Impact of India's Conditional Cash Transfer Program on Childhood Immunisation Rates

Maternal and Child Health

With 1.2 billion people and the world's fourth-largest economy, India will surpass China to become the most populous nation in the world by 2022.[1] But still Indian population exhibits some of the world's poorest health outcomes, inclusive of maternal and child health. In some states the rates are so high that they are comparable to those in the world's poorest countries.[2-3] According to the World Health Statistics (WHS) 2016, the maternal mortality rates of India are 174 per 100, 000 live births. Nearly five women die every hour in India from complications developed during childbirth, with heavy blood loss caused by haemorrhage being a major factor. This works out to nearly 45,000 mothers dying due to causes related to childbirth every year in India and accounts for around 17 per cent of such deaths globally.[4] According to the recent State of the World's Mothers report released in 2015, by Save the Children, India scored poorly, standing at 140 out of 179 countries. The Index scores countries on five criteria: maternal health, children's well-being, educational status, economic status and political status.[5]

On Child Mortality Rate front, although India has made laudable improvement but still even today 1.2 million children are dying per year before reaching their fifth birthday, dropping from 3.4 million in 1990. We have the largest number of under-five deaths in the world, accounting for 20% of global under-five deaths. Although, these deaths in India have dropped from 126 deaths per 1,000 live births in 1990 to 39 in 2016 - a 62% reduction but still it is higher than the average global reduction of 53%. The deaths are about seven times higher than in high-income countries where 1 in 147 is dying whereas in India 1 in 21 is dying.[6-8] According to the UNICEF report, poor children are twice as likely as rich children to die

before age 5 and stillbirths and neonatal mortality rates are higher than those of higher income groups.[9] One of the methods to reduce maternal and infant mortality rates is to promote maternal and child health services such as ante-natal care (ANC), institutional delivery and child immunisation.[10-13] Even though most of the primary healthcare is available free of charge in public health facilities but still the use of maternal and child health services is relatively low due to disparities across education levels, socioeconomic levels and Indian states.[13-16]

To address these longstanding issues, the government of India in 2005, launched the National Rural health Mission (NRHM) programme to re-vitalize the primary health care system and increase public health spending. The programme aimed to benefit the people living in rural areas, particularly in difficult, inaccessible and remote parts of the country. Poor pregnant women were being encouraged to use institutional maternal and child health services.[13, 2, 17] Of particular note of NHRM was the introduction of 'Janani Suraksha Yojana' (JSY), a central government funded scheme which focussed on promoting the uptake of deliveries in health facility through conditional cash-transfer to poor mothers and ASHAs. [18-19]

Benefits of the scheme varies across states. In ten Low Performing States (LPS), (Assam, Bihar, Rajasthan, Chhattisgarh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Orissa, Uttarakhand and Uttar Pradesh), based on maternal and child health indicators, all women are eligible for the program and are entitled to more funds from the central government and additional technical and managerial support. In these states, all pregnant women who deliver in a government facility or an accredited private facility in rural areas are given INR 1400, and in urban areas INR 1000.[20-21] Among the other High Performing States (HPS), the scheme is restricted to women holding a BPL card and only for their first two births. These

women are entitled for financial assistance of INR 700 in rural areas and INR 600 in urban areas. Under the scheme, the potential beneficiaries are encouraged to register to receive at least 3 prenatal check-ups, opt for institutional delivery, and seek postpartum and new-born care, although JSY cash is disbursed to the women immediately after delivery.[2, 21]

Evaluations of JSY has shown that it has succeeded in increasing the uptake of maternal health services, improving newborn health, immunisation rates and breastfeeding practices.[20-21, 13] Lim et al. (2010) was the first to analyse the impact of the JSY on reproductive health outcomes. He carried out an impact evaluation across all the states and union territories (UTs) using three different analytical approaches and found a small but significant effect of JSY on increasing antenatal care and reducing perinatal and neonatal mortality among two of three analytic approaches. Mazumdar, Mills, & Powell-Jackson (2011), and Carvalho (2014), Thacker, Gupta & Saloman (2014) followed Lim et al. but with different methods of impact analysis and studied additional health outcomes.[2] They found little to no impact of JSY on antenatal care and did not find a significant impact on neonatal and perinatal mortality.[20]

