vulnerabilities in India and its regions. Overall, 65.6 percent of ever-married women reported being deprived in any of them (either education or wealth or caste). 15 percent women deprived from education and wealth, 23 percent wealth and caste, 25.3 percent education and caste, and 12.4 percent in all three dimensions; 34 percent of the women are not deprived in any dimensions at the country level. Regional level variations show that women with any of them vulnerability found higher in eastern region with 81 percent followed by central region 73.5 percent and the least in southern region with 44 percent. Similarly, the vulnerabilities are concerned as education and wealth, wealth and caste and education and caste were also least in the southern region. Overall, the data show that there are huge variations in vulnerabilities levels across regions of India.

Table 4. Percentage of ever married women by dimensions of vulnerability in India and Its regions, 2015-16

Categories of Vulnerability	**India**	**Its Region**				
	Total	**North**	**Central**	**East**	**West**	**South**
	n=259627	**n=30959**	**n=70378**	**n=72707**	**n=32722**	**n=46514**
Any of them	65.64	59.22	73.49	81.02	52.36	43.97
Education and Wealth	14.94	9.57	19.33	25.21	5.62	4.11
Wealth and Caste	22.93	14.15	29.18	34.27	13.1	10.17
Education and Caste	25.27	19.63	30.95	35.27	15.28	13.02
All the Three	12.39	10.62	15	18.71	7.26	4.1
None	**34.3**	**40.78**	**26.51**	**18.98**	**47.64**	**56.03**

Source: NFHS-4

The correlation coefficients of dimensional deprivations were weak and found to be 0.11 for education and wealth, 0.34 for education and caste and 0.17 for wealth and caste, which indicates that these dimensions are unlikely to overlap.

Table 5. Utilisation of maternal and child care services among ever-married women who had at least one live birth in the five years preceding the survey by dimensions of Vulnerability

Type of Maternal care	Dimensions of deprivation							
	None	one			Two			Three
	n= 70617	education	Caste	Wealth	Education Wealth	Education caste	Wealth caste	Educat. Wealth, caste
ANC visits		n=64134	n=59816	n=84986	n=25774	n=45045	n=40650	n= 21029
No ANC	7.96	30.48	19.27	27.46	37.23	28.24	29.66	32.81
One visit	3.95	7.44	5.79	7.34	8.63	7.51	7.76	7.09
2-3 visits	19.99	30.69	27.22	31	31.23	30.54	30.94	30.92
4 or more visits	68.09	31.4	47.72	34.2	22.91	33.72	31.64	29.19
Place of Delivery	n=89189	n=93974	n=82935	n=122765	n=38749	n=65545	n=59501	n=30886
At home	6.93	36.69	24.73	32.85	40.66	32.97	34.12	40.14
At Public	45.1	50.41	58.63	55.77	48.47	55.1	54.83	52.54
At Private	47.78	12.63	16.37	11.08	10.58	11.64	10.75	7.03
Post Natal Care	n=70602	n=64055	n=59766	n=84925	n=25756	n=45019	n=40632	n=20994
Yes	80.47	57.45	68.09	59.14	52.16	59.14	57.83	55.82
No	19.53	42.55	31.91	40.86	47.84	40.86	42.17	44.18
Full Immunization	n=86559	n=88363	n=78787	n=115639	n=36326	n=61731	n=55939	29,044.00
	56.7	44.36	50.3	46.33	42.4	45.9	45.3	43.8
Institutional delivery	n=86559	n=88363	n=78787	n=115639	n=36326	n=61731	n=55939	29,044.00
	93	63.4	75.4	67.2	59.2	67	65.8	59.9

