Conditional cash transfers for better maternal and child health? Evidence from India

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Abstract

This paper investigates the health effects of a large Indian conditional cash transfer program, Indira Gandhi Matritva Sahyog Yojana (IGMSY). We determine the intention-to-treat effect by approaching the geographical variation in the program roll-out as a natural experiment and applying a combined matching and difference approach. We find that the program has a large effect on the percentage of children fully immunized against diphtheria, pertussis and tetanus. We detect no statistically significant impacts on other complete immunizations, underweight, stunting, anemia or mortality. In addition, we estimate heterogeneous effects for several child, household and state characteristics. We find no statistically significant differences between subsamples. Our results demonstrate that conditional cash transfers can set effective demand side incentives for preventive health care seeking. Notwithstanding this, continuing deficits in maternal health may inhibit improvements in child health outcomes.

Keywords: conditional cash transfer, child health, maternal health, India

JEL classification codes: I15, I18, I12, O15, O12

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1. Introduction

While there has been considerable progress in the worldwide reduction of child mortality, absolute mortality remains high, with more than 15000 children under five perishing each day (World Health Organization (WHO) 2018a). The majority of these deaths occur in low and middle income countries (LMICs) (WHO 2018), which also lag behind in terms of health risk and disease burden (Black et al. 2008; World Health Organization (WHO) 2009). For instance, Sub-Saharan Africa and South East Asia account for about 80 percent of stunted children (WHO 2018). The main causes which account for 80 percent of under-five child deaths in LMICs are perinatal and nutritional conditions as well as communicable diseases (WHO 2018). While many communicable diseases can be prevented by vaccination, immunization rates as high as 95 percent are necessary in order to locally eliminate an illness (Andre et al. 2008). In addition, deficits in child health persist owing to an intergenerational vicious cycle in which unhealthy mothers are more likely to give birth to unhealthy children (Black et

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al. 2008). Poor health and health care in early childhood in turn affects long-term physical and cognitive development (Currie 2009; Maluccio and Flores 2005; Maluccio et al. 2009; Miguel and Kremer 2004) which is again reflected in poor maternal health.

For these reasons, the Millennium Development Goals (MDGs) and the ensuing Sustainable Development Goals (SDG) put a strong emphasis on universal vaccination coverage and maternal and child health. After most LMICs, including India, fell short of the MDG's targeted reduction of maternal and infant mortality (United Nations Development Program 2015), many countries sought novel ways to strengthen maternal and child health in order to ensure progress towards the ensuing SDGs. In the wake of this, many LMICs adopted conditional cash transfer (CCT) policies (Fiszbein and Schady 2009). While few of these were explicitly targeting pregnant mothers, CCTs can in principle support mothers during the critical phase of pregnancy and childbirth and incentivize health-enhancing behavior. The literature presents inconclusive evidence on the effect of CCTs on child health outcomes. For instance, difference-in-difference estimates of Columbia's Familias en Acciȯn CCT program show that the latter led to improved nutritional status and reduced mortality of infants (Attanasio et al. 2005), whereas randomized controlled trials (RCT) of the conditional Mexican Oportunidades program discover little or adverse effects on child anthropometric outcomes (Behrman and Hoddinott 2005) until the cash transfer amount is doubled (Fernald et al. 2008). Apart from a small-scale RCT intervention in rural Rajasthan conducted by Banerjee et al. (2019) in which non-cash gifts vastly increased village child vaccination rates, evidence for the effect of CCTs on childhood vaccinations is so far inconclusive and only available for the Latin American context (Lagarde et al. 2009). Similarly, evidence of the effect of CCTs on child mortality in South Asia is largely absent in the literature (Glassman et al. 2013) except for Powell-Jackson et al. (2015), who find no effect on mortality rates of an Indian CCT conditioning on institutional delivery.

We study the Indian maternal and child health CCT program Indira Gandhi Matritva Sahyog Yojana (IGMSY). At the pilot stage, the program targeted 1.4 Mio. pregnant and lactating women above 18 and their first and second children. Based on a survey with implementing agencies as primary sampling units, Ghosh and Kochar (2018) evaluate IGMSY in the poorest Indian state of Bihar, where the program was poorly implemented. Despite inordinate delays in cash transfers, the authors find that the program had a large effect on children's weight-for-age but not height-for-age. The evaluation does not assess any effects on vaccination or mortality. We contribute to this literature by presenting the first evaluation of the program using a nationally representative sample from the fourth wave of the National Family Health Survey (NFHS-4, 2015-16) with a focus on child nutrition, mortality and vaccination. Moreover, we investigate potential drivers of the program effect. This includes children's strength of relation to the household head, a catalyst which has not yet been investigated in the context of a conditional cash transfer or other concrete intervention.

We identify the causal effect of the program on completed vaccination and child health characteristics with a matched difference estimator. This method exploits the timing of program implementation in 2011 and the government's strategy to select 52 pilot program districts based on district scores computed from health indicators drawn from the District Level Household and Facility Survey (DLHS-3). Based on this, we estimate the intent-to-treat (ITT) effects of the program by comparing cohorts of children in program districts with children in control districts matched by similar district scores. The program raises the likelihood of completion of a critical early childhood vaccination against diphtheria, pertussis and tetanus (DPT-3) up to 6 percentage points (i.e. 7 percent of the share of children receiving DPT-3 in the sample). The magnitude of this effect is greater for children directly related to the household head and groups assumed to be initially disadvantaged but not significantly different from the effect on children not directly related to the household head and more advantaged groups. We observe no program effect on child health outcomes or mortality. A continued rise in DPT-3 coverage at the above-described magnitude would raise coverage to the SDG's targeted full immunization (in children under five years) within four years.

The rest of the paper is structured as follows: Section 2 introduces the IGMSY program. Section 3 lays out the conceptual framework while section 4 sets out the methodology. The following section 5 describes the data and points out its limitations. We present balancing tests and the main results in section 6. Section 0 concludes.

2. Background of the IGMSY program

The Indian government started their first mother and child health related conditional cash transfer in 2005 in the form of a program that incentivizes safe delivery. This program, called Janani Suraksha Yojana (JSY) provides a one-time cash incentive of 1400 rupees (Rs) to pregnant women below the poverty line or from scheduled castes and tribes (SC/ST), conditional on institutional delivery or skilled assistance for delivery at home. However, complications during delivery are not the only risk to mother and child health. As stressed in the previous section, poor nutrition and health during pregnancy and lactation can have negative health consequences that affect mother and child throughout their life. In spite of this, JSY fails to cover the wage loss to the mothers during pregnancy and after birth and does not incentivize behavioral practices which are beneficial to both mother and child health that go beyond safe delivery, such as adequate nutrition or preventive health care seeking during pregnancy and lactation. The IGMSY program closes this gap. It aims to improve the health of mothers and their first two live born children via a conditional cash support during the time of pregnancy and lactation. As government employees are already entitled to paid maternity leave under the Maternity Benefit Act of 1961, they are excluded from the benefit. The grant of Rs 6000 (approx. USD 100) is funded by the national government via the state and district branches of the integrated women and child development scheme (ICDS). The transfer is sent to the mother's bank account in three installments, at the last trimester of the pregnancy and three and six months after the delivery, conditional on the fulfillment of conditions that ensure safe delivery and promote good infant and young child feeding practices. The compliance with these conditions is monitored by local primary child health workers (Anganwadi workers), who receive a monetary incentive for their additional effort and implement some of the services referred to in the conditions. An extensive list of the conditions and the timing of the cash disbursement upon their fulfillment is available in Table A1 in the appendix. IGMSY directly incentivizes several childhood vaccinations: BCG, Polio and DPT. In addition, IGMSY contains various nutrition-related incentives: during pregnancy, mothers have to collect iron and folic acid tablets and attend nutrition and health counseling. Once the child is born, its weight must be monitored regularly and the mother has to participate in several infant feeding counseling sessions. The set of conditions for the third installment stipulates in addition that the child must be exclusively breastfed for six months at the end of which complementary feeding must be initialized. The public primary health care infrastructure to fulfill these conditions is free and locally available so that health care and counseling undersupply is unlikely to impair the fulfillment of conditions.

Table 1: IGMSY program expenditure and implementation by state

	State expenditure per eligible woman 2011/12	State expenditure per eligible woman 2012/13	State expenditure per eligible woman 2013/14	State expenditure per eligible woman 2014/15	State expenditure per eligible woman 2015/16	Avg. state expenditure per eligible woman 2011-2014	Mothers who received transfer on time (%)
Andhra Pradesh	245.37	1002.04	1365.67	1497.79	226.72	871.03	4
Arunachal Pradesh	1514.92	0.00	314.33	1095.02	602.01	609.75	N.A.
Assam	14.78	0.00	2779.69	.	.	931.49	81
Bihar	352.55	837.83	2242.28	1600.64	.	1144.22	35
Chhattisgarh	596.11	1324.21	1557.49	3442.43	.	1159.27	N.A.
Goa	513.96	119.16	429.96	957.44	535.55	354.36	N.A.
Gujarat	1855.97	1521.37	2087.32	3097.54	2439.93	1821.55	66
Haryana	2119.08	0.00	722.89	3386.34	1872.64	947.32	N.A.
Himachal Pradesh	1284.23	387.59	1066.09	1371.42	2506.70	912.64	95
Jharkhand	398.41	0.00	508.74	525.74	0.00	302.38	N.A.
Karnataka	1160.60	262.74	1777.41	1901.45	1235.60	1066.92	21
Kerala	2079.03	691.18	2200.81	979.63	863.00	1657.01	0
Manipur	2419.66	0.00	.	.	.	1209.83	N.A.
Meghalaya	888.73	0.00	317.83	.	.	402.19	N.A.
Mizoram	16.76	845.28	920.08	625.10	312.71	594.04	N.A.
Delhi	125.74	0.00	550.31	391.09	437.45	225.35	N.A.
Punjab	27.34	0.00	422.96	497.58	.	150.10	N.A.
Rajasthan	494.07	565.84	1161.37	1430.47	879.46	740.42	1
Sikkim	1662.98	0.00	628.25	1133.96	214.45	763.74	N.A.
Tripura	655.31	477.45	977.19	709.10	1668.16	703.31	N.A.
Uttar Pradesh	591.50	23.15	263.90	123.02	.	292.85	1
Uttarakhand	962.08	152.35	1203.41	1183.13	788.14	772.62	N.A.
West Bengal	0.00	1066.95	612.78	1222.58	777.40	559.91	50
Telangana	245.37	1002.04	0.00	2037.23	509.31	415.80	N.A.
Average over states	842.69	428.30	1048.29	1390.89	933.48	775.34	35.4

Note: Expenditure in rupees. Source for data for expenditure is the Ministry of Women and Child Development (2019), source for percent of mothers who received the transfer on time (during their pregnancy) is Development Monitoring and Evaluation Office (DMEO) (2017) (only covers selected states. N.A. indicates states for which this indicator is not available), source for population data for calculation of eligible women is Census 2011.