Childhood immunisation is not the main target of JSY but directly or indirectly it has effects on its outcome. There is some evidence that immunisation rates have increased following the start of JSY but there has been no formal evaluation of the impact of JSY on childhood immunisation rates except for one of the studies done by Carvalho et al. in 2014. However, this study has assessed the effect of JSY based on the early post-NRHM period data of 2007–08, thus excluding the program effects after almost full implementation and widest outreach. Our study, is therefore an attempt to evaluate the impact of JSY on childhood immunisation rates in the late post-NRHM period than in the early post-NRHM period.

Methods

Study Sample

Data for the present paper has been drawn from the India Human Development Survey (IHDS) Wave 2 conducted in 2011-12. The advantage of the IHDS lies in the fact that it is a nationally representative sample which provides a comprehensive description of changes in childhood immunisation rates over an extended period of seven years after the initiation of the JSY program.

The survey re-interviewed the same households, creating one of the largest panel surveys in the world. Questionnaire design was very similar to that of the IHDS-I, covering a sample of about 42,152 households in 1,503 villages and 971 urban neighbourhoods across India. The topics covered were concerning health, education, employment, economic status, marriage, fertility, gender relations, social capital, village infrastructure, wage levels, and panchayats composition.

For the reproductive health module, the sample included women respondents from 2004-05 as well as one randomly selected additional woman from the same household, if present. For the additional woman sample, IHDS-II followed the same guidelines as IHDS-I, interviewing ever-married women aged 15-49 years. The re-contact rate for IHDS-II households was about 85 percent, which is a reliable percentage for exploring policy impacts after a gap of seven years. We used responses from ever-married women aged 15–49 years who reported having had the live birth after January 2005 onwards.

For the present paper, we used the birth history file to collect information related to children, their mothers and households and restricted our analysis to the children aged 12-60 months. If an eligible woman had two live births in the age-group of 12-60 months, then data on women's most recent live birth has been used to investigate the effect of JSY on immunisation rates. The final analytical sample of the kids aged 12-60 months was 7950. To

adjust for sample selection, eligible women sampling weights were used. The data analysis was performed with Stata 14.1.

Definition of Variables

Outcome variables

Women were asked whether they had received financial assistance from the government for hospital delivery or transportation for delivery for their most recent birth; those who responded ''yes'' to this question were coded as JSY = 1, and those who responded ''no'' were coded as JSY = 0. Because women were only asked about their most recent pregnancy, only data on women's most recent live birth could be used to investigate the effect of JSY on immunization rates.

Data on full immunisation of children (age 12-60 months) is based on vaccination card for the last live birth or on mother's report in case of non-availability of the card. According to the guidelines developed by the WHO, children who received one dose each of Bacillus Calmette–Guérin (BCG) and measles, and three doses each of diphtheria, pertussis and tetanus (DPT) and polio vaccine are defined as being fully immunised.

Predictor variables

The key socioeconomic predictors of interest that have influenced government policies and programmes include education of women/mothers and their husbands, social group, type of residence and household economic status.[22-25] A woman's educational indicator was constructed based on information related to attainment of a particular level of education. It was categorized as illiterate/no education, primary school, middle school, secondary school, higher secondary school or some college, and college graduate. A similar procedure was applied to construct the husband's education. The social group variable includes the

following categories: Forward caste, Other Backward Class [OBC], Dalit, Adivasis, Muslim, Christian, or Sikh. A household was classified according to the urban/rural definition of the Census of India.

The level of economic status of children was derived from the information on household wealth vis-à-vis possession of wealth or assets by the household to which they belonged. A composite index of household wealth was constructed and it was based on the ownership of 28 basic durable household assets which were common across both rounds of the survey. The index was constructed by adding how many assets the household owned, from 0 to 28, where a value of '0' denotes that the household possesses none of the 28 assets while a value of '28' indicates the ownership of all 28 assets (see http://ihds.umd.edu/assets.html). Based on the scores, households are categorised in quintiles (i.e., five equal divisions, each representing 20% of the entire sample) from the poorest to the richest groups corresponding to the lowest to the highest quintiles at the national level. Thus, this study has represented the household economic status of children in terms of 'wealth quintile', categorised in five groups, that is, 'poorest', 'poorer', 'middle', 'richer' and 'richest'.

