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Maternal cash for better child health? The impacts of India's IGMSY/PMMVY maternity benefit scheme

Paula von Haaren and Stefan Klonner

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Maternal cash for better child health?
The impacts of India's IGMSY/PMMVY maternity benefit scheme*

Paula von Haaren[a 1] Stefan Klonner[a]

[a] *Heidelberg University, Dep. of Development Economics, building 4130, Voßstr. 2, 69115 Heidelberg, Germany*

Abstract

The maternity benefit scheme introduced as Indira Gandhi Matritva Sahyog Yojana (IGMSY) in 2011 and renamed Pradhan Mantri Matriva Sahyog Yojana (PMMVY) in 2017, which incentivizes pregnant and lactating women to participate in various infant health-promoting activities, is India's largest conditional cash transfer program thus far. We approach IGMSY's geographically targeted pilot phase as a natural experiment and use data from a large national health survey to estimate its effects by a matched-pair differences-in-differences approach. Consistent with the program's objectives we find positive, albeit small effects on infant immunization as well as long-term health care utilization. In addition, intervals between eligible births increase by 15 percent. Our findings suggest that PMMVY is moderately cost-effective, at least regarding immunization, but that it will make only a small contribution to redressing India's dismal child-health record.

Keywords: cash incentives, demand-side financing, child health, maternal health, India

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

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[1] Corresponding author. Contact address: see above, Email: haaren@uni-heidelberg.de

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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 15,000 children under five perishing each day (WHO 2018b). The majority of these deaths occur in low and middle income countries (LMICs) (WHO 2018a), which also lag behind in terms of health risk and disease burden (Black et al. 2008; WHO 2009). Eighty percent of under-five child deaths in LMICs are caused by communicable diseases as well as perinatal and nutritional conditions (WHO 2018a). 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), a number that has not yet been reached by most LMICs (WHO 2018b). Perinatal conditions contribute to persisting deficits in child health owing to an intergenerational vicious cycle in which unhealthy mothers are more likely to give birth to unhealthy children (Black et al. 2008). In turn, poor health, nutrition and health care in early childhood affect long-term physical and cognitive development (Currie 2009; Maluccio and Flores 2005; Maluccio et al. 2009; Miguel and Kremer 2004), which is again related to poor maternal health.

For these reasons, the Millennium Development Goals (MDGs) and the ensuing Sustainable Development Goals (SDGs) have emphasized universal vaccination coverage, and maternal and child health. After most LMICs had fallen short of the MDG's targeted reduction of maternal and infant mortality (United Nations Development Program 2015), many governments have sought novel ways to strengthen maternal and child health to ensure progress toward the SDGs. A popular measure in this connection have been conditional cash transfer (CCT) programs, which have been adopted by numerous LMICs (Fiszbein and Schady 2009). While these can in principle support mothers during the critical phase of pregnancy and childbirth, and incentivize health-enhancing behavior, few explicitly target pregnant women (Ranganathan and Lagarde 2012).

One scheme which is tailored to the needs of women and children in the critical phase around delivery is India's maternity benefit scheme introduced in 2011 as *Indira Gandhi Matritva Sahyog Yojana* (IGMSY) and renamed *Pradhan Mantri Matru Vandana Yojana* (PMMVY) in 2017. In terms of expenditures, IGMSY/PMMVY has become India's largest CCT program ever. The program was introduced at a time when India showed marked deficits in health service use and poor child health outcomes. In particular, in a comparison of 16 indicators of health service coverage around the year 2010, India ranked below the world median in 15 of these (WHO 2012). The country's performance with respect to child nutritional outcomes has been particularly desolate: India had the third and second highest percentage of low birth weight and underweight children below five years of age out of 119 and 109 countries, respectively (WHO 2012). During its five-year long pilot phase, IGMSY offered cash transfers for all pregnant and lactating women aged 19 and older for their first and second live births in selected districts (Ministry of Women and Child Development 2011) provided they complied with several maternal- and child-health-related conditions.