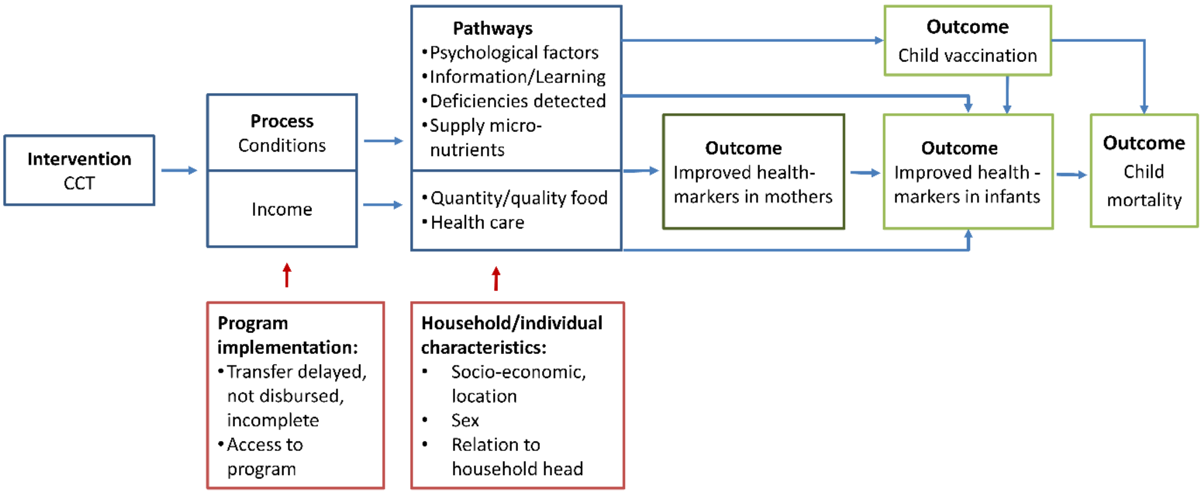
In the initial years, the program targeted 1.4 million women in 52 pilot districts (Ministry of Women and Child Development, Government of India 2019). The selection of these pilot districts was based on an index comprising six indicators from the third round of the District Level Household and Facility Survey (DLHS-3), fielded during 2007-2008. Using this index, all 640 districts of India were categorized as low, medium and high performing districts. From these groups, program districts were randomly selected: Eleven districts were drawn from the high-performing and low-performing categories and twenty-six from the medium-performance categories. The remaining four districts were union territories (UTs), namely, Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli and Lakshadweep. In October 2010, the program was approved for implementation by the state government, with a relatively small budgetary allocation. the actual implementation of the scheme started in April 2011, since there were considerable lags in communicating the scheme to the ICDS state implementation agencies. In 2013, after the National Food Security Act was promulgated, the cash component of the program was aligned with the new legal framework and hence increased from Rs 4000 to Rs 6000 (equivalent to 4.2 (2.8) and 6.1 (4.3) times the monthly rural (urban) poverty line in 2011). Table 1 presents figures on yearly state IGMSY expenditures per woman in child-bearing age in pilot districts. However, no consistent raise in expenditure can be detected in 2013 which casts doubt on the implementation of this change in the transfer. In 2017, the program was renamed Pradhan Mantri Matritya Vandana Yojana (PMMVY) and expanded to all of India.

3. Theory of change

The beneficial effects of CCTs on maternal and child health outcomes can run through two channels (depicted in Figure 1). First, through the fulfilment of conditionalities, incentivizing women to access maternal and child healthcare and adopt healthy behavioral practices. Second, through additional income which can be used to extend the consumption of private healthcare and improve nutrition during the critical phase of pregnancy, childbirth and lactation.

Two important child health indicators that are affected by poor maternal health and inadequate nutrition practices as well as infections are stunting (low height-for-age) and underweight (low weight-for-age) (World Health Organization (WHO) 2014). Nutrition deficiencies, mainly of iron but also folate, vitamins B12 and A, are also the main cause of a third indicator, anemia (United Nations (UN) 2015; World Health Organization (WHO) 2019). Anemia reduces the oxygen level in the blood and can lead to severe organ damage.

Figure 1: Theory of change



IGMSY can improve these health indicators either directly through nutrition-related conditions such as infant and child feeding educational sessions, regular weight control of the child, complementary feeding or directly through the cash transfer via the purchase of more and better quality food for the child once complementary feeding is started. While the cash transfer can in principle be spent on non-health related items, the literature suggests that expanding mother's income increases expenditure on child nutrition and health (Quisumbing and Maluccio 2000). In addition, child health indicators can improve indirectly through conditions that aim to improve maternal health such as nutrition counseling sessions, iron and folic acid tablet provision during pregnancy, prenatal care; or additional food and health care for the mother purchased with the cash transfer during pregnancy and lactation. In addition, the conditions directly incentivize three types of vaccination: three doses of diphtheria, pertussis and tetanus (DPT), three doses of polio and one dose of BCG (Bacillus Calmette-Guèrin) vaccine. BCG vaccine is administered at birth and protects primarily against tuberculosis. Polio has been officially eradicated in India (Lahariya 2014) but the vaccination is necessary to uphold the protection for the whole population. Infections with these illnesses can be lethal and hinder the child from absorbing growth-promoting micro-nutrients or induce weight loss (World Health Organization (WHO) 2014). Thus, while the vaccination rate is an important outcome per se due to its spillover effects, an associated reduction in infections in BCG and DPT-3 can also reduce stunting, underweight and child mortality. Similarly, a reduction in underweight goes hand in hand with a lower risk of mortality (World Health Organization (WHO) 2010).

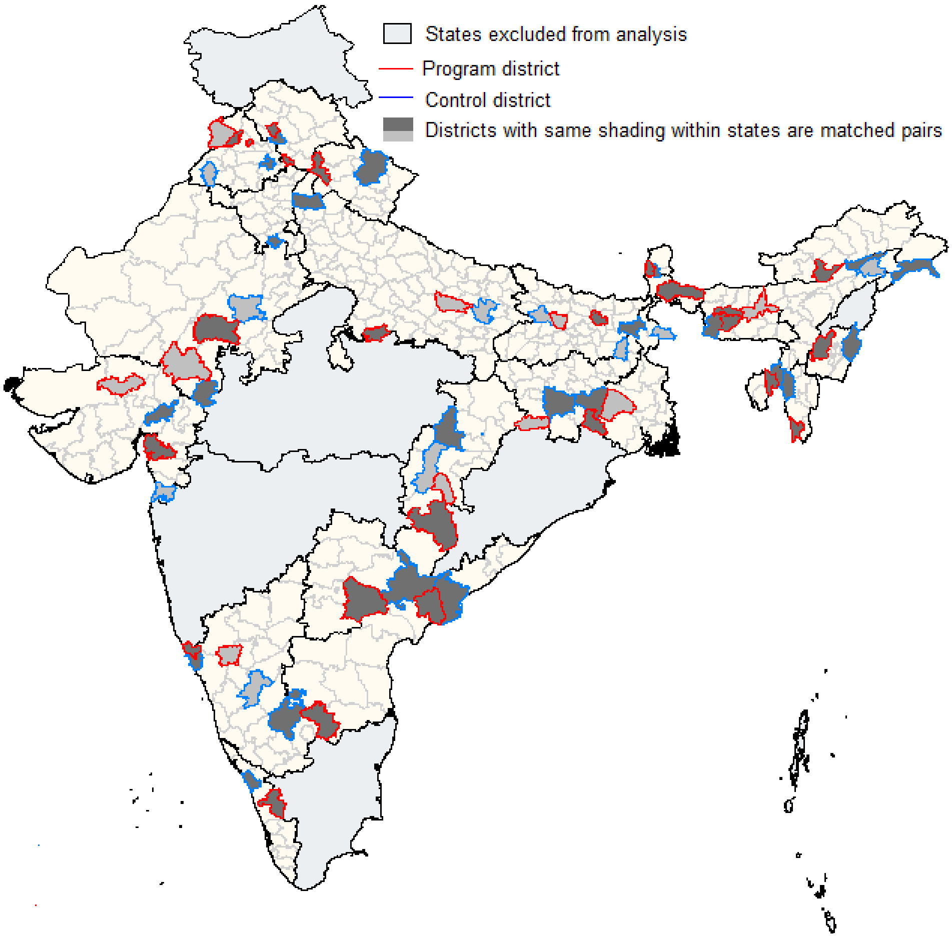
How effectively the program can take effect via these channels depends on the one hand on how well the program is implemented and on the other hand on individual and household characteristics. Regarding the first point, if the cash transfer does not or only incompletely reach the eligible women due to poor implementation, this will mitigate its effect. With respect to the second point, households that are potentially initially worse-off such as households that are poor, classified as SC/ST or are situated in a rural area are expected to profit more from the program (unless these characteristics restrict their access to the program). In addition, effects may differ between boys and girls as there is evidence that Indian parents in income-constrained settings invest more in boys' health compared to girls' (Asfaw et al. 2010). Moreover, how much of the transfer is spent on mothers and their children is determined by their position in the household such as their relationship to the household head. In particular, wives of household heads and their children enjoy a privileged position in the household which can positively influence children's access to resources such as food and schooling (Hoddinott and Kinsey 2001; Case et al. 2004).