Source: NFHS-4, 2015-16

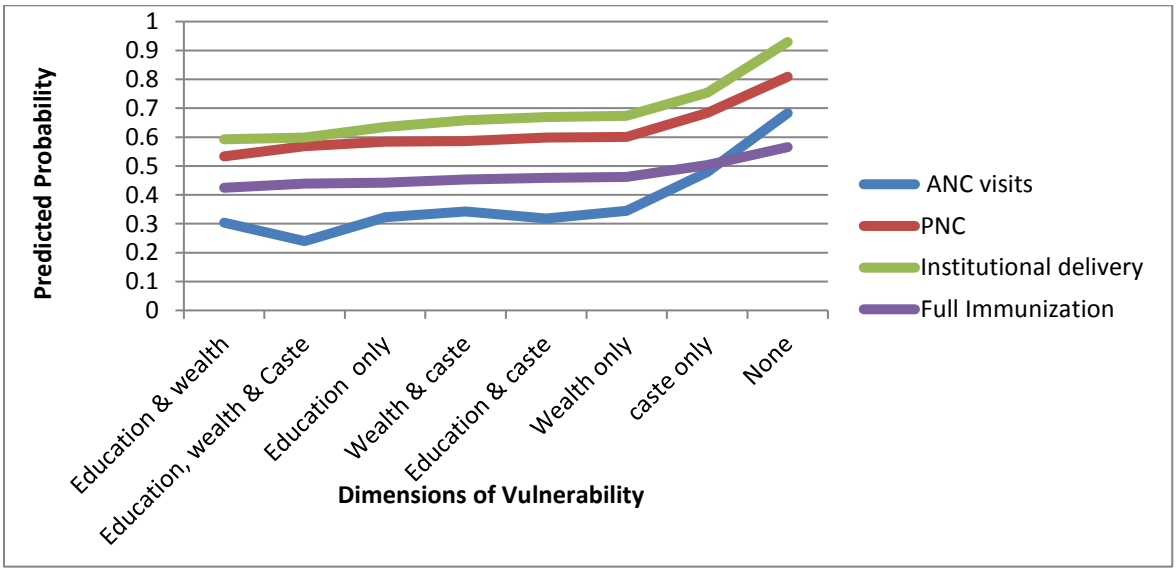
Table 5 represents the utilization of maternal and child care services among the all ever-married women who gave at least one live birth in the five years preceding the survey across dimensions of vulnerability. The table clearly shows that women who had multiple vulnerabilities were less likely to receive various MCH services. Overall, the data show that the four and more ANC coverage in India is very low and as low as 68 percent for those women with no deprivation. As compared to 31-47 percent of those deprived of any one dimension, 22-31 percent of those deprived in two dimensions and 29 percent of those deprived in all three dimensions. Similarly, the proportion of women with no antenatal care was also seen across the level of dimensions.

The level of receiving institutional delivery is similar to that for four and more ANC service utilization. Of live births that occurred to ever-married women in the previous five years, the proportion of delivery happened in the health facilities is 92 percent among those women who do not face vulnerability in any of the three dimensions compared with 59 percent among those

women who are vulnerable concerning all three dimensions. Further, with an increase in dimensions of vulnerability the institutional delivery proportion decreases. Among women deprived in one dimension, the proportion of births took place in health facilities is lowest for those deprived in education (62.5%), followed by those deprived in wealth (66.4%) and those deprived in caste (74.4%); among women deprived in two dimensions, the proportion of births took place in health facilities is lowest among those deprived in education and wealth (59%), followed by those deprived in education and caste (66.2%), and those deprived in wealth and caste (64.7%).

The pattern of utilization for postnatal care (PNC) is similar to that of the other two indicators. The proportion of women who had received PNC is higher among those with no deprivations or vulnerabilities than among those with deprivation in all three dimensions (80.4% vs. 55.8%). Among those deprived in one dimension, the proportion receiving PNC is lower for those deprived in wealth than for those deprived in education or caste; among those deprived in two dimensions, the proportion receiving PNC varied from 52 percent for those deprived in education and wealth, 59 percent for those deprived in education and caste, and 53 percent for those deprived in wealth and caste.