In this paper, we conduct a comprehensive impact evaluation of the IGMSY/PMMVY program using a large, nationally representative sample from the fourth wave of India's National Family Health Survey (NFHS-4). Our focus is on fertility, maternal health, health care use, immunization, child health and mortality. The extended pilot phase of five years and the timing of the survey, which was fielded four years after IGMSY's introduction, provide the unique opportunity to also estimate medium-term effects of a CCT whose cash transfers end six months after a child's birth.

We approach IGMSY's pilot phase as a natural experiment employing a matched-pair differences-in-differences estimator. We exploit the feature that the 52 pilot districts were selected based on district scores computed from a previous health survey to identify 52 control districts, one for each pilot district. We estimate intent-to-treat (ITT) effects of the program by comparing the within-district difference in health outcomes between younger birth cohorts exposed to the program and older cohorts not exposed to IGMSY across pilot and control districts.

Consistent with IGMSY's objectives, we find that the program increases complete infant immunizations by nine percent and mothers of once eligible children report fourteen percent more contacts with the government health system three to four years later. We also find substantially longer birth intervals for low parities of more than ten percent. Despite these improvements in health inputs, we find no robust evidence of gains in health outcomes, albeit some of our results suggest improvements in child mortality and weight-related outcomes for both children and mothers. An analysis of heterogeneous program effects suggests that girls benefit disproportionately regarding vaccinations. The lack of conclusiveness regarding health outcomes is partly owed to limited estimation precision, which arises from the relatively small geographic scope of IGMSY's pilot phase.

Overall, our evaluation shows a mixed record, with solid improvements in health service use and birth spacing, suggestive evidence for improvements in weight-related outcomes and mortality but no further tangible health gains. The effect on health care and immunization is to be commended given India's dismal record on these indicators until the first decade of the 21st century. Moreover, our estimates show that the program has the potential to reduce India's gap to the SDG's targeted 95 percent immunization rate by a moderate seven percent. Our findings also have important policy implications. In particular, they make clear that increases in the demand for health care incentivized by a maternal CCT are not sufficient to lastingly improve health outcomes in children and mothers, at least when the program fails to reach almost every second eligible mother. Accordingly, we argue that the outreach of such incentive schemes needs to be massively improved and additional policies are warranted that identify and tackle the causes of health risks and simultaneously raise the quality of health services.

Studies most closely related to ours are, first, Powell-Jackson et al. (2015), who evaluate India's JSY program, which pays a cash transfer conditional on institutional or assisted delivery. They show that JSY increases institutional delivery rates but fails to decrease perinatal mortality. In addition, the authors document a number of side effects of the program such as higher fertility, increased breastfeeding, and lower demand for private health services. Second, Ghosh and Kochar (2018) evaluate the IGMSY program for Bihar, India's most destitute state, where the program was poorly implemented. Despite inordinate delays in cash transfers, the authors find large positive effects on children's weight and birth spacing. Our contribution relative to that study is that we cover the majority of India's states, the data comes from a nationally representative sample. Moreover,we consider important additional perinatal and infant outcomes, namely birthweight, anemia and mortality, vaccination and other health service use, as well as maternal health. Further, we uncover some important heterogeneous program effects.

Our study also contributes new evidence and adds a new regional focus to a broader literature on the effectiveness of conditional cash transfer programs, specifically in the context of child and maternal health. This literature has delivered plenty of evidence for substantial effects of cash incentives on health-service use (Ranganathan and Lagarde 2012; Grépin et al. 2019). However, studies of CCTs geared at promoting infant immunization have been conducted only in some Latin American countries (Lagarde et al. 2009).[2] Evidence on the impact of CCTs on maternal health is scarce, with one study documenting only insignificant effects for Mexico's Progresa/Oportunidades program on anemia (Glassman et al. 2017). Regarding the effect of CCTs on child health, the extant literature reports inconclusive evidence. For five Latin American CCT programs, Ranganathan and Lagarde (2012) document positive effects on height-related measures, predominantly positive effects on weight-related measures and mixed evidence for anemia. Impacts of CCT programs in Indonesia, Uruguay and Mexico on birthweight have been found to be positive, but the effects are mostly small and often insignificant (Amarante et al. 2011; Barber and Gertler 2010; Triyana 2016). Evidence on the effect of CCTs on child mortality is largely absent in the literature, particularly for South Asia (Glassman et al. 2013; Hunter et al. 2017), with the exception of the aforementioned study by Powell-Jackson et al. (2015).

