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Coverage and Determinants of Child Immunization in Uttar Pradesh

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ABSTRACT

Immunization is one of the key interventions for protection of children from life threatening diseases, which are preventable. This paper not only show the spatial variation among districts in terms of child immunization but also examine the major socio-economic and demographic determinants of child immunization. For this study, national family health survey-4 (latest round) has been used as data-source. GIS mapping, cross-tabulation, chi-square test and binary logistic regression has been used as tool for this study. The main findings are- western Uttar Pradesh and Bundelkhand doing good in terms of full immunization whereas central-Terai region and eastern Uttar Pradesh are performing bad. Children belonging to Hindu in comparison to Muslim, none of others among social group, mothers with age-group 20-25 years, mothers having higher education, richest household, children with 1st birth-order and household using Anganwadi services are more fully immunized then their correspondent categories. Religion, social group, mother's education, wealth index, birth order, place of birth and utilization of Anganwadi services are the background variablesthat significantly determined full vaccination.

Key Words : Full immunization, Partial immunization, No immunization, Responsive variables, Background determinants, Uttar Pradesh

INTRODUCTION

Immunization plays the most significant role in child health status because it is a preventable measure (Mosley and Chen, 1984). Immunization is a preventable measure, which protect children from life threatening diseases such as BCG, diphtheria, pertusis, hepatitis B, measles, tetanus and japani encephalitis. Vaccination Programme in India was introduced in 1978 as 'Expanded Programme of Immunization' (EPI) by the Ministry of Health and Family Welfare, Government of India. After that Government of India was launched several programs for universal immunization. Among all some are more important. UIP was launched in 1985. India's Universal Immunisation Programme (U.I.P.) is one of the largest in the world in terms of quantities of vaccine used. This program immunized all children from BCG, diphtheria, pertusis, hepatitis B, measles, tetanus and japani encephalitis. In December 2014, Government of India launched a new immunization program known as MissionIndradhanush with the aim of expanding immunization coverage to all childrenupto 2 years and all pregnant women across India by year 2020. Targets of this mission is to immunize all children with all available vaccine against preventable diseases namely Diphtheria, Pertussis, Tetanus, Childhood Tuberculosis, Polio, Hepatitis B, Japani Encephalitis and Measles. To further intensified the immunization programme, in October 2017, GOI launched the Intensified Mission Indhradhanush.The main determinants of immunization are- literacy of mother and father, size and accessibility of villages, lack of information, place of residence (Singh and Yadav, 2001); lack of faith, considering polio as the only vaccine (Nath *et al.*, 2007). Along with mother's education, standard of living, mass-media exposure and availability of health card is a significant predictor in explaining the full immunization coverage (Kumar and Mohanty, 2011). Study based on

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urbanized village of Delhi concluded that level of literacy; ownership status and place of birth of a child are also important determinants. Children whose mothers had eight or more years of schooling were two times more likely to receive complete immunization than those whose mothers were not educated. Children of clerks, shopkeepers or semi-professional were more likely to be fully immunized as compared to those who were skilled or unskilled workers ($p<0.01$, OR=1.8). Children of tenants who were migrants from other states were less likely to be immunized as compared to the permanent residents of the area (Chhabra *et al.*, 2007). Full immunization means children received all vaccine *i.e.* BCG, Measles, and three doses of polio and DPT. Partially immunization means children missed any vaccine. No immunization means children missed all the vaccine.

This paper aims to focus on inter-district variation in coverage of full, partial immunization, children missed all vaccine and to find-out socio-economics and demographic determinants of full immunization.

Data-source:

Data on immunization among children under age of five years and different socio-economic, demographic indicators has been abstracted from women file of national family health survey-4 of Uttar Pradesh.National family health survey-4 covered all 71 districts of the Uttar Pradesh (as per census, 2011) with 97.5 per cent of response rate for household and 97.2 per cent of response rate of women. For vaccination sample, living children age between 12 to 23 months has been considered. Total sample size for vaccination among age-group 12 to 23 months is 7659. Time period for data collection in Uttar Pradesh was January 2015 to September 2016.

METHODOLOGY

Geographical Information System, Arc Map10 software has been used for creating the maps, for showing the inter-district variation (spatial distribution) in immunization level (fully immunized, partially vaccinated or no vaccine). Cross-tabulation has been used for showing coverage of immunization by household's background. Chi-square test has been used for checking significance of each independent variable. Since the response variables (children between the age of 12-23 months received full vaccine or not) in this study converted into dichotomous, taking 1 or 0, binary logistic regression method has been used to measure the net effect of background variables (place of residence, religion, social-group,education status of mothers, respondent current age, birth order, place of birth, sex of the household head, wealth index, media exposure, insured by health insurance, utilization of Anganwadi services), on the response variables.