4. Empirical approach

4.1 Main regression specification

We elicit the intention to treat effect (ITT) with a matching estimator which compares the effect of the program on children which had access to the program and those who had not. This is done by approaching the pilot phase of the program as a natural experiment. Only children of mothers pregnant after April 2011, in districts where the program was implemented in the pilot phase (program

Figure 2: Matched pairs of treatment and control districts



Note: based on geospatial data from GADM database (2015). Excluded from analysis are states with state-wide maternity programs, union territories and Jammu and Kashmir, where districts could not be identified unequivocally.

districts), could enter the program, while those children born before 2012 who lived in non-pilot districts had no access. We construct and match control districts for each pilot district. This is done by recalculating the development/health index for all districts based on data from DLHS-3 reports (International Institute for Population Sciences (IIPS) 2010). See Table A8 in the appendix for index scores of all districts in our analysis. Next, we select within each state the nearest neighbor to each program district in terms of the index in order to form a matched pair. Despite Madhepura being the closest match for Saharsa, Kathihar was selected as control district because of a pilot project for an Anganwadi center improvement program being implemented in Madhepura (Ghosh and Kochar 2018).

The matching estimator compares the difference in outcomes of children born before 2012 and children born in 2012 or later within pairs of matched program and control districts. As the actual program start may have been delayed in some states, our estimator represents a lower bound of the program effect. The estimate will only be unbiased if our matching technique pairs control and program districts that had initially similar health outcomes. We assert this in section 6.1 with a balancing test. In addition, we partly address this concern through our double difference method, which eliminates differences constant over cohorts, by including district, pair and cohort fixed effects, and by controlling for several potential confounding factors at individual and household level. The corresponding regression equation is depicted in equation (1),

$$H_{pdti} = \alpha_{pd} + \mu_t + (\delta_p \times eligbirth_t) + \beta(T_d \times eligbirth_t) + \gamma X_{pdti} + u_{pdti} \quad (1)$$

where i indicates child, d denotes district, t stands for the birth year of the child and p is the matched treatment and control district pair. H is a health or vaccination outcome. The coefficient β denotes the ITT effect. T is a dummy variable indicating whether a child lives in a program district, $eligbirth$ is a dummy variable which indicates whether a child was born in the year 2012 or later. X encompasses several control variables. These include child sex, birth order, mother's height, age and squared age as well as caste, wealth, religion and rural location of the household. α, μ and δ capture district, birth year and matched pair fixed effects respectively. More specifically, μ_t captures average cohort specific differences between children common to both treatment and control districts (and thus includes spatially independent differences between children born before and after the program launch). District fixed effects, α_{pd}, account for cohort-independent differences between districts (thus also absorbing cohort-independent differences between treatment and control districts). $\delta_p \times eligbirth_t$ captures pair-specific trends over time. Simple pair fixed effects are absorbed by the district fixed effects. u denotes the robust standard error. As suggested by Abadie, Spiess (January 2019) for matched samples, the standard errors are adjusted for correlation across cohorts within districts by clustering at the pair level. We account for a higher probability of falsely rejecting the null-hypothesis of no effect when testing multiple models at once by adjusting the standard errors for families of (i) vaccination outcomes and (ii) nutrition-related outcomes according to the method of Romano and Wolf (2005). This method, implemented in stata using the rwolf command, applies bootstrapping to stepdown adjusted p-values that control for the familywise error rate. We restrict the analysis to children born in in the two years around the program start (2010-2013) in order to maximize comparability of the cohorts.

We refrain from exploiting the third eligibility criterion through a triple difference (only first and second born children vs. third or later born children) due to potential spillover effects between eligible and ineligible siblings. Spillovers are particularly likely when payments are delayed, evidence for which exists in several states (Niti Aayog and Development Monitoring and Evaluation Office (DMEO) 2017).

4.2 Estimation of heterogeneous effects

In order to investigate whether certain sub-populations profit particularly from the program, for those outcomes where we find a program effect, we estimate heterogeneous effects for various subsamples that differ regarding household characteristics and an indicator of program implementation, based on the theory of change in section 3. As the Romano-Wolf method is only applicable for model families that differ regarding their dependent variable, the p-values of the individual and household characteristics are adjusted for multiple hypothesis testing with Benjamini and Hochberg's (1995) method.

4.3 Robustness tests

For the purpose of testing whether our results are sensitive to the choice of specification, we complement the main results with two robustness tests. First, we model the ITT effect without controls, second, with a logit instead of a linear probability model.

5. Data

5.1 Dataset construction

Primary source of data for vaccinations, health and control variables is the seventh round of the Indian demographic and health survey (International Institute for Population Sciences (IIPS) and ICF 2018), in India called the National Family and Health Survey or NFHS – 4. It consists of a household survey which was administered between January 2015 and December 2016. We derive our main outcome and control variables from the children's data set which comprises information on 259,627 children under five years of age at the time of survey. The NFHS provides sampling weights in order to adjust for oversampling of certain types of populations (see USAid and MEASURE DHS/ICF International (2013)) for more details). All statistics and estimates computed with the NFHS data are adjusted using these weights.

We restrict the dataset in several ways. Firstly, we retain only the treatment or control districts selected as described in section 4.1. Furthermore, we eliminate states with additional/universal maternity programs[2] due to spillovers to control districts. We further exclude UTs[3], which are effectively nationally governed and only consist of one district, as well as Jammu and Kashmir since districts in the latter cannot be matched unequivocally with the districts in NFHS. In addition, we restrict the analysis to first and second born children of mothers older than 19 at the birth of the child since only these are eligible for the transfer. Moreover, we create a more comparable sample by considering only children born in the four years around the introduction of the program in 2011 and of mothers under 40. Changes in the number of observations after each of these restrictions, are traced in Table A9 in the appendix. Finally, after excluding children with missing observations in any control and outcome variables, the dataset encompasses 24 states, 70 districts (35 treatment and control districts each) and roughly 9300 children.

5.2 Outcome measures

The main outcomes are binary variables which take on one if a child died, has been administered the last diphtheria, pertussis and tetanus (DPT-3), polio (polio-3) or BCG vaccination dose or suffers from anemia, stunting or underweight respectively. We include all vaccinations directly incentivized through IGMSY: DPT-3 and polio-3 vaccination of the child within six months of birth is a condition for the third installment. BCG vaccination at birth is a condition for the second installment. While these vaccinations do not encompass all vaccinations recommended by the WHO, DPT – 3 is seen as an indicator for "the overall system strength to deliver infant vaccination" (World Health Organization (WHO), United Nations Children's Fund (UNICEF) 2019). Stunting is based on z-scores which express the measured value (here height/age) as the number of standard deviations from the WHO reference population's

[2] Madya Pradesh, Maharashtra, Odisha and Tamil Nadu

[3] Chhandigarh, Dadra and Nagar Haveli, Daman and Diu, Lakshadweep, Puducherry, Andaman and Nicobar Islands

median. A child is stunted if it has a height-for-age (HAZ) z- score below -2. Underweight is defined as a weight-for-age z-score (WAZ) below -2. Compared to wasting (weight-for height), underweight is less susceptible to fluctuate short term over the year. While a change in underweight can be induced both by variation in weight or height, these two effects can be distinguished by looking at both underweight and stunting simultaneously. Lastly, a child is anemic if its hemoglobin level falls below 10.9 g/dl. While binary indicators have the disadvantage over continuous outcomes that small health changes far from the threshold cannot be detected, we base our analysis on thresholds because they enable us to measure a state of deprivation, which is a prerequisite for policy evaluation.

5.3 Control variables and characteristics for heterogeneous effects

We control for several potential confounding factors at individual and household level. The individual characteristics encompass sex and birth order of the child, its mother's height, age and squared age and the mother's educational level (either no education - the reference group-, primary education, secondary education or higher education). The household controls comprise dummy variables which indicate whether the household is situated in a rural area, belongs to a scheduled caste or tribe, its religion (Hindu, Muslim, Christian, Sikh, Buddhist and as reference non or other religion) as well as a wealth measure already contained in the NFHS – 4 data set which is a continuous measure of relative wealth of a household based on the factor score of an index of owned assets.

Table 2 presents the summary statistics for outcome variables and regressors. 65 percent of the children in our sample are eligible for the program by birth year, with a slightly higher share (66 percent) born in 2012 or later in control districts than in program districts (64 percent). Immunization coverage for BCG is with 93 percent almost universal. While the majority of children in our sample has been fully immunized against DPT and Polio, 15 percent and 25 percent did not receive the DPT-3 and Polio-3 vaccination respectively. The mortality rate in our sample is 4 percent. About one third of children are underweight, 36 percent are stunted and more than half suffer from anemia. The majority of children live in rural areas and are Hindus. Roughly one-third belongs to scheduled castes or tribes. Statistics for outcomes and control variables are similar for treatment and control districts. We find some minor non-significant differences in the proportion of mothers without formal education (24 percent in treatment, 21 percent in control districts). Moreover, treatment and control districts have on average slightly different wealth index scores.