Other social and demographic variables also can have a significant impact on the immunisation rates. Hence, we included the woman's age (continuous), parity (1, 2 and 3+); age of the child (continuous), sex of the child (male/female), work status of the mother (not working, working). The State variable entailed differentiation between the Low Performing States (LPS) and non-LPS States.

Statistical Analysis

In order to investigate the effect of maternal receipt of financial assistance from JSY on childhood immunization rates, we used a binary logistic regression, considering full immunisation as the outcome variable which is binary in nature. The model was adjusted for a set of sociodemographic factors. The results are presented as odds ratios (OR). The OR explains the probability that kids belonging to mothers of an exposed group will have higher immunisation rates relative to the probability that kids belonging to mothers of an unexposed group.

The present paper also propose to conduct a propensity-score matching (PSM) analysis with logistic regression to control for potentially confounding differences between the JSY and non-JSY groups. PSM is a widely used method in impact evaluation literature when experimental data are not available. This method can correct for biases in treatment effect due to observed covariates that result from confounding due to non-random assignment of the treatment (Rosenbaum et al., 1983). Matching allows for the ‘‘treated’’ group to be made as similar to the ‘‘untreated’’ group as possible based on observed pre-treatment matching covariates, to reduce the link between the treatment variable (receipt of JSY) and background characteristics of the participant (Imai et al., 2007).

We would be using a logit model to estimate propensity scores and 1:1 nearest neighbour matching algorithm without replacement to generate matched groups. Matching covariates would be maternal age, number of live births, maternal education, father’s education, household wealth, social group and place of residence.

Results

Mean immunization rates among our sample population (children aged 12 to 60 months that were the most recent births of women 15 to 49years of age) for both rural and urban areas are shown in Table 1. More than 85% of children have been vaccinated against BCG and Polio at birth in both rural and urban areas. Large drops in coverage rates between the first and third recommended doses were seen for both polio (34 percentage point drop in rural areas and 40 percentage point drop in urban areas) and DPT (20 percentage point drop in rural areas and 17 percentage point drop in urban areas) vaccines. About 75% of the children in rural areas have been vaccinated against measles and more than 80% in urban areas. Only about 40% of the children aged 12 to 60 months in both rural and urban areas were fully vaccinated against all the doses given in the first year of life whereas about 80% were fully vaccinated for doses given in the first three months of birth. Less than 5% of children had received no vaccine.

Table 1: National level immunization coverage estimates among most recent births 12-60 months prior to survey to women 15-49 years who did/did not participate in JSY

Vaccinations	**Mean Percentages**					
	JSY			**No JSY**		
	Rural	**Urban**	**Total**	**Rural**	**Urban**	**Total**
BCG	94.2	94.5	94.3	87.4	92.1	89.0
Polio at birth	89.7	93.9	90.5	86.0	90.8	87.6
Polio 1	89.8	91.3	90.1	85.3	87.2	85.9
Polio 2	79.8	83.8	80.6	76.1	78.2	76.8
Polio 3	57.2	60.2	57.8	52.1	49.5	51.3
DPT 1	90.8	93.6	91.3	86.3	90.3	87.6
DPT 2	83.2	87.3	84.0	78.2	83.1	79.8
DPT 3	72.6	78.1	73.7	64.7	72.1	67.1
Measles	77.7	83.8	78.8	72.2	81.3	75.2
Fully vaccinated child*	42.9	47.5	43.7	36.9	39.1	37.6
Fully vaccinated for doses upto 3 months**	83.6	86.1	84.1	77.4	83.7	79.5
No vaccine	1.9	0.8	1.7	6.6	4.6	6.0
N	**1915**	**547**	**2462**	**3631**	**1857**	**5488**

*A fully vaccinated child was defined as a child who had received one dose of BCG vaccine, 3 doses of DPT and polio vaccines (not including polio at birth), and one dose of measles vaccine. (IIPS 2010)