RESULTS AND DISCUSSION

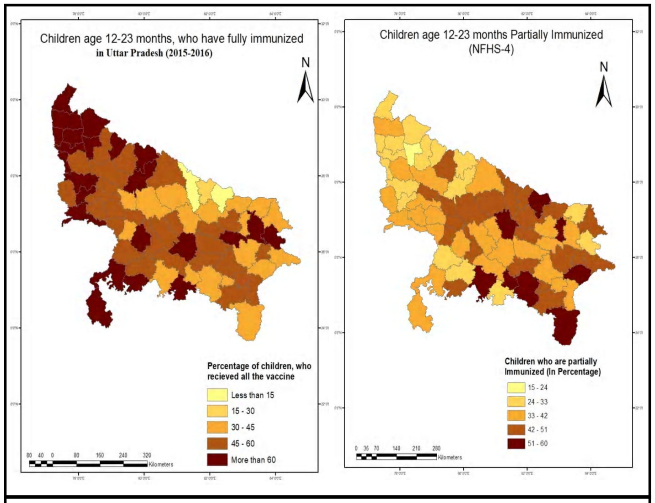
At national level, as per NFHS-4, total number of children age 12-23 months, who have fully immunized is 62 per cent. Total improvement between NFHS-3 to NFHS-4 is 18.5 per cent. Among all eight empowered action group states, Odisha with 78.6 per cent fully immunized children, doing best in terms of immunization. While Uttar Pradesh performing worst, with only 51.1 per cent of fully immunized children. Though total improvement between NFHS-3 to NFHS-4 is 28.1 per cent in terms of fully immunized children in Uttar Pradesh (Table 1). In Uttar Pradesh, 40.2 per cent children aged 12-23 months, have been partially immunized, 8.8 per cent children haven't received any vaccine.

Table 1 : Showing level of Immunization among EAG States in NFHS-3 and NFHS-4

EAG States	Children age 12-23 months fully immunized	
↓	NFHS-4	NFHS-3
Uttar Pradesh	51.1	23
Bihar	61.7	32.8
Jharkhand	61.9	34.2
Madhya Pradesh	53.6	40.3
Rajasthan	54.8	26.5
Uttarakhand	57.6	60
Chhattisgarh	76.4	48.7
Odisha	78.6	51.8
India	62	43.5

Source- NFHS -4 Factsheet

There is wide inter-district variation in Uttar Pradesh in terms of number of children age 12-23 months who have fully immunized. This value ranges from 74.2 per cent in Jyotiba Phule Nagar to 7.2 per cent in Balrampur district. Map-1 clearly illustrate the regional variation in level of immunization. In terms of fully immunization, again western Uttar Pradesh is doing best followed by Bundelkhand region and central-south Uttar Pradesh. While Eastern Uttar Pradesh and Terai belt of Himalaya