Figure 1. Among ever-married women who had had at least one live birth in the previous five years, predicted probability of having received four antenatal care visits, postnatal care and Institutional delivery and; among children 12-23 months who received full immunization before the survey, predicted probability by dimensions of deprivation



Source: NFHS-4, 2015-16

Notes: Adjusted for the age of mother, place of residence, India regions, religion and birth order, parity, sex of child

Predicted probabilities for each of the four maternal and child health outcomes indicators have been estimated, adjusting for other social and demographic factors such as the age of mother, place of residence, regions, religion and birth order. The predicted probability of full antenatal care for each level of a vulnerability is lower than that of full immunization, postnatal care (PNC), and institutional delivery. Women who have deprived in all three dimensions are less likely than those who have not deprived in any to have received four antenatal care (predicted probability, 0.3 vs. 0.9), full immunization (0.5 vs. 0.8), postnatal care (0.4 vs. 0.8) and institutional delivery (0.5 vs. 0.8). In addition, the probability of each outcome is lowest among those deprived in all three dimensions followed those deprived in education and wealth, education and caste, education only, caste and wealth, wealth only, caste only and in none. Overall, the single level of deprivation like education only appears stronger than the others, i.e. caste only and wealth only. After adjusting for confounders, women deprived in education alone were less likely to use maternal and child health services such as full ANC, PNC, institutional delivery, and full immunization than those deprived of both wealth and caste.

Table 6. Percentage of ever-married women who received four or more antenatal care visits for their last live birth in the previous five years, preceding the survey, by dimensions of deprivation; and ratio of percentages, by dimensions of deprivation-according to major states

India and Its major states	Dimensions of Vulnerability				Ratio of none to		
	None	One	Two	Three	One	Two	Three
Haryana	52.26	43.05	27.34	27.63	1.2	1.9	1.9
H P	74.14	65.31	43.26	19.34	1.1	1.7	3.8
J& K	85.46	69.96	54.86	46.63	1.2	1.6	1.8
Punjab	72.31	66.78	56.23	53.81	1.1	1.3	1.3
Rajasthan	51.48	40.99	27.26	24.52	1.3	1.9	2.1
Uttarakhand	39.89	26.56	14.37	7.25	1.5	2.8	5.5
Chhattisgarh	70.09	62.77	52.91	45.32	1.1	1.3	1.5
M P	53.44	36.24	26.41	20.35	1.5	2.0	2.6
U P	45.94	26.1	14.58	11.54	1.8	3.2	4.0
Assam	66.25	50.25	40.27	33.6	1.3	1.6	2.0
Bihar	34.94	18.46	8.94	6.44	1.9	3.9	5.4
Jharkhand	55	34.77	22.07	15.43	1.6	2.5	3.6
Orisha	69.14	64.18	59.47	53.44	1.1	1.2	1.3
W B	86.75	77.78	74.94	71	1.1	1.2	1.2
Gujarat	80.22	71.04	56.28	35.85	1.1	1.4	2.2
Maharashtra	76.82	70.54	66.75	50.81	1.1	1.2	1.5
A P	81.04	73.13	69.8	66.29	1.1	1.2	1.2

Karnataka	73.97	70.99	67.81	62.91	1.0	1.1	1.2
Kerala	90.17	92.31	79.49	79.82	1.0	1.1	1.1
T N	82.18	80.4	77.8	79.04	1.0	1.1	1.0
Telangana	78.65	77.31	61.33	65.15	1.0	1.3	1.2
Total	67.78	52.53	33.72	29.19	1.3	2.0	2.3

Source: NFHS-4, 2015-16

Understating differences in women's utilization of four ANC services are explored across the states in India. The utilization level and service coverage of ANC services vary among women across regions and states. Utilization of maternal and child health care services also varied considerably by the dimension of vulnerabilities across regions and states, deceasing with an increased level of deprivation/vulnerability.

To understand the inequality in better way, the status of MCH care utilization across different vulnerable groups, ratios have been calculated to compare the access and use of service among women who did not deprived in any dimensions with that of women deprived in one, two and three dimensions; the closer the ratio is to 1.0, the lower the inequality is between the groups. For ANC, the ratio of women deprived in none dimension to those deprived in one dimension was highest in Bihar (1.9), UP (1.8), Jharkhand (1.6) and MP (1.5); the lowest ratios were in Kerala, TN, Karnataka, Telangana and AP, WB, Gujarat and Maharashtra (1.0-11). And moreover, for two or three dimensions of vulnerabilities, the ratios were considerably higher in all the states, ranging from 1.1-3.9 for two dimensions and 1.0-5.4 for three dimensions. Similarly, the pattern was also observed for institutional delivery and post natal care.