The variables by which we divide the data into subsamples are also for the most part derived from NFHS – 4. Household characteristics are dummy variables for rural location, SC/ST affiliation of the household and whether the household belongs to the poorest 40 percent in the sample. Indicator for the position of the child within the household is a dummy variable equal to one if the child is directly related to the household head (i.e. the mother is either household head or the wife of the household head). We assume that states with a higher program expenditure per eligible woman implemented the program more successfully. Thus, we construct as measure for program implementation a dummy variable indicating whether a state disbursed more than the median average IGMSY expenditure per eligible woman between 2011 and 2014. For program expenditure in each state we draw on data from the Ministry of Women and Child Development, Government of India (2019). The number of eligible women in each state is derived by calculating the share of women in each age group between 19 and 49 years for each program district using NFHS – 4 data and then multiplying it with the number of women in the respective age group for each program district (based on Census 2011 population data (Registrar General of India 2011)). According to our estimations, the total number of women in the eligible age group in program districts in 2011 is 8,623,631. The median average expenditure between

2011 and 2014 per eligible woman amounts to Rs 806. We choose this measure instead of the number of beneficiaries in each state reported by the government since our measure is more strongly correlated with survey measures of program coverage from Niti Aayog and Development Monitoring and Evaluation Office (DMEO) (2017). Moreover, it better reflects the ITT effect we are testing for.

Table 2: Summary statistics of dependent and independent variables

	Full sample			Program districts			Control districts		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
Child Outcome Variables									
BCG vaccinated (%)	93.38	24.87	8911	93.86	24.02	4510	92.94	25.63	4401
DPT-3 vaccinated (%)	84.98	35.73	8873	85.34	35.38	4487	84.64	36.06	4386
Polio-3 vaccinated (%)	75.41	43.06	8914	76.52	42.39	4512	74.38	43.66	4402
Mortality (%)	4.17	20.00	9300	3.45	18.30	4692	4.82	21.41	4608
Stunted (%)	36.08	48.03	8311	36.35	48.11	4197	35.82	47.95	4114
Underweight (%)	34.11	47.41	8311	34.80	47.64	4197	33.47	47.20	4114
Anemic (%)	54.47	49.80	8360	54.61	49.79	4227	54.34	49.82	4133
Child Characteristics									
Female (%)	48.36	49.98	8873	48.08	49.97	4487	48.62	49.99	4386
Mother Characteristics									
Height (cm)	15184.65	608.12	8873	15182.06	597.61	4487	15187.04	617.76	4386
Age (years)	26.38	3.60	8873	26.52	3.65	4487	26.25	3.54	4386
Education									
No education (%)	22.72	41.90	8873	24.19	42.83	4487	21.36	40.99	4386
Primary education (%)	13.66	34.34	8873	13.38	34.04	4487	13.92	34.62	4386
Secondary education (%)	50.46	50.00	8873	49.39	50.00	4487	51.44	49.98	4386
Higher education (%)	13.17	33.82	8873	13.04	33.68	4487	13.28	33.94	4386
Household Characteristics									
Rural (%)	73.12	44.33	8873	72.68	44.56	4487	73.53	44.12	4386
SC/ST (%)	33.64	47.25	8873	34.23	47.45	4487	33.08	47.06	4386
Religion									
Hindu (%)	82.96	37.60	8873	82.23	38.23	4487	83.64	36.99	4386
Muslim (%)	10.56	30.73	8873	10.12	30.16	4487	10.96	31.24	4386
Christian (%)	3.06	17.22	8873	3.33	17.95	4487	2.80	16.51	4386
Sikh (%)	2.54	15.73	8873	3.47	18.30	4487	1.68	12.84	4386
Buddhist (%)	0.25	4.95	8873	0.32	5.66	4487	0.17	4.18	4386
None or other religion (%)	0.64	7.98	8873	0.53	7.24	4487	0.75	8.61	4386
Mean wealth index score	0.05	0.99	8873	0.09	1.01	4487	0.01	0.97	4386
Eligibility Variable									
Share born 2012 or later	0.65	0.48	8873	0.64	0.48	4487	0.66	0.47	4386

Note: DPT-3: child completed the third diphteria, pertussis and tetanus vaccination. BCG: child completed the Bacillus Calmette-Guèrin vaccination (primarily employed against tuberculosis). Polio-3: child completed the third polio vaccination. Wealth index score equals the factor score from principal component analysis of the NFHS-4 household asset index. SC/ST indicates whether the child's household belongs to a Scheduled Caste or Tribe. Summary statistics are based on data from NFHS-4 and constructed using state mother/child sampling weights provided by NFHS-4. Sample: First and second born children of mothers aged 19-39 born 2010 - 2013, 70 districts.

5.4 Data limitations

Our data underlies several restrictions. First, it does not allow us to test whether any increase in DPT vaccination transmits into a higher protection from these diseases as the NFHS-4 lacks information on the incidence of specific infections. However, we can assume that protection is similar to that found in other studies. For instance, a recent study on the effectiveness of DPT-vaccine finds that diphtheria, pertussis and tetanus are reduced by 75 percent in DPT-3 vaccinated children aged 5 to 9 years (Domenech de Cellès et al. 2019). BCG vaccination is even more effective (Mangtani et al. 2013). A second constraint of our data is its lack of information on expenditure and food consumption, the latter being only available for the last 14 days previous to the interview. This makes it difficult to explore with our empirical approach whether (lack of) changes in expenditure on and consumption of nutritional items are a potential pathway for effects on stunting and underweight. For this reason, and in order to estimate short-term effects of the program, it would have been interesting to perform a simple difference between treatment and control districts amongst children born in the last 12 months before the survey. However, restricting the sample in this way leaves us with too few observations. Thus, due to the long time period that elapsed between the program implementation and the NFHS-4 survey, we can only measure long-term effects on child health with our final sample. Third, we cannot control for father's characteristics as these are only available for a very small subsample.

We would ideally confirm our analysis with data from a time period shortly before the program implementation (placebo test) in order to assure that treatment and control districts were initially similar in health and vaccination outcomes and followed similar cohort trends in these outcomes. Unfortunately, the previous rounds of NFHS for India do not include district identifiers. The most recent round with district identifiers is NFHS – 2 from 1998/99 with a much smaller sample. Moreover, in the NFHS-2 and a similar health survey, the district level household survey (DLHS – 2), the questionnaire was administered only to children under three years of age, which makes it impossible to conduct a placebo test with our double difference methodology. In addition to estimating effects on an extensive margin, we would have liked to investigate effects on an intensive margin by exploiting the official raise in the cash transfer amount in 2013. Notwithstanding this, we opted against this proceeding since such a raise cannot consistently be seen in the official expenditure data (Table 1), indicating incomplete implementation. Lastly, while we do address program district independent, cohort-dependent effects, the internal validity of our approach is restricted by the fact that we cannot account for differential time *trends between* treatment and control groups because we rely on cross-sectional data.

6. Results

6.1 Balancing test

In order for our estimate of the program effect to be unbiased, our matching technique must produce well-matched control and program districts. In order to test whether children born before program implementation (substitute for a baseline) in our treatment and control districts have similar observable characteristics, we provide a balancing test in Table 3. Except for the wealth index, there are no significant differences in outcomes and other observable characteristics between children in treatment and control districts. Thus, we argue that health and vaccination outcomes were similar between program and control districts before the start of the program. Moreover, we account for the difference in the wealth index score by including wealth as a control variable in the regression.

Table 3: Balancing test: Difference in means of outcomes and other characteristics between program and control districts of children born before 2012

	Control districts		Program districts			
	Mean	Stand. error	Mean	Stand. error	Pr |T|>t difference in	Obs.
Outome variables						
BCG vaccinated (%)	93.00	1.06	93.43	1.40	0.75	3030
DPT-3 vaccinated (%)	85.18	2.28	82.94	2.59	0.44	3017
Polio-3 vaccinated (%)	71.09	3.56	71.43	4.38	0.91	3030
Stunted (%)	36.46	2.91	33.75	3.26	0.33	2790
Underweight (%)	33.87	2.80	36.03	2.43	0.51	2790
Anemic (%)	47.75	2.87	44.70	2.53	0.33	2789
Mortality (%)	5.46	0.78	3.66	0.89	0.15	3172
Other observable characteristics						
Mean Age	3.71	0.04	3.70	0.04	0.93	3036
Female (%)	46.28	1.46	48.09	1.74	0.44	3172
Mean mother's height (cm)	15149	43	15175	39	0.22	3118
Formally educated mothers (%)	76.18	4.64	74.65	3.78	0.58	3172
SC/ST (%)	33.84	2.71	34.24	4.34	0.91	3172
Hindu (%)	86.79	2.32	84.16	3.08	0.42	3172
Mean wealth score	-0.08	0.13	0.07	0.14	0.07	3172
Rural (%)	77.37	2.97	73.75	5.08	0.34	3172
Mean birth interval first-second born	37.30	1.29	36.69	2.28	0.76	1527

Note: Robust standard errors clustered at the matched pair level. All estimates computed using sampling weights provided by NFHS-4. Sample: 1st and 2nd children born before 2012 of mothers aged 19-39.

Another potential threat to our identification strategy would be posed by families moving from control to program districts in order to profit from the program, in this way introducing selection bias. However, we find no effect of IGMSY on years of residence in the current location (results not shown).

6.2 Effect of the conditional cash transfer on childhood vaccinations and health

Table 4 documents the ITT effect of the conditional cash transfer program on children's immunization and health outcomes. The second column reveals that children eligible for the program are on average six percentage points more likely to complete the third combined diphtheria, pertussis and tetanus vaccination. The results are statistically significant at the 1 % level and remain so when adjusting p-values for multiple hypothesis testing (adjusted p-value is 0.0099). Notwithstanding these improvements through the program, we find no statistically significant coefficients for complete BCG and Polio vaccination (columns 1 and 3), stunting, underweight, anemia and mortality (columns 4-7). However, except for anemia, the coefficients all display the expected sign.

