Inequalities in Childhood Immunization in India - A National Level Analysis of Policy Concerns

Introduction:

Immunization has revolutionized child health in countries throughout the world, preventing million of deaths every year in addition to reducing the risk of disability caused by infectious diseases. It stands out as one of the greatest public health achievement of the 20th century. Along with these achievements the darker side of the picture is that the global commitment to immunization has not been sustained in all developing countries and the benefits of immunization are not reaching all children of the world in an equitable manner.

Immunization is one of the most cost-effective interventions to prevent a series of major illnesses among children. Special focus on 'reduction of child mortality' in Millennium Development Goals (MDG) has made the world conscious about the prevention of diseases and care of the child. The six serious but vaccine preventable childhood diseases are measles, tuberculosis, diphtheria, pertussis (whooping cough), tetanus and poliomyelitis. Children are considered to be fully immunized if they receive one dose of BCG (Bacille Calmette Guerin) against tuberculosis and measles vaccine along with three doses of DPT (Diphtheria, Pertussis, Tetanus) and poliomyelitis (polio) vaccines.

The *Expanded Program on Immunization* (EPI) raised the percent of children immunized globally from less than 5 per cent in 1977 to about 80 percent by 1990 with DPT and Measles vaccines. In India, since 1940's childhood immunization has been an important part of Maternal and Child Health services. BCG immunization started in 1948 and between 1969 and 1985 vaccines for DPT, measles and other childhood diseases were added as a part of EPI. Government of India during the year 1985-86 launched the *Universal Immunization Program* (UIP) to attain at least 85 per cent vaccination of all infants by 1990 against the six vaccine preventable diseases. The National Health Policy and the National Rural Health Mission (NRHM) reiterated in achieving the universal immunization by 2010. In spite of a long standing national program and the efforts made by the government to improve the immunization coverage, the results are far below the set targets which is revealed by the DLHS-3(District Level Household and Facility Survey) conducted during the year 2007-08. The coverage of full immunization is 54 percent only which is far below the target of universal immunization. What is astonishing is that there are 11 percent children not immunized at all and 34 percent children receiving only some of the recommended vaccines. This data shows that though a substantial number of children started out on the vaccination schedule but were unable to complete the recommended schedule of vaccines. Drop-outs remain a problem especially with respect to multiple dose vaccines of DPT and polio. This has resulted in the overall level of full immunization coverage coming down.

Therefore, an understanding of the factors contributing to low childhood immunization against the vaccine preventable diseases and the implementation of policies targeting appropriate groups at the local level is critical to improve the immunization coverage. With respect to this, the present study aims to focus on the factors contributing to the low coverage of immunization in India with a special focus on the drop outs in multiple dose vaccines of DPT and polio, along with focusing on the inequalities that exist in immunization with respect to economic status of the household, the place of residence, the sex of the child

and the region of the country. The study also examines the reasons for not immunizing the child, as stated by the mothers, for the country as a whole and the *seventeen major states of India*.

Data:

The data for the study comes from the latest round of the District Level Household and Facility Survey -3 *(DLHS-3)* which was conducted in *2007-08*. The DLHS -3 is one of the largest ever demographic and health surveys carried out in India, with a sample size of about seven lakh households covering all districts of the country. Immunization details of children aged 12-23 months were collected in DLHS-3.The mothers were asked whether they had a vaccination card for each child. If the card was available, then the details of vaccinations were taken from the card and if the details were not present on the card then the mother's recall was used. If the mother could not show a vaccination card, mother's recall on the vaccinations received was used. If the child had not received any immunization the reasons for not immunizing the child was also collected. Along with it, the information with respect to whether the ANM, doctor or the health worker had given the advice to vaccinate the child and the place where the last immunization had been received was also collected.

Methodology:

Two immunization indicators are used in the analysis, that is full and no immunization. From a policy perspective, the two immunization indicators reflect different aspects of health system. The extent of no immunization indicates whether the system is working at all. Thus high proportion of children with no immunization may indicate a complete system failure. The extent of full immunization suggests the capacity of a working system to ensure complete follow up. Thus, if few children have all the required immunization, the system may be reaching them but may not be efficient enough to ensure that immunization protocols are completed satisfactorily.

To bring out the economic inequality in immunization coverage, a summary index called concentration index is used. A concentration curve plots the cumulative proportion of all children (beginning with those households from the poorest wealth quintiles and ending with those from the richest wealth quintiles) against the cumulative proportions of immunized children. If immunization is distributed equally between children from all wealth groups, then the concentration curve lies along the diagonal. The concentration index is defined as twice the area between the concentration curve and the diagonal. In general, if the index measures good health, it is defined as positive when the concentration curve lies below the diagonal and negative when it lies above the diagonal.

Gender differentials will be calculated based on simple ratio of immunization rates for boys and girls. The two indices are as follows:

$$\text{Gender ratio for full immunization} = \frac{\%\ of\ boys\ fully\ immunized}{\%\ of\ girls\ fully\ immunized} * 100$$

$$\text{Gender ratio for no immunization} = \frac{\%\ of\ girls\ with\ no\ immunization}{\%\ of\ boys\ with\ no\ immunization} * 100$$

Thus, a value of hundred implies no gender differential in full or no immunization. The ratio for no immunization is inverted compared to that of full immunization so that the interpretation of the two remains the same: a value above hundred would indicate there is female disadvantage. For the purpose of showing the differentials in immunization with respect to residential status the immunization coverage will be analyzed separately for the rural as well as urban areas.