Table 7. Institutional Delivery received by the ever married women in the recent birth, preceding the five years, by dimensions of vulnerability and ratio of percentage, by the percentage of vulnerability in India and its major states

India and Its major states	Dimensions of Vulnerability				Ratio of none to		
	None	One	Two	Three	One	Two	Three
Haryana	89.18	77.22	61.43	63.65	1.2	1.5	1.4
H P	82.52	72.69	49.26	25.13	1.1	1.7	3.3
J& K	91.17	82.53	64.52	52.24	1.1	1.4	1.7
Punjab	94.57	88.97	80.44	73.58	1.1	1.2	1.3
Rajasthan	92.92	86.03	77.58	74.48	1.1	1.2	1.2
Uttarakhand	79.81	66.32	47.55	44.58	1.2	1.7	1.8
Chhattisgarh	84.81	74.25	64.78	51.73	1.1	1.3	1.6
M P	95.19	87.97	75.99	59.7	1.1	1.3	1.6
U P	82.86	69.87	58.71	55.48	1.2	1.4	1.5
Assam	91.68	79.05	62.69	63.07	1.2	1.5	1.5

Bihar	86.04	72.69	57.49	53.88	1.2	1.5	1.6
Jharkhand	87.04	71.95	55.39	40.35	1.2	1.6	2.2
Orisha	98.05	92.73	85.05	66.98	1.1	1.2	1.5
W B	91.29	78.15	65.17	69.6	1.2	1.4	1.3
Gujarat	96.38	89.21	79.41	66.87	1.1	1.2	1.4
Maharashtra	96.1	91.95	80.07	57.63	1.0	1.2	1.7
A P	96.43	90.72	84.79	68.94	1.1	1.1	1.4
Karnataka	97.46	95.28	87.47	84.01	1.0	1.1	1.2
Kerala	99.92	100	99.45	100	1.0	1.0	1.0
T N	99.27	98.82	98.61	92.33	1.0	1.0	1.1
Telangana	96.92	93.29	79.07	69.65	1.0	1.2	1.4
Total	92.78	82.36	66.74	59.57	1.1	1.4	1.6

Source: NFHS-4, 2015-16

For institutional delivery (table 7), the differences were observed across vulnerable groups which were similar to those in ANC. For post natal care (table 8), the state with low usage of ANC and institutional delivery had also low usage of PNC. Further, the differences between those deprived in multiple dimensions and those deprived in none are similar for ANC, Institutional and PNC across the states in India. And, when we grouped these states into particular region, likewise, the eastern region falls into highly deprived region with multiple dimensions followed by central and northern regions in India. Southern region faces less inequality in MCH services. Linking with multiple deprivations/vulnerabilities southern region suffer less compare to other four regions.

Table 8. Percentage of Post natal care received by the ever married women in the recent birth, preceding the five years, by dimensions of vulnerability and ratio of percentage, by the percentage of vulnerability in India and its major states

India and Its major states	Dimensions of Vulnerability				Ratio of none to		
	None	One	Two	Three	One	Two	Three
Haryana	78.01	73.02	61.08	65.08	1.1	1.3	1.2
H P	86.37	79.07	60.83	31.67	1.1	1.4	2.7
J& K	85.84	74.77	60.22	48.1	1.1	1.4	1.8
Punjab	93.03	89.97	84.52	85.93	1.0	1.1	1.1
Rajasthan	74.82	69.35	59.31	58.28	1.1	1.3	1.3
Uttarakhand	71.53	59.69	45.09	39.63	1.2	1.6	1.8
Chhattisgarh	81.66	76.79	73.36	62.01	1.1	1.1	1.3
M P	72.49	62.79	54.32	46.93	1.2	1.3	1.5
UP	75.1	64.12	53.26	49.71	1.2	1.4	1.5
Assam	81.39	73.54	63.8	63.81	1.1	1.3	1.3
Bihar	65.89	53.96	44.9	43.24	1.2	1.5	1.5
Jharkhand	70.13	58.39	48.19	39.22	1.2	1.5	1.8
Orisha	87.81	85.63	84.15	81.32	1.0	1.0	1.1
W B	80.7	71.93	66.95	72.19	1.1	1.2	1.1