Table 4: Program effect on child health and vaccination

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Vaccinations			Health outcomes			
	BCG	DPT-3	Polio-3	Stunting	Underweight	Anemia	Mortality
Program District x Birth Year in 2012 or later	1.75	5.89***	3.21	5.60	-3.23	3.46	-0.13
	(1.25)	(2.11)	(3.49)	(3.48)	(2.17)	(2.64)	(0.71)
	{0.26}	{0.01}	{0.39}	{0.33}	{0.34}	{0.35}	{0.84}
Control mean (%)	93	84	72	35	46	35	4
Observations	8911	8873	8914	8311	8311	8360	9300
No. Clusters (Pairs)	35	35	35	35	35	35	35
No. Districts	70	70	70	70	70	70	70

Note: Linear probability models. Outcomes are dummy variables indicating BCG (Bacillus Calmette-Guèrin vaccine, primarily employed against tuberculosis); DPT-3 (third diphtheria, pertussis and tetanus vaccination dose); Polio-3 (third Polio vaccination dose); mortality; stunting (HAZ below -2); underweight (WAZ below -2); and anemia (hemoglobin level below 10.9 g/dl). Coefficients in percentage points. Birth year in 2012 or later is a dummy variable equal to 1 when a child is born in 2012 or later. Program district is a dummy variable equal to 1 when a child lives in a district where IGMSY was active from 2011 onward. Additional controls included but not reported in the table are birth order of the child, mother's educational level, age, squared age and height, household religion and wealth index factor score, and dummy variables equal to 1 if the household belongs to a Scheduled Caste or Tribe and is situated in a rural area respectively. Sample: First and second children born to mothers aged 19-39 between 2010-2013, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific pair fixed effects. Robust standard errors clustered at the matched pair level in parentheses, Romano-Wolf bootstrapped q-values (p-values adjusted for multiple hypothesis testing in columns (1)-(3) and columns (4)-(7)) in curly brackets.
* p<0.10 ** p<0.05 *** p<0.01

6.3 Subsample analysis: Drivers of the program effect

We estimate heterogeneous program effects based on child, household characteristics and a measure of program implementation in order to explore the drivers of the effect we found in the previous section. Table 5 displays the effect of the program on DPT – 3 vaccination rates for various sample splits and the differences between corresponding subsamples. As expected, the coefficients for girls and children living in poor, SC/ST, rural and parent-headed households and in states with high expenditure per eligible population are of larger magnitude than those of children living in wealthier, SC/ST, urban, non-parent-headed households and in states with low expenditure per eligible population. However, in none of the cases do we find an at conventional levels statistically significant difference between the two corresponding subsamples (also a result of our conservative clustering at district pair level). However, the difference between children whose mother or father is the household head and those who are not directly related to the household head is considerable and almost significant. The program increases the likelihood of a third DPT dose in parent-headed households on average by 10 percentage points (significant at the 1% level), whereas the influence of other households is not statistically significant from zero.

Table 5: Heterogeneous program effects on DPT-3 vaccination

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Sample split by:		Individual and Household Characteristics										Intensity of Program Implementation (by State)	
	Full Sample	Sex		Wealth		Social Group		Residence		Relation to HH Head			
		Female	Male	Bottom 40%	Upper 60%	SC/ST	Other	Rural	Urban	First Degree	Higher Degree	Low	High
Program District x Birth Year 2012 or later	5.89***	9.21**	3.41	7.43**	4.17**	7.71**	5.79**	6.93***	2.58	9.63***	1.99	4.55***	6.52*
	(2.11)	(3.44)	(2.63)	(3.55)	(1.92)	(3.39)	(2.77)	(2.00)	(5.42)	(2.42)	(3.85)	(1.43)	(3.57)
Group Difference		5.80		3.26		1.92		4.35		7.65		1.97	
		[0.182]		[0.350]		[0.649]		[0.390]		[0.141]		[0.607]	
		{0.649}		{0.649}		{0.649}		{0.649}		{0.649}			
Control Mean (Percent)	84	83	85	80	87	85	84	83	88	84	85	83	85
Observations	8873	4332	4541	3684	5189	3660	5213	6696	2177	4408	4465	5065	3808
No. Clusters (Pairs)	35	35	35	35	35	35	35	34	35	35	35	18	17
No. Districts	70	70	70	70	70	70	70	67	70	70	70	36	34

Note: Linear probability model. Outcome is a dummy variable equal to 1 if a child has completed the third diphteria, pertussis and tetanus vaccination dose. Coefficients in precentage points. Birth year 2012 or later is a dummy variable equal to 1 if the child is born in 2012 or later. Program district is a dummy variable equal to 1 when a child lives in a district where IGMSY was active from 2011 onward. Sample: First and second children born to mothers aged 19-39 between 2010-2013, 70 districts. Subsamples: Wealth comprises children in households that belong to the poorest 40 percent (wealthiest 60 percent) of sample households, based on factor score of an asset index. Social group comprises children in households belonging (not belonging) to a Scheduled Caste or Tribe. Residence comprises children living in a rural (urban) area. First (higher) degree of relation to household head comprises children of mothers who are (are not) the household head or whose spouse is (is not) the household head. Low (high) intensity of program implementation consists of children in states with Rs. average expenditure between 2011-2014 per woman living in program districts aged 19-39 below (equal to /above) median. Additional controls included but not reported in the table are birth order of the child, mother's educational level, age, squared age and height; household religion, wealth index factor score and whether the household belongs to a Scheduled Caste or Tribe (except in SC/ST subsamples) and whether it is situated in a rural/urban area respectively (except in rural/urban subsamples). All estimates are computed using sampling weights and year and pair fixed effects as well as cohort specific pair fixed effects. Robust standard errors clustered at the matched pair level in parentheses, p-values for group difference in square brackets, Benjamini-Hochberg q-value (p-value adjusted for multiple hypotheses) in curly brackets. * p<0.10 ** p<0.05 *** p<0.01

6.4 Discussion of results and simple cost-effectiveness estimate

Magnitude and accordance with literature

The importance our results regarding vaccination is illustrated by the fact that the increase in DPT – 3 vaccination induced by the program is equivalent to 7 percent of the share of children receiving DPT-3 immunization in our control group (children born before program start in control districts). If DPT-3 coverage consistently rose by this factor (which corresponds to a growth rate of 1.34 in each cohort), the program could close the gap of children in this age group towards the SDG's targeted full immunization (95 percent) within four years. The non-significant results for BCG and polio-3 vaccination are in line with Ranganathan and Lagarde (2012), who conclude in their meta-analysis for Latin American countries that cash transfers affect DPT-3 but evidence for other vaccinations is mixed. In our case the results for BCG can be explained by the fact that BCG rates were very high to begin with and thus unlikely to vastly improve. In contrast, polio vaccination coverage is lower. Although the result for polio-3 vaccination is insignificant, we find a statistically significant increase in the polio-2 vaccination rate which is of similar magnitude to the polio-3 coefficient (results not shown). Combined with the positive albeit insignificant coefficients for polio-3 and BCG, this suggests that conditioning directly on vaccination positively influences vaccination rates in less prevalent vaccinations.

Contrary to Ghosh and Kochar (2018), we find no effect on weight-related outcomes. Regarding stunting, our results are consistent with the results of Ghosh and Kochar (2018) and a meta-analysis of Manley et al. (2013) who find no significant improvement in height related outcomes through IGMSY and other cash transfers. As laid out in section 3, frequent reasons for stunting are poor maternal health and nutrition, inadequate breastfeeding and later feeding practices (World Health Organization (WHO) 2014). Further conditions that could play a role but which the program is unlikely to alter are hypertension, malaria and intestinal worms during pregnancy. Since 92 percent of mothers in our sample exclusively breastfeed until the child is 6 months of age, we suspect that malnutrition at later stages in life or poor maternal health are the most relevant factors that explains the absence of an effect on child anthropometrics. The latter pathway is supported by the fact that the program has no significant impact on mother's health outcomes such as underweight or anemia (Table A13). On the upside, the program did not increase fertility in eligible women, contrary to JSY (Powell-Jackson et al. 2015). High fertility is associated with a number of factors such as childbearing at very young and old ages and short birth-spacing that contribute to adverse health outcomes for children and mothers (Cleland et al. 2012).

We also do not find a significant effect of IGMSY on child anemia. Similar to the other child health outcomes, one explanation for this could be a transmittance of anemia related to micro-nutrient deficiency from mothers to children during pregnancy and lactation. However, while present-day anemia in mothers is not reduced through the program, 86 percent of mothers in our sample report taking iron supplements during pregnancy which makes a transmittance of anemia from mothers to children unlikely. Apart from nutrition deficiencies, further causes of anemia can be chronic inflammation, genetic disposition, malaria or hookworms (United Nations (UN) 2015; World Health Organization (WHO) 2019). As malaria cases in India decreased between 2010 and 2016 (World Health Organization (WHO) 2018b), geographical variation in malaria or hookworm burden may be one explanation for this result.

As the program seems to leave children's health outcomes unaltered, it is not surprising that we find no significant effect on child mortality. Moreover, the result is consistent with the findings of Powell-Jackson et al. (2015).

Cost effectiveness

The estimated cost per fully DPT protected child amounts to 15408 rupees, approximately 215 USD. For lack of a cost-effectiveness estimate of a CCT on DPT-3 vaccination, these costs are compared to Banerjee et al. (2010), who estimate the costs for incentives and recruiting per fully immunized child in their study with Rs 2010.60. However, the comparison has to be treated with caution as Banerjee et al. do not estimate the ITT but the treatment effect, and for a mix of vaccinations.

Notwithstanding the seemingly low cost-effectiveness of the program, these results are in line with Banerjee et al. (2019), who call attention to the fact that a policy tailored to improve a particular indicator is usually more cost-effective than a cash transfer, which can be spent in a number of ways and thus may improve a range of indicators but each only to a limited extent.