The rest of the paper is structured as follows: Section 2 introduces the IGMSY/PMMVY program and discusses anticipated effects. Section 3 lays out our empirical strategy. Section 4 describes the data and presents balancing tests. Results are in section 5 and section 6 concludes.

2. Background

2.1 The IGMSY/PMMVY conditional cash transfer program

The Indian government started a first mother-and-child-health-related conditional cash transfer program in 2005 for incentivizing safe deliveries. This program, the *Janani Suraksha Yojana* (JSY), which literally translated means Safe Motherhood Scheme, pays a one-time cash transfer to mothers conditional on institutional delivery or skilled assistance for delivery at home. It was partially motivated by the fifth millennium development goal (MDG), to improve maternal health, whereby one of two progress indicators is the proportion of births attended by skilled personnel (United Nations Development Program 2015). This program has not been universal: while all births of mothers have been eligible for a transfer of ₹ (rupees) 1,400 in rural and ₹ 1,000 in urban areas of ten comparatively poor states, only the first two births of mothers in below-the-poverty-line households or from disadvantaged social groups have been eligible for ₹ 700 and ₹ 600 in all other states (Lim et al. 2010). While the said MDG indicator

[2] However, in a small-scale randomized intervention in rural Rajasthan, conditional *in-kind* gifts vastly increased village child immunization rates (Banerjee et al. 2019).

improved rapidly, from 46.6 percent in 2005/06 to 81.4 percent in 2015/16 (Ministry of Statistics and Programme Implementation 2017, 2011), policymakers recognized that complications during delivery are not the only risk to maternal and child health (Ministry of Women and Child Development 2011). JSY fails to cover the wage loss of mothers, which may prevent their rest and adequate nutrition during pregnancy and lactation. Furthermore, it does not incentivize mothers to engage in behavioral practices beneficial to both mother and child that go beyond safe delivery, such as adequate nutrition or preventive health care such as vaccination (Ministry of Health and Family Welfare 2011b).

The *Indira Gandhi Matritva Sahyog Yojana* (Indira Gandhi Motherhood Support Scheme) has been an attempt to fill this gap. It aims to improve maternal and infant health through a conditional cash support during the time of pregnancy and lactation. Unlike JSY, this program has been universal in the program's pilot districts, covering the first two live births of all women with the exception of government employees. The cash benefit of initially ₹ 4,000 (approximately US$ 65) is equivalent to 7.3 (6.0) times the monthly rural (urban) poverty line or 31 female unskilled agricultural daily wages in 2011. It is funded by the national government via the state and district branches of the Integrated Child Development Scheme (ICDS). During its early years, the transfer has been 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 program conditions.

All activities related to the conditions of IGMSY take place at local primary health care centers, known as *Anganwadi* centers. Compliance with the program's conditions is monitored there and the *Anganwadi* staff also receive a monetary incentive of ₹ 100 to 200 per completed case. Apart from one antenatal check-up and tetanus immunization for mothers, IGMSY directly incentivizes three child immunizations: one dose of BCG (Bacillus Calmette-Guérin), which protects primarily against tuberculosis, and three doses of polio and DPT (diphtheria, pertussis and tetanus) vaccine, respectively. In addition, IGMSY features various nutrition-related conditions: during pregnancy mothers have to collect iron and folic acid (IFA) tablets and attend a nutrition and health counseling session. After the delivery, the child's weight is to be recorded four times and the mother has to participate in four counseling sessions.[3]

With more than 1.3 million Anganwadi centers all over the country, the public primary health care infrastructure necessary to fulfill the program conditions is dense and, at least in principle, free of charge. In addition, part of the government's budget allocation for IGMSY has been dedicated to hiring of additional staff in Anganwadi centers of pilot districts, to prevent an undersupply of the incentivized services (PBI 2010).