Gujarat	72.74	73.55	69.1	61.91	1.0	1.1	1.2
Maharashtra	86.46	82.2	75.86	66.93	1.1	1.1	1.3
A P	87.01	88.02	83	80.41	1.0	1.0	1.1
Karnataka	72.69	70.36	59.81	57.3	1.0	1.2	1.3
Kerala	92.81	94.4	97.17	93.38	1.0	1.0	1.0
T N	89.92	89.65	86.67	84.9	1.0	1.0	1.1
Telangana	89.85	87.96	81.59	80.65	1.0	1.1	1.1
Total	80.6	72.22	59.14	55.82	1.1	1.4	1.4

Source: NFHS-4, 2015-16

Table 9. Among ever-married women who had had at least one live birth in the previous five years, predicted probability of having received four antenatal care visits, postnatal care and Institutional delivery and; among children 12-23 months who received full immunization before the survey, predicted probability by dimensions of deprivation (state)

India and Major states	Ante-natal care				Institutional Delivery			
	None	One	Two	Three	None	One	Two	Three
India	0.68	0.53	0.34	0.30	0.93	0.82	0.67	0.60
Haryana	0.48	0.39	0.27	0.18	0.90	0.79	0.63	0.52
H P	0.48	0.42	0.25	0.19	0.89	0.83	0.66	0.54
J & K	0.49	0.42	0.27	0.21	0.90	0.80	0.63	0.54
Punjab	0.51	0.45	0.35	0.20	0.90	0.84	0.71	0.54
Rajasthan	0.48	0.34	0.22	0.18	0.89	0.76	0.60	0.52
Uttarakhand	0.49	0.36	0.23	0.17	0.90	0.77	0.61	0.51
Chhattisgarh	0.58	0.44	0.33	0.25	0.91	0.81	0.70	0.58
M P	0.58	0.42	0.30	0.24	0.91	0.79	0.67	0.57
UP	0.56	0.39	0.23	0.22	0.91	0.76	0.60	0.54
Assam	0.67	0.50	0.34	0.33	0.93	0.82	0.68	0.63
Bihar	0.64	0.45	0.28	0.31	0.92	0.79	0.63	0.61
Jharkhand	0.66	0.48	0.36	0.35	0.92	0.81	0.66	0.55
Orisha	0.67	0.52	0.42	0.33	0.93	0.84	0.75	0.63
W B	0.68	0.53	0.41	0.35	0.92	0.82	0.71	0.66
Gujarat	0.75	0.62	0.47	0.40	0.94	0.85	0.75	0.66
Maharashtra	0.74	0.65	0.51	0.42	0.94	0.88	0.78	0.67
A P	0.80	0.72	0.59	0.52	0.95	0.89	0.80	0.73
Karnataka	0.81	0.73	0.61	0.52	0.95	0.89	0.81	0.72
Kerala	0.81	0.80	0.67	0.54	0.95	0.93	0.85	0.74
T N	0.82	0.75	0.65	0.54	0.95	0.91	0.84	0.74
Telangana	0.81	0.72	0.58	0.52	0.95	0.89	0.79	0.73

India and Major states	Post-natal Care				Full Immunization			
	None	One	Two	Three	None	One	Two	Three
India	0.81	0.72	0.59	0.56	0.56	0.51	0.45	0.43
Haryana	0.76	0.70	0.58	0.50	0.54	0.50	0.45	0.41
H P	0.76	0.73	0.58	0.52	0.57	0.55	0.46	0.41
J& K	0.76	0.71	0.58	0.53	0.57	0.53	0.46	0.43