6.5 Robustness tests/Sensitivity analysis

Table 6: Program effect on children's health outcomes, without additional controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	BCG	DPT-3	Polio-3	Stunting	Underweight	Anemia	Mortality
Program District x Birth Year 2012 or later	1.79	6.15**	2.96	5.54	-2.41	3.50	0.13
	(1.17)	(2.29)	(3.25)	(3.39)	(2.32)	(2.57)	(0.76)
Observations	9406	9366	9409	8650	8650	8693	9812
No. Clusters (Pairs)	35	35	35	35	35	35	35
No. Districts	70	70	70	70	70	70	70
Control Mean (%)	93	84	72	35	46	35	4

Note: Linear probability models. Outcomes are dummy variables indicating BCG (Bacillus Calmette-Guèrin vaccine, primarily employed against tuberculosis); DPT-3 (third diphtheria, pertussis and tetanus vaccination dose); Polio-3 (third Polio vaccination dose); mortality; stunting (HAZ below -2); underweight (WAZ below -2); and anemia (hemoglobin level below 10.9 g/dl). Birth year in/after 2012 is a dummy variable equal to 1 when a child is born in 2012 or later. All outcomes represent percentages. Program district is a dummy variable equal to 1 when a child lives in a district where IGMSY was active from 2011 onward. Sample: First and second children born to mothers aged 19-39 between 2010-2013, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific pair fixed effects. Robust standard errors clustered at the matched pair level in parentheses. * p<0.10 ** p<0.05 *** p<0.01

Table 7: Program effect on children: Comparison linear probability and logit model

	BCG		DPT-3		Polio-3		Stunted		Underweight		Anemia		Mortality	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	LPM	Logit	LPM	Logit	LPM	Logit	LPM	Logit	LPM	Logit	LPM	Logit	LPM	Logit
Program District x Birth	0.017	0.011	0.059***	0.057**	0.032	0.031	0.056	0.057	-0.032	-0.030	0.035	0.033	-0.001	0.002
Year 2012 or later	(0.012)	(0.015)	(0.021)	(0.023)	(0.035)	(0.034)	(0.035)	(0.035)	(0.022)	(0.021)	(0.026)	(0.027)	(0.007)	(0.012)
No. Clusters (Pairs)	35	35	35	35	35	35	35	35	35	35	35	35	35	35
No. Districts	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Observations	8911	8216	8873	8783	8914	8914	8311	8311	8311	8311	8360	8360	9300	9117

Note: Average marginal effects for linear probability (LPM) and Logit models. Outcomes are dummy variables indicating BCG (Bacillus Calmette-Guèrin vaccine, primarily employed against tuberculosis); DPT-3 (third diphtheria, pertussis and tetanus vaccination dose); Polio-3 (third polio vaccination dose); mortality; stunting (HAZ below -2); underweight (WAZ below -2); and anemia (hemoglobin level below 10.9 g/dl). Birth year 2012 or later is a dummy variable equal to 1 when a child is born in 2012 or later. Program district is a dummy variable equal to 1 when a child lives in a district where IGMSY was active from 2011 onward. Additional controls included but not reported in the table are birth order, mother's educational level, age, squared age and height; household religion and wealth index factor score; and whether the household belongs to a Scheduled Caste or Tribe and is situated in a rural area respectively. Sample: First and second children born to mothers aged 19-39 between 2010-2013, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific pair fixed effects. Robust standard errors clustered at the matched pair level in parentheses. * p<0.10 ** p<0.05 *** p<0.01

We repeat the main regression without control variables (Table 6), which leaves our results almost unchanged. While the coefficients for underweight and mortality changes change their sign, they remain insignificant. Table 7 re-estimates the program effects with a logit specification and compares them to our previous estimates. The marginal effects of the logit and linear probability model are of similar magnitude. Statistical significance of our DPT-3 estimate decreases in the logit model but lies still at 5%.

7. Conclusion

We assess the effects of the Indian conditional cash transfer IGMSY on child health. For this purpose, we employ a double difference approach that exploits geographical variation in program roll-out and cohorts of children born before and after implementation of the program. We discover that the program quantitatively and statistically significantly improves DPT-3 childhood immunization. While we find no statistically significant differences between subsamples, there is some weak indication that the IGMSY raises vaccination rates to a larger extent among children of household heads than of children not directly related to the household head. The program does not statistically significantly improve other indicators of completed immunization, anthropometric outcomes, anemia and mortality. The continuously high burden of stunting and underweight may be a product of unaffected low maternal health, which perpetuates the vicious cycle of maternal and child health in spite of the program. Further explanations for the low effect of IGMSY on child health that we cannot exclude are child malnutrition in the aftermath of the program, malaria and hookworm infections. Thus, in order to reach all SDGs corresponding to maternal and child health, it suggests itself that policy makers should on the one hand seek ways to more effectively strengthen maternal health. This could potentially be done by assuring that all eligible women have full and timely access to the program, and through campaigns that inform about the nexus between mother and child health in order to motivate mothers to spend part of the transfer on their own nutrition during pregnancy. On the other hand, policy makers should consider combatting anemia through hygiene, de-worming and anti-malaria programs. Notwithstanding this, more research is essential to identify the concrete causes of poor mother and child health in this context.

Publication bibliography

Abadie, Alberto; Spiess, Jann (January 2019): Robust post-matching inference.

Andre, F. E.; Booy, R.; Bock, H. L.; Clemens, J.; Datta, S. K.; John, T. J. et al. (2008): Vaccination greatly reduces disease, disability, death and inequity worldwide. 86th ed. World Health Organization (WHO) (Bulletin of the World Health Organization, 2). Available online at https://www.who.int/bulletin/volumes/86/2/07-040089/en/, checked on 5/12/2019.

Asfaw, Abay; Lamanna, Francesca; Klasen, Stephan (2010): Gender gap in parents' financing strategy for hospitalization of their children. Evidence from India. In *Health economics* 19 (3), pp. 265–279.

Attanasio, Orazio; Gómez, Luis Carlos; Heredia, Patricia; Vera-Hernandez, Marcos (2005): The short-term impact of a conditional cash subsidy on child health and nutrition in Colombia. Centre for the Evaluation of Development Policies; Institute for Fiscal Studies, Sistemas Especializads de información. Bogotá.

Banerjee, Abhijit; Niehaus, Paul; Suri, Tavneet (2019): Universal basic income in the developing world. In *Annual Review of Economics* 11, pp. 959–983.

Behrman, Jere R.; Hoddinott, John (2005): Programme evaluation with unobserved heterogeneity and selective implementation. The Mexican PROGRESA impact on child nutrition. In *Oxford bulletin of economics and statistics* 67 (4), pp. 547–569.

Benjamini, Yoav; Hochberg, Yosef (1995): Controlling the false discovery rate. A practical and powerful approach to multiple testing. In *Journal of the Royal statistical society: series B (Methodological)* 57 (1), pp. 289–300.

Black, Robert E.; Allen, Lindsay H.; Bhutta, Zulfiqar A.; Caulfield, Laura E.; Onis, Mercedes de; Ezzati, Majid et al. (2008): Maternal and child undernutrition. Global and regional exposures and health consequences. In *The lancet* 371 (9608), pp. 243–260.

Case, Anne; Paxson, Joseph; Ableidinger, Joseph (2004): Orphans in Africa: Parental death, poverty, and school enrollment. In *Demography* 41 (3), pp. 483–508, checked on 8/14/2019.

Cleland, John; Conde-Agudelo, Agustin; Peterson, Herbert; Ross, John; Tsui, Amy (2012): Contraception and health. In *The lancet* 380 (9837), pp. 149–156.

Currie, Janet (2009): Healthy, wealthy, and wise. Socioeconomic status, poor health in childhood, and human capital development. In *Journal of Economic Literature* 47 (1), pp. 87–122.

Domenech de Cellès, Matthieu; Rohani, Pejman; King, Aaron A. (2019): Duration of Immunity and Effectiveness of Diphtheria-Tetanus-Acellular Pertussis Vaccines in Children. In *JAMA pediatrics* 173 (6), pp. 588–594. DOI: 10.1001/jamapediatrics.2019.0711.

Fernald, Lia C. H.; Gertler, Paul J.; Neufeld, Lynnette M. (2008): Role of cash in conditional cash transfer programmes for child health, growth, and development. An analysis of Mexico's Oportunidades. In *The lancet* 371 (9615), pp. 828–837.

Fiszbein, Arial; Schady, Norbert R. (2009): Conditional cash transfers: Reducing present and future poverty. World Bank. Washington, D.C.

Ghosh, Prabhat; Kochar, Anjini (2018): Do welfare programs work in weak states? Why? Evidence from a maternity support program in India. In *Journal of Development Economics* 134 (C), pp. 191–208.

Glassman, Amanda; Duran, Denizhan; Fleisher, Lisa; Singer, Daniel; Sturke, Rachel; Angeles, Gustavo et al. (2013): Impact of conditional cash transfers on maternal and newborn health. In *Journal of health, population, and nutrition* 31 (4 Suppl 2), S48.

Hoddinott, John; Kinsey, Bill (2001): Child growth in the time of drought. In *Oxford bulletin of economics and statistics* 63 (4), pp. 409–436, checked on 8/14/2019.

International Institute for Population Sciences (IIPS) and ICF (2018): Demographic and Health survey (DHS) / National Family Health Survey (NFHS-4), 2015-16: India. Available online at dhsprogram.com, checked on July 2018.

International Institute for Population Sciences (IIPS) (2010): District Level Household and Facility Survey (DLHS-3), 2007--08. Mumbai. Available online at http://rchiips.org/pdf/INDIA_REPORT_DLHS-3.pdf.

Lagarde, Mylene; Haines, Andy; Palmer, Natasha (2009): The impact of conditional cash transfers on health outcomes and use of health services in low and middle income countries. In *The Cochrane database of systematic reviews* (4), CD008137. DOI: 10.1002/14651858.CD008137.

Lahariya, Chandrakant (2014): A brief history of vaccines & vaccination in India. In *The Indian journal of medical research* 139 (4), p. 491.

Maluccio, John; Flores, Rafael (2005): Impact evaluation of a conditional cash transfer program. The Nicaraguan Red de Protección Social: International Food Policy Research Institute.

Maluccio, John A.; Hoddinott, John; Behrman, Jere R.; Martorell, Reynaldo; Quisumbing, Agnes R.; Stein, Aryeh D. (2009): The impact of improving nutrition during early childhood on education among Guatemalan adults. In *The Economic Journal* 119 (537), pp. 734–763.