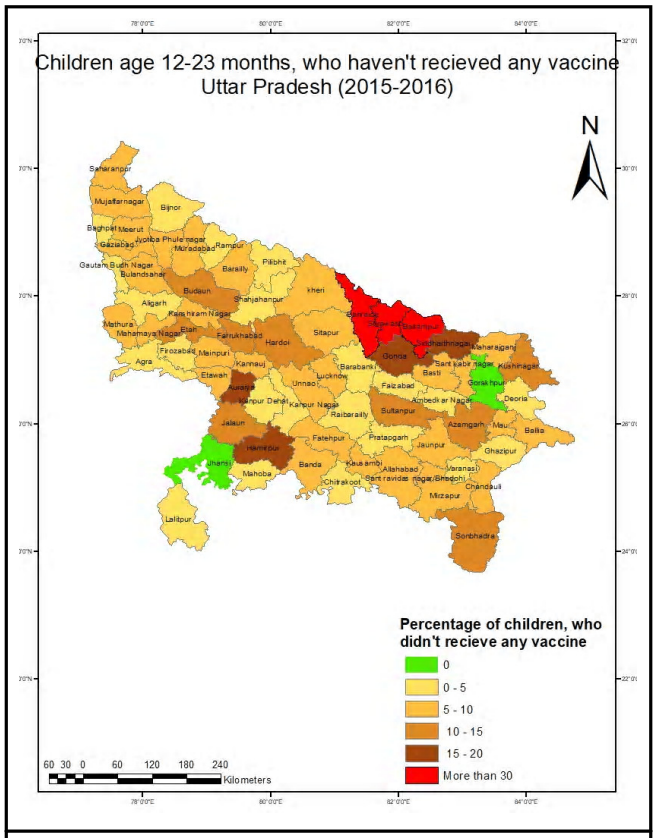


Map 1 : Showing immunization level in Children age 12-23 months in Uttar Pradesh

is not doing good. The cases of partial immunization are higher in Eastern Uttar Pradesh and some region of Tarai belt of Himalaya and lower in Western Uttar Pradesh and Bundelkhand region. Best performing districts in terms of fully immunization are- Jyotiba Phule Nagar followed by Pilibhit, Bijnor, Baghpat and Rampur in decreasing order. Jyotiba Phule Nagar, Bijnor, Baghpat and Rampur belonging to western Uttar Pradesh. Worst

Performing districts are- Balrampur (only 7.1 % children received full vaccine) followed by Bahraich (9.4 %), Sravasti (17.3 %), Sonbhadra. Balrampur, Bahraich and Shravasti districts belongs to Tarai belt of Himalaya while Sonbhadra belongs to Eastern Uttar Pradesh. Cases of partial vaccination are highest in Barabanki (57.2 % children aged 12-23 months are partially immunized), followed by Balrampur (57 %), Kaushambi and Ghazipur.

Map 2 shows that there are random scatered patches of those children who have not received any vaccine. But mostly area of Tarai belt are not performing well. There is huge inter-district variation in term of children who have not received any vaccine. It ranges from zero in Gorakhpur and Jhasi to 47.8 per cent in Bahraich. In Jhansi and Gorakhpur districts there is not a single case registered like this. In Jhansi 62.7 per cent children aged 12-23 months have been fully immunized and 37.3 per cent have been partially immunized. And in Gorakhpur 65.4 per cent 12-23 months chindren have been fully immunized and 34.6 per cent have been partially immunized. Highest percentage of 12-23 months children who haven't recived any vaccine are in Bahraich (47.8 %) followed by Balrampur (35.8 %) and Shravasti (32.7



Map 2: Showing percentage of children age 12-23 months, who didn't receive any Vaccine

%). These all three districts is in Tarai region. This type of situation is very hazardous for the state of Uttar Pradesh. Government must be taken some extra-ordinary step to over come this situation.

Socio-economic and demographic background of children aged 12-23 months with level of immunization:

To show the association between level of immunization among 12–23 months old children and different socio-economic and demographic indicator and utilisation of ICDS services; cross-tabulation and chi square test has been used. Chi-square test result show significant association of level of immunization and religion, social group, current age of marriage, mother education, birth order, place of birth, wealth index, media exposure and utilization of ICDS services. But Chi-square test does not show the significant association of level of immunization with place of residence, covered by insurance, working status of mother and sex of the household head. Cross-tabulation shows that higher per

Table 2 : Percentage of children who received vaccine by socio-economic and demographic background in Uttar Pradesh, 2015-16

Background	Children Aged 12-23 months			Total Children
	No Vaccine	Partial Immunized	Full Immunized	
Place of Residence			5.187	
Urban	8.3	38.2	53.6	1630
Rural	8.9	40.7	50.4	6030
Religion			**83.237*** **	
Hindu	7.5	39.6	53	6041
Muslim	13.7	42.5	43.8	1608
Others	0	20	80	10
Social Group			**38.782*** **	
SC	7.7	40.2	52.1	1932
ST	21.3	44.3	34.4	122
OBC	8.8	41	50.3	4141
None of the Others	8.2	37.7	54.1	1417
Current age of mother			**84.495*** **	
15 - 20 Years	10.5	40.9	48.7	411
20 - 25 Years	6.4	39	54.6	3190
25 - 30 Years	9	41.3	49.7	2583
30 - 35 Years	13.2	37.9	49	1011
35 - 40 Years	11.9	48.1	40.1	362
40 - 45 Years	15.5	36.9	47.6	84
45 - 49 Years	16.7	55.6	27.8	18
Mother Education			**322.025*** **	
Illiterate	13.8	44.2	42	3065
Primary	9	42.4	48.5	1119
Secondary	4.9	37.3	57.7	2558
Higher	2.3	31.9	65.8	916
Birth Order			**167.299*** **	
1st Birth	6	35.4	58.6	2410
2nd Birth	6.8	40.9	52.3	2039
3rd Birth	10.1	41.8	48.1	1379
4 and More	13.7	44.4	41.9	1832
Place of Birth			**423.311*** **	
Home	18.2	43.5	38.2	2154
Public Sector	5.4	40	54.6	3604
Private Sector	4.4	36.3	59.3	1877
Covered by Health Insurance			0.148	
No	8.8	40.2	51.1	7544
Yes	7.8	40.5	51.7	116
Mother's Occupation			3.444	
Working	7.4	41.7	50.9	1117
Not Working	9	39.9	51.1	6542
Wealth Index			**250.291*** **	
Poorest	13.2	45.4	41.4	2410
Poorer	9.7	41.2	49.1	1844
Middle	6.3	37.8	55.9	1369

Table 2 contd….