Dropouts are defined as those children who have received DPT-1 but missed DPT-2, whereas children who did not receive DPT-3 are considered as those who had vaccine of both DPT-1 and 2 but could not receive DPT-3. Similarly polio dropout is also defined. The dropouts are analyzed taking into consideration the dropouts between the first and the second dose and the second and the third dose of the DPT and polio vaccines. The dropouts are also be analyzed taking into consideration a number of factors such as the age of the mother at childbirth, mother's education, religion, caste, sex of the child, type of family and place of residence. For this purpose, simple bivariate and multivariate analysis is used.

Preliminary Results:

The data presents a sobering picture of the poor levels of immunization in India, particularly worse in rural areas, more among girls and in northern states of India. About 63 percent of the children in the urban areas and only about half of the children in the rural areas were fully vaccinated. Moreover about a quarter of the children in the rural areas and one-tenth of the children in the urban areas had not received any of the recommended vaccines by 2007-08.

There is also a high degree of inequality in immunization between children from rich and poor households, being more in the case of no immunization in the urban areas. In rural India as well children from poorer households are less likely to be fully immunized and more likely to have no immunization than those from the richest households. For all the wealth quintiles, the urban children fare better than the rural children, in levels of both full and no immunization.

There is notable gender inequalities, with more boys fully immunized and fewer boys completely not immunized than girls, in both urban and rural areas. Boys fare better than girls at almost all levels of household wealth status with gender differentials being larger in no immunization than full immunization. This shows that gender bias in India goes beyond household economics. Even with the improvement in the economic condition, gender bias still exists. The same is the scenario in drop-outs with respect to polio and DPT vaccines with the dropouts being concentrated more among the children from the poor households belonging to the rural areas and girl children.

The children whose mothers and both parents were educated had better chances of completing the immunization schedule. Muslims are less likely than Hindus to have complete immunization. The main reason given for not immunizing the child was the lack of awareness with respect to the importance of immunization. Other reasons such as lack of facility, poor supply of vaccines, misconceptions regarding the effect of the vaccines, etc. were also reported by a large number of women interviewed in the survey for not immunizing their children. There are enormous variations in the immunization performance across states. Full immunization ranges from a lowest of 30 percent in Uttar Pradesh to a highest of 82 percent in Himachal Pradesh. The performance of the southern states is comparatively better as compared to the northern states of India.

One striking finding with respect to inequality in immunization is the fact that even among the better performing states the inequalities with respect to wealth, gender and place of residence is widespread. It reflects the fact that even though the immunization coverage is improving it is more concentrated in the hands of the better sections of the society, residing in the urban areas and among the males.

Table1. Concentration Index showing the inequality in immunization by economic status of households, major states of India (2007-08)

	Full Immunization			No Immunization		
States	***Total***	***Rural***	***Urban***	***Total***	***Rural***	***Urban***
Orissa	0.112	0.114	0.038	-0.388	-0.367	-0.085
Uttarakhand	0.072	0.061	0.073	-0.399	-0.396	-0.602
Chhattisgarh	0.105	0.094	0.103	-0.362	-0.351	-0.392
Jharkhand	0.088	0.077	0.038	-0.215	-0.191	-0.447
Rajasthan	0.086	0.065	0.09	-0.246	-0.223	-0.214
Bihar	0.133	0.133	0.099	-0.078	-0.099	-0.184
Madhya Pradesh	0.221	0.178	0.158	-0.326	-0.273	-0.40
Uttar Pradesh	0.180	0.172	0.213	-0.142	-0.193	-0.23
India	**0.145**	**0.139**	**0.107**	**-0.325**	**-0.282**	**-0.351**

Table2. Gender ratio showing the inequality in immunization by gender of the child, major states of India (2007-08)

	Full Immunization			No Immunization		
States	***Male***	***Female***	***Gender Ratio***	***Male***	***Female***	***Gender ratio***
Orissa	63.6	60.9	104.4	2.4	3.1	133.2
Uttarakhand	65.1	60.2	108.0	5.6	9.3	165.7
Chhattisgarh	60.0	58.7	102.2	2.1	3.1	143.6
Jharkhand	54.5	53.3	102.3	9.7	8.7	89.6
Rajasthan	51.1	46.1	110.8	10.8	14.2	131.7
Bihar	44.8	37.7	119.0	2.4	2.5	102.9
Madhya Pradesh	36.7	35.2	104.1	9.7	10.3	106.1
Uttar Pradesh	31.6	28.6	110.7	4.0	4.1	102.0
India	**54.6**	**52.3**	**104.4**	**4.9**	**5.2**	**107.2**

Table 3. Gender inequality in immunization by the households' economic status, major states of India (2007-08)

		Wealth Quintiles				
States		***Lowest***	***Second***	***Middle***	***Fourth***	***Highest***
Orissa	Male	48.5	67.2	72.2	79.6	76.9
	Female	48.6	58	73.2	73.2	83.1
Uttarakhand	Male	33.3	55.2	58.6	58.8	78.1
	Female	69.2	53.7	53.4	55.7	70.6
Chhattisgarh	Male	46.7	55.8	60.5	73.8	86.3
	Female	46.6	55.9	58.5	67.4	89.9
Jharkhand	Male	47.3	53.5	59	58.2	75.6
	Female	42.5	50.3	65.1	67.7	75.5
Rajasthan	Male	44.6	43.6	44.7	56.4	64.4
	Female	42.8	37.1	39.4	49	62.8
Bihar	Male	32.3	42.9	49.7	60.9	65.6
	Female	25.7	35.2	44	51.5	63.3
M.P.	Male	20.4	26.9	36.2	49.9	63.8
	Female	17.5	29.7	35.1	44.3	61
U.P.	Male	21.7	25.1	31.9	39.3	54.9
	Female	18	24.1	27	36.9	50.6
India	**Male**	**9.7**	**6.5**	**5.7**	**3.3**	**1**
	Female	**9.9**	**7.2**	**5**	**3.8**	**1.6**