Mangtani, Punam; Abubakar, Ibrahim; Ariti, Cono; Beynon, Rebecca; Pimpin, Laura; Fine, Paul E. M. et al. (2013): Protection by BCG vaccine against tuberculosis. A systematic review of randomized controlled trials. In *Clinical infectious diseases* 58 (4), pp. 470–480.

Manley, James; Gitter, Seth; Slavchevska, Vanya (2013): How Effective are Cash Transfers at Improving Nutritional Status? In *World Development* 48, pp. 133–155. DOI: 10.1016/j.worlddev.2013.03.010.

Miguel, Edward; Kremer, Michael (2004): Worms. Identifying impacts on education and health in the presence of treatment externalities. In *Econometrica* 72 (1), pp. 159–217.

Ministry of Women and Child Development (2011): Indira Ghandi Matritva Sahyog Yojana (IGMSY) -a conditional maternity benefit scheme. Implementation guidelines for state governments/UT administrations. New Delhi.

Ministry of Women and Child Development, Government of India (2019): Annual reports. Available online at https://wcd.nic.in/annual-report, updated on 2019, checked on 8/12/2019.

Niti Aayog; Development Monitoring and Evaluation Office (DMEO) (2017): Quick evaluation study on Indira Gandhi Matritva Sahyog Yojana (IGMSY). Delhi.

Powell-Jackson, Timothy; Mazumdar, Sumit; Mills, Anne (2015): Financial incentives in health. New evidence from India's Janani Suraksha Yojana. In *Journal of health economics* 43, pp. 154–169.

Quisumbing, Agnes R.; Maluccio, John A. (2000): Intrahousehold allocation and gender relations: new empirical evidence. (FCND Discussion Paper, 84).

Ranganathan, Meghna; Lagarde, Mylene (2012): Promoting healthy behaviours and improving health outcomes in low and middle income countries. A review of the impact of conditional cash transfer programmes. In *Preventive medicine* 55 Suppl, S95-S105. DOI: 10.1016/j.ypmed.2011.11.015.

Registrar General of India (2011): Census 2011 Fertility tables. Available online at http://censusindia.gov.in/Tables_Published/F-Series/f_series_tables_2001.html, checked on 7/22/2019.

Romano, Joseph P.; Wolf, Michael (2005): Exact and Approximate Stepdown Methods for Multiple Hypothesis Testing. In *Journal of the American Statistical Association* 100 (469), pp. 94–108. DOI: 10.1198/016214504000000539.

Sutter, Roland W.; Bahl, Sunil; Deshpande, Jagadish M.; Verma, Harish; Ahmad, Mohammad; Venugopal, P. et al. (2015): Immunogenicity of a new routine vaccination schedule for global poliomyelitis prevention. An open-label, randomised controlled trial. In *The lancet* 386 (10011), pp. 2413–2421.

United Nations Development Program (2015): The Millennium Development Goals report 2015.

United Nations (UN) (2015): Targets and indicators for the post-2015 Sustainable Development Goals. Accountability for the measurement of results in nutrition. A technical note. Available online at http://www.unscn.org/files/Publications/FINAL_draft_2_17Dec_Post_2015_Measurements_and_Accountability_on_Results_for_Nutrition.pdf.

USAid; MEASURE DHS/ICF International (2013): Standard recode manual for DHS-6.

WHO (2018): Global Health Estimates 2016: Deaths by cause, age, sex, by country and by region, 2000-2016. World Health Organization (WHO). Geneva.

World Bank (2019): World Development Indicators (WDI). Available online at https://datacatalog.worldbank.org/dataset/world-development-indicators, updated on 4/24/2019, checked on 5/15/2019.

World Health Organization (WHO), United Nations Children's Fund (UNICEF) (2019): SDG indicators Metadata. Goal 3. Target 3b. Indicator 3.b.1: Proportion of the target population covered by all vaccines included in their national programme. Available online at https://unstats.un.org/sdgs/metadata/files/Metadata-03-0b-01.pdf, checked on 4/25/2019.

World Health Organization (WHO) (2009): Global health risks. Mortality and burden of disease attributable to selected major risks. Geneva, Switzerland: World Health Organization. Available online at http://site.ebrary.com/lib/academiccompletetitles/home.action.

World Health Organization (WHO) (2010): Nutrition Landscape Information System (NLIS). Country profile indicators. Interpretation guide. Available online at https://www.who.int/nutrition/nlis_interpretation_guide.pdf, checked on 4/28/2019.

World Health Organization (WHO) (2014): WHO global nutrition targets 2025: Stunting policy brief.

World Health Organization (WHO) (2018a): World health statistics 2018. Monitoring health for the SDGs. Geneva: World Health Organization.

World Health Organization (WHO) (2018b): World malaria report 2018. Geneva: World Health Organization.

World Health Organization (WHO) (2019): Health topics. Anemia. Available online at https://www.who.int/topics/anaemia/en/, updated on s.d., checked on 4/28/2019.

8. Appendix

8.1 Timing of disbursement and conditions for the IGMSY cash transfer

Table A1: Timing of conditions and transfer disbursement in IGMSY

Install-ment	Timing of disbursement	Amount	Conditions
		2011-2013	
1	At the end of six months of pregnancy	1500	(1) Pregnancy registered within four months at the Anganwadi Center (AWC) or Health Center (2) Mother participated in min. one antenatal check-up (3) Mother picked up IFA tablets (4) Mother received at least one tetanus vaccination (5) Mother attended a nutrition and health counselling at least once
2	At the end of three months after delivery	1500	(6) Child birth is registered (7) Child has received Polio 0 and BCG vaccination (8) Child has received Polio and DPT-1 vaccination (9) Child has received Polio and DPT-2 vaccination (10) Child has been weighed at least twice since birth (11) After delivery, mother participated in at least two infant and young child feeding (IYCF) counselling meetings
3	At the end of six months after delivery	1000	(12) Child has been exclusively breastfed for first six months, unless advised otherwise by a medical doctor (13) After six months, the child has been started to be fed complementary foods (14) Child has received Polio and DPT-3 vaccination (15) Child has been weighed at least twice between three and six months (16) Between three and six months after birth the mother participated in at least two infant and young child feeding (IYCF) counseling meetings
		With increase of transfer amount in 2013	
1	At the end of six months of pregnancy	3000	(1) Pregnancy registered (2) Mother participated in at least two antenatal care visits where she received iron and folic acid tablets and tetatus vaccination
2	At the end of six months after delivery	3000	(3) Child birth is registered (4) Child is immunized against BCG, Polio 1-3 and DPT 1-3 (5) In the first three months after delivery, mother participates in at least three IYCF meetings and had the child’s growth measured at least three times (6) Mother exclusively breastfeeds for six months, afterwards child is introduced to complimentary food.

Note: source: Niti Aayog and Development Monitoring and Evaluation Office (DMEO) (2017); Ministry of Women and Child Development (2011),

8.2 Ranking of index scores, treatment and control districts

Table A8: Ranking of index scores of treatment and matched control districts

District	State	Maternity Index	Performance Group	Treatment / Control District	District	State	Maternity Index	Performance Group	Treatment / Control District
Katihar	Bihar	139.2	Low	C	Dehradun	Uttarakhand	348.2	Medium	T
Saharsa	Bihar	139.3	Low	T	Purbi Singhbhum	Jharkhand	349.2	Medium	T
Godda	Jharkhand	165.2	Low	C	West District	Sikkim	352.7	Medium	T
Simdega	Jharkhand	165.9	Low	T	South	Delhi	356.8	Medium	C
Tamenglong	Manipur	179.7	Low	T	North West	Delhi	359.5	Medium	T
Vaishali	Bihar	191.8	Low	T	Dhamtari	Chhattisgarh	359.6	Medium	T
Saran	Bihar	192.6	Low	C	South District	Sikkim	362.7	Medium	C
Muzaffarnagar	Uttar Pradesh	192.9	Low	C	Rewari	Haryana	364.8	Medium	C
Mahoba	Uttar Pradesh	194.1	Low	T	Panchkula	Haryana	368.3	Medium	T
Sultanpur	Uttar Pradesh	203.6	Low	T	Patan	Gujarat	372.4	Medium	T
Azamgarh	Uttar Pradesh	207.3	Low	C	Fatehgarh Sahib	Punjab	373.7	Medium	C
East Garo Hills	Meghalaya	210.8	Low	T	Kapurthala	Punjab	374.0	Medium	T
West Garo Hills	Meghalaya	234.8	Low	C	Valsad	Gujarat	374.2	Medium	C
Banswara	Rajasthan	246.1	Low	C	Kamrup	Assam	376.8	Medium	T
Ukhrul	Manipur	248.9	Low	C	Dibrugarh	Assam	379.5	Medium	C
Bilaspur	Chhattisgarh	251.0	Low	C	Kheda	Gujarat	379.7	Medium	C
Bhilwara	Rajasthan	251.7	Low	T	West	Delhi	382.6	Medium	T
Udaipur	Rajasthan	252.7	Low	T	Bharuch	Gujarat	382.7	Medium	T
Dhalai	Tripura	252.8	Low	T	East	Delhi	383.6	Medium	C
Bastar	Chhattisgarh	257.5	Medium	T	Nalgonda	Telangana	391.2	Medium	T
Tonk	Rajasthan	257.7	Medium	C	Khammam	Telangana	395.0	Medium	C
Dhemaji	Assam	263.7	Medium	C	Davanagere	Karnataka	403.4	High	C
Goalpara	Assam	266.5	Medium	T	Bilaspur	Himachal Pradesh	413.7	High	C
Ranchi	Jharkhand	276.1	Medium	C	Dharwad	Karnataka	421.0	High	T
North Tripura	Tripura	280.2	Medium	C	Muktsar	Punjab	421.6	High	C
Changlang	Arunachal Pradesh	306.7	Medium	C	East Godavari	Andhra Pradesh	421.7	High	C
Lawngtlai	Mizoram	307.8	Medium	T	Amritsar	Punjab	426.5	High	T
Chamoli	Uttarakhand	313.4	Medium	C	Kolar	Karnataka	428.0	High	T
Puruliya	West Bengal	320.5	Medium	C	West Godavari	Andhra Pradesh	435.8	High	T
Jalpaiguri	West Bengal	328.5	Medium	T	Tumkur	Karnataka	442.2	High	C
Durg	Chhattisgarh	329.0	Medium	C	Hamirpur	Himachal Pradesh	470.1	High	T
Bankura	West Bengal	343.5	Medium	T	Palakkad	Kerala	488.1	High	T
Mamit	Mizoram	345.3	Medium	C	Kozhikode	Kerala	501.1	High	C
Dakshin Dinajpur	West Bengal	346.2	Medium	C	North Goa	Goa	502.3	High	T
Papumpare	Arunachal Pradesh	347.2	Medium	T	South Goa	Goa	517.8	High	C