Contd… Table 2

Richer	5.3	37.2	57.6	1122
Richest	3.1	31.7	65.3	913
Sex of the Household Head			2.132	
Male	8.9	40.4	50.8	6750
Female	8.1	38.6	53.3	910
Media Exposer			**186.603*** **	
No	13.2	43.4	43.4	3053
Yes	5.8	38	56.2	4605
Utilization ICDS centres			**452.535*** **	
No	14.6	43.6	41.7	3829
Yes	2.9	36.7	60.4	3832

Source: National Family Health Survey-4, Uttar Pradesh

Note: Figure in parentheses is the chi-square statistics, applied for each variable.

Level of significance for chi-square test: *p<0.05; **p<0.01; ***p<0.001

cent of children of urban area are fully immunized than rural areas, but this relation is not statistically significant. Among different religion, Others have the highest percentage of fully immunized children (80 percent) followed by Hindus (53 %). Muslims have the lowest percentage of fully immunized 12-23 months old children (47.3 %) and highest percentage (13.7 %) of children without any vaccine. There is not a single child missed out without any vaccine in others. Across different social groups, children of schedule tribes have the lowest percentage (34.4 percent) full immunization followed by other backward class (50.3 percent), schedule caste (52.1) and none of the other (54.1 %). There is one interesting finding is that, schedule caste performing better than OBCs in terms of full immunization. The highest percentage of children left out of any vaccination is in the scheduled tribe (21.3 %) and the lowest percentage is in the scheduled caste (7.7 %). Schedule caste is doing bestamong all social group in terms of any vaccine. As level of mother education increases percentage of fully immunized children also increasing and percentage of children left out from all vaccine is also decreasing. Only 42 percent of illiterate mothers' children are fully immunised whereas 65.8 per cent of higher educated mothers' children are fully immunized. Above table illustrate that as the birth order of the child increases, the level of complete immunization decreases. Place of birth plays a vital role in immunization. Only 38.2 per cent children are fully immunized who are born in home.While 59.3 per cent (highest in all category) born in private sector related health institution are fully immunized children.The higher economic strata of household also encourage them to provide all necessary vaccination to their children. As wealth quintiles increases percentage of fully immunized children also increasing and percentage of children left out from all vaccine is also decreasing. Only 41.4 per cent of children belonging to poorest household are fully immunized and 13.2 per cent of children aged 12-23 months left out from all vaccine are of this wealth strata. While children belong to household of richest wealth quintiles, 65.3 per cent are fully immunized and only 3.1 per cent left out from all vaccine. Above table show that, media increases the awareness for the need of immunization. 56.2 per cent of childrenare fully immunised whose mothers are exposed to media, while 43.4 per cent of children fully immunised whose mothers are not exposed to media. In terms of immunization, ICDS centres are also play an important role. Among children who are utilising anganwadi services, 60.4 per cent children are fully immunized while only 41.7 per cent children received all vaccine who are not getting benefit from ICDS centres (Table 2). Among children who are not using ICDS services, 14.6 missed out from taking any vaccine. This is a large number. Whereas only 2.9 per cent of the children remained without all vaccines who are benefiting from ICDS centres (Table 2).

Determinants of Full Immunization:

Table 3 includes the bivariate logistic regression analysis to illustrate the effects of different socio-economic and demographic indicator on full immunization among children age 12-23 months. After controlling the role of socio-economic and demographic factors, full immunization among 12-23 months children significantly determined by religion, education level of mothers, birth

Table 3 : Odds ratio of full immunization among 12-23 months children by different background character-sticks, in Uttar Pradesh, 2015-2016