[3] The comprehensive conditions and timing of the cash transfers under the original scheme are provided in Table A1 in the appendix.

During a pilot phase, the program was geographically targeted and implemented in only 52 of India's 640 districts (Ministry of Women and Child Development 2019).[4] Unlike the majority of geographically targeted welfare programs in India, the pilot phase of IGMSY has not focused on the country's most destitute areas. Instead, a deliberate attempt was made to identify a set of districts representative of the country as a whole. The following stratified selection procedure was employed (Ghosh and Kochar 2018; Ministry of Women and Child Development 2011): First, an index of six health and development indicators was calculated from the third round of the District Level Household and Facility Survey (DLHS-3), fielded in 2007 and 2008. Second, according to this index, all 640 districts of India were categorized as either low, medium or high-performing. From these three groups, the pilot districts were randomly selected; eleven from each of the high and low-performing categories, and twenty-six from the medium-performance category. The remaining four districts were union territories (UTs).

In October 2010, the program was approved for implementation by the central government with budgetary allocations of ₹ 3.9 and ₹ 6.1 billion for the fiscal years 2010/11 and 2011/12 (PBI 2010). According to our calculations, the latter amount corresponds to roughly ₹ 4,600 per eligible birth. The actual implementation of the scheme started not before April 2011: program guidelines were agreed upon between the center and the states in April 2011 and training of implementation staff on the ground was scheduled for late May 2011 (Ministry of Women and Child Development 2011). Moreover, transfers from the central to the state governments were in some cases delayed until September 2011 (Sinha et al. 2016). For the pilot districts included in our analysis, state expenditures per eligible child on IGMSY were only ₹ 6 in 2010/11, rising to 3,190 in 2011/12 and 3,438 in 2012/13.[5] Only one state (Meghalaya) spent any funds in 2010. Despite identical numbers of target beneficiaries in 2011 and 2012, the amount of funds expended by state governments in 2011 was only half of what was spent in 2012 (Falcao et al. 2015). This suggests that the program was up and running only in the second half of the financial year 2011/12. As a consequence, there have been virtually no beneficiaries in the fiscal year 2010/11. In the following two fiscal years, about 28 and 59 percent of the 1.2 million target beneficiaries were reached (Falcao et al. 2015). In 2013/14, the cash transfer increased from ₹ 4,000 to ₹ 6,000 (implying expenditures of ₹ 8,458 per eligible child) and was paid in two rather than three installments.

In 2017, the program was renamed *Pradhan Mantri Matritva Vandana Yojana* (PMMVY), in English the Prime Minister's Reverence for Maternity Scheme, and expanded to all districts of India with a cash transfer of ₹ 5,000 per woman paid in three installments, two during pregnancy and one after. Only the first live birth is eligible under PMMVY. There are two stated objectives of this program. First, to provide "partial compensation for the wage loss [...] so that the woman can take adequate rest before and after delivery" and second, that "the cash incentive provided would lead to improved health seeking behavior amongst the pregnant

[4] Due to the separation of Kundagaon from the pilot district Bastar, this number increased to 53 districts in 2012.

[5] For our definition of program expenditure per eligible case and data sources see appendix A2.

women and lactating mothers” (PBI 2017), in particular, safe delivery and immunization of firstborn children (PBI 2019).