8.3 Data restrictions and number of observations

Table A9: Data restrictions and number of observations

Restriction	*N children*	*N mothers*	*N women*
Original dataset (NFHS-4, children and women schedules)	259,627	699,686	699,686
Excluding UTs	252,064	678,068	678,068
Restricted to treatment and control districts	32,686	95,266	95,266
Excluding states with other maternity programs	26,518	76,282	76,282
Excluding Jammu and Kashmir because districts cannot be matched unequivocally	25,115	71,997	71,997

Restricted to children of mothers who were at least 19 at the birth of the respective child and under 40 at time of survey	22,999	-	-
Restricted to children born between 2010 and 2013	14,135	-	-
Restricted to first and second born children	9,812	-	-
Restricted to women 19-34 years old	-	36,703	36,703
Restricted to mothers with surveyed children	-	24,903	-
Restricted to mothers who gave birth to first or second child between 2010 and 2014		13,099	-
Restricted to observations for which data is available for at least one of the main outcomes	9,812	12,877	36,703
Restricted to observations for which data is available for all control variables	9300	12,371	35,433

8.4 Description of variables

Table A10: Description of variables

Variable	Description	Unit of observation	Source
	Outcome variables		
Polio-3	Dummy variable, equals one if child has been administered the last polio vaccination dose	Child	NFHS-4
DPT-3	Dummy variable, equals one if child has been administered the last combined diphtheria, pertussis and tetanus vaccination dose	Child	NFHS-4
BCG	Dummy variable, equals one if a child has been administered the Bacillus-Calmette-Guèrin- vaccination	Child	NFHS-4
Anemic	Dummy variable, equals one if child has mild, moderate or severe anemia (hemoglobin level below 10.9 g/dl)	Child	Generated from NFHS-4
Stunted	Dummy variable, equals one if the height for age z-score (using the WHO reference population) (HAZ) lies below -2 The HAZ is equal to the number of standard deviations below or above the reference median and calculated as follows: (observed height/age) – (median height/age of the reference population) / standard deviation of the reference population	Child	NFHS-4

Underweight	Dummy variable, equals one if weight for age z-score (using the WHO reference population) (WAZ) below -2	Child	NFHS-4
Mortality	Dummy variable, equals one if the child has perished	Child	Calculated from NFHS-4
Fertility	Number of children a woman has given birth to	Woman	NFHS-4
Underweight	Dummy variable, equals one if Body Mass Index lies below 18.5	Mother	NFHS-4
Anemia	Dummy variable, equals one if the mothers has mild, severe or moderate anemia (Anemia level. Levels below 10.9 g/dl for pregnant women and below 11.9 g/dl for all other adult women.)	Mother	Generated from NFHS-4
Control variables and variables employed for heterogeneous effects estimation			
Sex	Dummy variable, equals one if the child is female	Child	NFHS-4
Birth order	Birth order of the child	Child	NFHS-4
Height	Height in cm	Mother	NFHS-4
Educational level	Woman's highest educational level. Consists of the following categories: no education, primary education, secondary education, higher education	Mother	NFHS-4
Marital status	Marital status of the mother, consists of the following categories: 0 "Never in Union" 1 "Married" 3 "Widowed/Separated"	Mother	Generated from NFHS-4
Age	Age in years	Mother	NFHS-4
Squared age	Squared age in years	Mother	Generated from NFHS-4
Wealth	Continuous measure of relative wealth of a household equal to the factor score of an index of owned assets (Range: -2.25822 to 2.86687)	Household	NFHS-4
SC/ST	Dummy which indicates whether household belongs to a scheduled caste or tribe	Household	Generated from NFHS-4
Residence (rural)	Dummy for living in a rural area	Household	NFHS-4
Religion	Religion of the household. Consists of the following categories: Hindu, Muslim, Christian, Sikh, Buddhist, non-or other religion	Household	Generated fom NFHS-4
State implementation	Dummy variable, equals one for states with average IGMSY expenditure between 2011-2014 per eligible woman above the median (eligible women are defined as women in program districts aged 19-49)	State	Generated from expenditure (source: Ministry for women and child development) and

			population data (source: Census 2011)
Poor	Dummy variable, equals one if a household belongs to the poorest 40% in the NFHS-4 sample in terms of the wealth index	Household	NFHS-4
Relationship to household head	Dummy variable, equals one if the mother or her husband are the household head	Household	NFHS-4
	Treatment and eligibility variables		
Program district	Dummy variable, equals one for districts in which IGMSY was implemented in 2011. The variable takes on zero if the district is a control district (district which is nearest neighbor in terms of the maternity and child health index score used for selection of program districts, in the same state)	District	Program districts (source: Indian government), control districts matched by authors
Birth year 2012 or later (Elig_birth)	Dummy variable, equals one if child was born in 2012 or later	Child	Generated from NFHS-4
Eligibility (Elig _w)	Dummy variable, equals one if a mother gave birth to a first or second born child after 2011 (for regressions with underweight and anemia as Outcomes). Dummy variable, equals one if the woman has given birth to max. one child before 2012 (for regressions with fertility as outcome)	Mother / woman	Generated from NFHS-4

8.5 Empirical approach for women and mothers' outcomes and results

Whether a mother is eligible is measured in regressions with underweight, stunting and anemia as outcomes via a dummy variable that takes on one if the mother gave birth to a first or second born child after the year 2011. However, when fertility is the outcome, this definition of eligible women is susceptible to reverse causality. Hence, for regressions with outcome fertility elig_w is a dummy indicating whether the woman can *potentially* become eligible for IGMSY. Potentially eligible are women who gave birth to not more than one child before 2012.

$$H_{pdti} = \alpha_{pd} + \mu_t + (\delta_p \times elig\_w_{pdti}) + \beta(T_d \times elig\_w_d) + \gamma X_{pdti} + u_{pdti} \qquad (3)$$

where subscript i indicates woman, d district, p matched treatment and control district pair, t indicates birth year of mother

- H: health outcome (underweight, anemia) and fertility
- $\boldsymbol{\beta}$: ITT effect
- T: dummy for program district
- $elig\_w$: eligibility of the woman/mother
- X_{pdti}: control variables

- α_{pd} : district fixed effects
- δ_p : matched pair fixed effects
- μ_t: mother's birth year fixed effects
- u_{pdti} : robust standard errors clustered at the pair level
- Sample for regressions with fertility as outcome: women aged 19-34
- Sample for regressions with nutrition-related health outcomes: mothers aged 19-34 who had a first or second child between 2010 and 2014 (in order to assure a relatively even sample split and comparability)

Table A11: Program effect on mothers' health outcomes and women's fertility

	(1)	(2)	(3)
	Fertility	Health outcomes	
		Underweight	Anemia
Program District x Eligible	-0.00	-1.72	0.82
	(0.03)	(1.93)	(2.25)
		{0.60}	{0.70}
Control Mean (Percent)	2.67	19.09	57.83
Observations	35433	12339	12281
No. Clusters (Pairs)	35	35	35
No. Districts	70	70	70

Notes: Fertility measured by number of children. Coefficients for underweight and anemia in percentage points. Column (1): eligible is a dummy variable equal to 1 if a woman has born max. one child before 2012. Columns (2) and (3): eligible equals one if the mother gave birth to a first or second born child in 2012 or later. Program district is a dummy variable equal to 1 when a woman lives in a district where IGMSY was active from 2011 onward. Additional controls included but not reported in the table are educational level, marriage status, religion, wealth index factor score of the household, and whether the household belongs to a Scheduled Caste or Tribe and is situated in a rural area respectively. Sample for (1): women aged 19-34. Sample for (2) and (3): mothers aged 19-34 with first or second children born between 2010 and 2013. All estimates are computed using sampling weights, district fixed effects, mother's birth year fixed effects and child-cohort specific pair fixed effects. Robust standard errors clustered at the matched pair level in parentheses. Romano-Wolf bootstrapped q-values (p-values adjusted for multiple hypotheses testing of models in colums (2) and (3)) in curly brackets.
* p<0.10 ** p<0.05 *** p<0.01

8.6 Cost effectiveness calculation

The cost effectiveness of the intervention was estimated as follows:

$$\frac{Average\ national\ program\ expenditures\ 2011-2013/14}{Program\ effect\ on\ share\ DPT-3\ vaccinated\ \ X\ \ Average\ no.of\ eligible\ children\ 2011-2013}$$

Source for the data for national program expenditure is the Ministry of Women and Child Development, Government of India (2019). The number of eligible children is based on the yearly number of eligible women in program districts (taking advantage of the fact that each eligible woman can only have one eligible child at a time. The number of eligible women in program districts is calculated by first estimating the age-group and district specific proportions of these women who are at least 19 years old and gave birth to a 1st or 2nd child in the 12 months before the interview (source: NFHS-4 (International Institute for Population Sciences (IIPS) and ICF 2018) and multiplying these with the district population in the respective age group (source: Registrar General of India 2011). These figures are then summed up over all age groups and program districts. This yields the number of eligible children in 2011. The figure for 2011 is extrapolated to 2012 and 2013 by multiplying it with the yearly growth rate (source: World Bank (2019). Finally, we average over the three years which yields the number of eligible children per year.