Covariates		Full Immunization in Children age 12 – 23 months Odds ratio (CI - 95%)
Place of Residence	Urban®	
	Rural	1.037(0.902 - 1.192)
Religion	Hindu®	
	Muslim	0.787***(0.691 - 0.896)
	Others	2.980(0.522 - 17.016)
Social Groups	SC®	
	ST	0.581**(0.388 - 0.869)
	OBC	0.903(0.802 - 1.017)
	None of them	0.896(0.765 - 1.049)
Education status of Mother	No Education®	
	Primary	1.096(0.946 - 1.269)
	Secondary	1.260**(1.108 - 1.434)
	Higher	1.547***(1.271 - 1.882)
Current age of Respondent	15 - 19 Years®	
	20 - 24 Years	1.446(0.978 - 2.137)
	25 –29 Years	1.485(0.997 - 2.211)
	30 - 34 Years	1.609*(1.060 - 2.442)
	35 - 39 Years	1.440(0.921 - 2.252
	40 - 44 Years	2.216**(1.265 - 3.880)
	45 - 49 Years	1.288(0.564 - 2.945)
Birth Order	1st Birth®	
	2nd Birth	0.796**(0.697 - 0.908)
	3rd Birth	0.791**(0.674 - 0.928)
	4th or More Birth	0.711***(0.593 - 0.853)
Place of Birth	Home®	
	Public sector health facilities	1.649***(1.470 - 1.851)
	Private sector health facilities	1.592***(1.381 - 1.836)
Sex of the household head	Male®	
	Female	1.126(0.972 – 1.303)
Working Status of	Yes®	
Mother	No	1.057(0.924 - 1.208)
Wealth Index	Poorest®	
	Poor	1.239**(1.083 - 1.419)
	Middle	1.553***(1.323 - 1.824)
	Richer	1.716***(1.422 - 2.071)
	Richest	2.192***(1.741 - 2.758)
Media Exposure	No®	
	Yes	1.030(0.916 - 1.158)
Utilizing of Anganwadi services	No®	
	Yes	2.236***(2.028 - 2.466)
Covered by health Insurance	No®	
	Yes	0.807(0.548 - 1.187)

Note- CI = Confidence Intervals. ®= Reference Category;
Level of Significance: ***p≤0.001, **p≤0.01, *P≤0.05

order, place of birth, wealth index, utilization of ICDS services. Full immunization does not significantly determine by place of residence, working status of mother, sex of the household head mothers' media exposure, children covered by health insurance (Table 3). After excluding the variable- utilization of anganwadi services, the bivariate regression result is significant for place of residence and social group. It means utilization of anganwadi services is more influential variable than place of residence and social group in terms of full immunization. Among different religion odds of full immunization for Muslim {0.787***(0.691 - 0.896)} is much lower than Hindu (reference category). It means full immunization varies across religions and immunization level is lower in Muslim than Hindu in study area. Across social group, level of full immunization is highest in schedule caste followed by none of the other, OBCs and schedule tribes {0.581**(0.388 - 0.869)}but association does not statistically significant for none of the other and OBCs. As education status of mother increases the level of full immunization also increasing, the value of odds is highest for higher educated mothers {1.547***(1.271 - 1.882)}. As birth order increases, odds for full immunization decreases. It means as number of children increases, carelessness of household for full immunization increases. Children born in public sector health facilities have highest odds {1.649***(1.470 - 1.851)} than born in private health facilities or in home. As wealth index of the household increase, odds of full immunization also increasing. It means children belongs to richest household wealth status have higher access {2.192***(1.741 - 2.758)} to full immunization than lower wealth status. The odds of complete immunization are more than two times higher among children who are getting benefit from ICDS centres {2.236***(2.028 - 2.466)}compared to children who are not getting benefit from ICDS centres (Table 3). In terms of immunization ICDS centres play a very important role.

Findings :

Among all empowered action group states, Uttar Pradesh have the lowest coverage (51.1 %) of full immunized children of age group 12-23 months. Western Uttar Pradesh and Bundelkhand doing good in terms of full immunization whereas central-Terai region and eastern Uttar Pradesh are performing bad. Bharaich, Shravasti and Balrampur are doing extremely poor in terms of children who haven't received any vaccine. More than 30 per cent children of these trio districts even not received any vaccine. Chi-square test result show significant association of level of immunization and religion, social group, current age of marriage, mother education, birth order, place of birth, wealth index, media exposure and utilization of ICDS services. Children belonging to Hindu in comparison to Muslim, none of others among social group, mothers with age-group 20-25 years, mothers having higher education, richest household, children with 1st birth-order and household using Anganwadi services are more fully immunized then their correspondent categories. Binary logistic regression result shows that religion, social group, mother's education, wealth index, birth order, place of birth and utilization of Anganwadi services are the background variables that significantly determined full vaccination.

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