The demographic and socioeconomic characteristics are presented in Table 2. The mean age of the ever-married women ranged from 27.9 years in rural areas to 28.3 years in urban areas. The mean number of children ever born is between two and three for women in urban and rural areas. On average, women were found to have more years of schooling in urban areas (8.3) than in rural areas (5.0). A similar pattern was seen in schooling years of respondents' husbands. It increased from 6.7 years in rural areas to 9.0 years in urban areas. Similarly, the mean number of assets owned by households also varied across rural (12.1) and urban areas (19.8). There were almost same proportion of girls and boys in both rural and urban areas. It is very surprising to find that higher percentage of women are working in rural (51%) than in urban areas (18%). About one in every three women in rural areas and one in every five women in urban areas have received financial assistance from JSY programme. More than 60 percent of the kids belonged to LPS in rural areas and about 35 percent in urban areas.

Table 2: Demographic and Socioeconomic characteristics of the kids aged 12-60 months

Characteristic	**Mean Percentages**
Mean age of the mothers (years)	28.02 (SD 5.22)
Mean no. of children ever born	2.57 (SD 1.67)
Mean age of the kids (in months)	32.29 (SD 14.36)
Mean years. of schooling of the mothers	5.95 (SD 4.96)
Mean years. of schooling of the fathers	7.37 (SD 4.75)
Mean no. of assets per household	14.28 (SD 6.65)
Sex of the Child	
% Boys	55.4
% Girls	44.6
% of mothers currently working	41.8
% of mothers participation in JSY programme	32.1
% belonging to Low Performing States (LPS)	55.2
Social group	
% Forward caste	16.5

Characteristic	Mean Percentages
% OBC	34.5
% Dalit	22.6
% Adivasis	8.3
% Muslim	16.5
% Christian, Sikh	1.5
N	**7950**

Preliminary results from the binary logistic regression are shown in Table 3. Findings indicate that the odds of receiving full immunisation was significantly 1.6 times higher among kids whose mothers received financial assistance from JSY.

Similarly, the odds of receiving full immunisation was higher among Dalits (OR=1.080), Christians, Sikhs and Jains (OR=1.381). It was also significantly higher among the kids belonging to less developed villages (OR=1.647) and poorer households (OR=1.153). Also kids whose mothers were less educated (OR=1.651) were significantly equally likely to be vaccinated like those whose mothers were highly educated (OR=1.668). Kids whose mothers were working were significantly less likely to be vaccinated than those whose mothers were not working.

Preliminary findings clearly indicate that India's conditional cash transfer program has led to an improvement in child health indicators, in particular childhood immunisation outcomes. Receipt of cash assistance for delivery resulted in increased immunization rates.

Table: Logistic regression results for the effect of JSY on immunization outcome for full vaccination, run on sample of children 12-60 months of age

Fully vaccinated for doses upto 3 months	**Model**	
	Odds Ratio	**P>z**
Mothers availed JSY benefits		
No (ref)		
Yes	1.389	0.000
Mothers belonging to Low Performing States		
No (ref)		
Yes	0.773	0.001
Interaction variable		
i.lps # i.jsy	0.758	0.061
Maternal age (years)	1.008	0.293
Number of live births		
1 birth (ref)		
2 births	0.953	0.572
3 or more	0.704	0.001
Age of the child	0.997	0.191
Sex of the child		
Boy (ref)		
Girl 2	1.009	0.896
Place of residence		
Metro cities (ref)		
other urban	0.998	0.986
more developed vill	1.243	0.083
less dev vill	1.660	0.000
Social group		
Forward caste (ref)		
OBC	0.865	0.145
Dalit	1.095	0.407
Adivasis	0.801	0.126
Muslim	0.878	0.279
Christian, Sikh, Jain	1.367	0.137
Maternal education		
Illiterate (ref)		
1-4 std	1.662	0.003
5-9 std	1.494	0.000
10-11 std	1.458	0.006
high sec & some college	1.717	0.000
College graduate	1.682	0.003
Father's education	0.998	0.832
Work status of the mother		
Not working (ref)		
working	0.840	0.021
Household wealth		
Poorest (ref)		
2nd quintile	1.152	0.230
Middle q	1.261	0.054
4th quintile	1.363	0.021
Richest	1.663	0.001

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