Punjab	0.77	0.74	0.65	0.52	0.57	0.55	0.50	0.42
Rajasthan	0.75	0.67	0.54	0.50	0.54	0.48	0.43	0.41
Uttarakhand	0.76	0.67	0.55	0.50	0.55	0.49	0.44	0.40
Chhattisgarh	0.78	0.70	0.61	0.55	0.55	0.51	0.47	0.43
M P	0.78	0.68	0.59	0.54	0.55	0.50	0.45	0.41
UP	0.78	0.67	0.54	0.52	0.55	0.48	0.43	0.41
Assam	0.81	0.71	0.60	0.59	0.58	0.53	0.45	0.45
Bihar	0.80	0.68	0.56	0.57	0.54	0.49	0.42	0.43
Jharkhand	0.80	0.69	0.60	0.58	0.54	0.50	0.46	0.45
Orisha	0.81	0.72	0.65	0.58	0.57	0.54	0.49	0.44
W B	0.81	0.72	0.63	0.60	0.56	0.52	0.46	0.43
Gujarat	0.82	0.76	0.66	0.61	0.57	0.52	0.47	0.44
Maharashtra	0.82	0.77	0.68	0.62	0.56	0.53	0.48	0.43
A P	0.84	0.79	0.71	0.66	0.56	0.53	0.49	0.45
Karnataka	0.84	0.80	0.71	0.65	0.57	0.54	0.49	0.46
Kerala	0.85	0.84	0.75	0.67	0.59	0.61	0.55	0.47
T N	0.84	0.81	0.73	0.66	0.58	0.56	0.52	0.47
Telangana	0.84	0.79	0.70	0.66	0.56	0.53	0.49	0.45

Source: NFHS-4, 2015-16

Notes: Adjusted for the age of mother, place of residence, India regions, religion and birth order, parity, sex of child

A set of binary logistic regressions examining the association between level of vulnerability and utilization of maternal and child health care services controlling for social-economic and demographic covariates are conducted for India and its major states. Results are shown as adjusted predicted probabilities at the mean of all other independent variables. In general, the multivariate analysis supports those from the bivariate analyses. It showed that the probability of using each of maternal and child health care services decreased with increasing level of vulnerability.

For example, the states come under the northern, central and eastern region; the probability of receiving four ANC is lesser than the southern and western regions. The state like UP, Bihar, MP, Jharkhand, Rajasthan, J&K and Uttarakhand; the differences between dimensions are huge, when, the probability of receiving ANC, institutional delivery, PNC and child immunization among those who have not deprived in any dimension and those deprived in all three dimensions.

Conclusion and Policy implication

Overall, the study brings out interesting dimension on understanding the linkages between multiple vulnerabilities and utilization of MCH services in India and its regions and moreover, across major states. Although there have been improvements in the utilization of different MCH

services, there are inequalities in several of those utilization indicators while accessing the services within and across regions and states. Further, women with multiple vulnerabilities were less likely to have access to essential maternal and child healthcare than those women who were not vulnerable in any of them (none).

The use of maternal and child care services-at least four ANC, institutional delivery, PNC, and full immunization vary significantly among women by the level of deprivation/vulnerability in India and across states. While comparing India's regions which show that women belong to eastern region followed by central region face multiple vulnerabilities in utilizing MCH services than south, western and northern region.

Overall, the utilization of MCH services declines with increasing levels of deprivation. The educational vulnerability appears to be stronger than other types of vulnerabilities such as caste and wealth in the utilization of MCH services. Economic factor that influenced woman in accessing and utilizing of health care services stands second position after education factor. The utilization of maternal and child services also vary across the regions, states and among socioeconomic groups in the country. Women from eastern region (Assam, Bihar, Jharkhand, Odisha and West Bengal) appear to have a low level of MCH service utilization followed by central region (Uttar Pradesh, Madhya Pradesh, Chhattisgarh), and in all the regions there exist inequality in service utilization.

In general, the differences between those with multiple deprivations and those with none appear to be high in the regions where already service coverage is low and low in the regions where service coverage is high. Such differences may arise from differences in availability, accessibility, and quality of care in public health centres. Urgent actions are required to address inequities in MCH services, as well as access to general healthcare, should be comprehensive and based on multi-sectoral approaches. Women education may lead to better knowledge, awareness and health practices in the community.

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