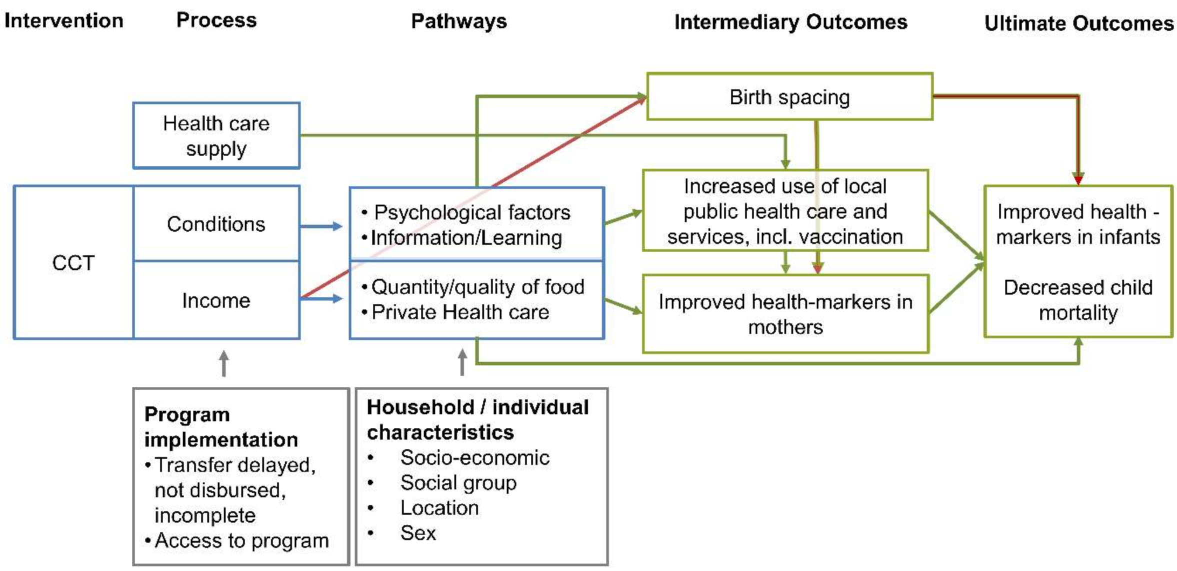
In terms of expenditures, with a budget allocation in 2017/18 of 27 billion rupees (US$ 400 million), PMMVY is India’s largest conditional cash transfer program ever, accounting for 12 percent of the Ministry of Women and Child Development’s budget or 0.13 percent of government expenditures. In comparison, the older JSY program, which has paid a maximum of ₹ 2,000 for an institutional delivery as of 2015, had a budget allocation of 20 billion rupees in 2017/18. On the other hand, according to administrative data, JSY reached out to 10.0 million women during the financial year 2018/19, while there were not more than 7.5 million beneficiaries under PMMVY. Still, unlike the IGMSY pilot, PMMVY appears underfunded relative to the program entitlements. A back-of-the-envelope calculation suggests that twice the allocated budget would be needed to adequately fund the roughly 9.5 million first births in India in 2018.

2.2 Anticipated effects

In the following, we discuss how we expect the different elements of IGMSY to affect maternal and child health. We draw on Gaarder et al. (2010), who develop a theory of change for the impact of health-related CCTs, which we adapt to the setting of perinatal health and the Indian social context (see Figure 1).

First, conditions for the receipt of cash transfers may directly incentivize healthy behaviors in the form of increased demand for maternal and child health inputs. In the case of IGMSY, the program conditions not only directly mandate vaccinations but also require the repeated interaction with a health worker. This raises the probability of prevention, early detection and treatment of health deficiencies in mothers and children. Second, IGMSY may indirectly promote healthy behaviors and birth spacing decisions through information conveyed in the incentivized educational sessions (Ministry of Health and Family Welfare 2011a). Third, there can be an income effect due to the cash transfer, whose funds are likely to be spent on additional healthcare and food during the critical phase of pregnancy, childbirth and lactation (Quisumbing and Maluccio 2000). Fourth, the additional income may also contribute to maternal health by reducing the labor supply of beneficiary women during pregnancy. On the other hand, the cash transfer can serve as an unintended incentive for impatient parents to reduce the birth interval between the first and second child (Powell-Jackson et al. 2015). Short birth spacing in turn contributes to adverse health outcomes for children and mothers (Cleland et al. 2012). Finally, the expansion of health service supply, which has been part of IGMSY, may lift access barriers to health care and thus increase health care use regardless of the cash transfer or its conditions.

Figure 1: Theory of change



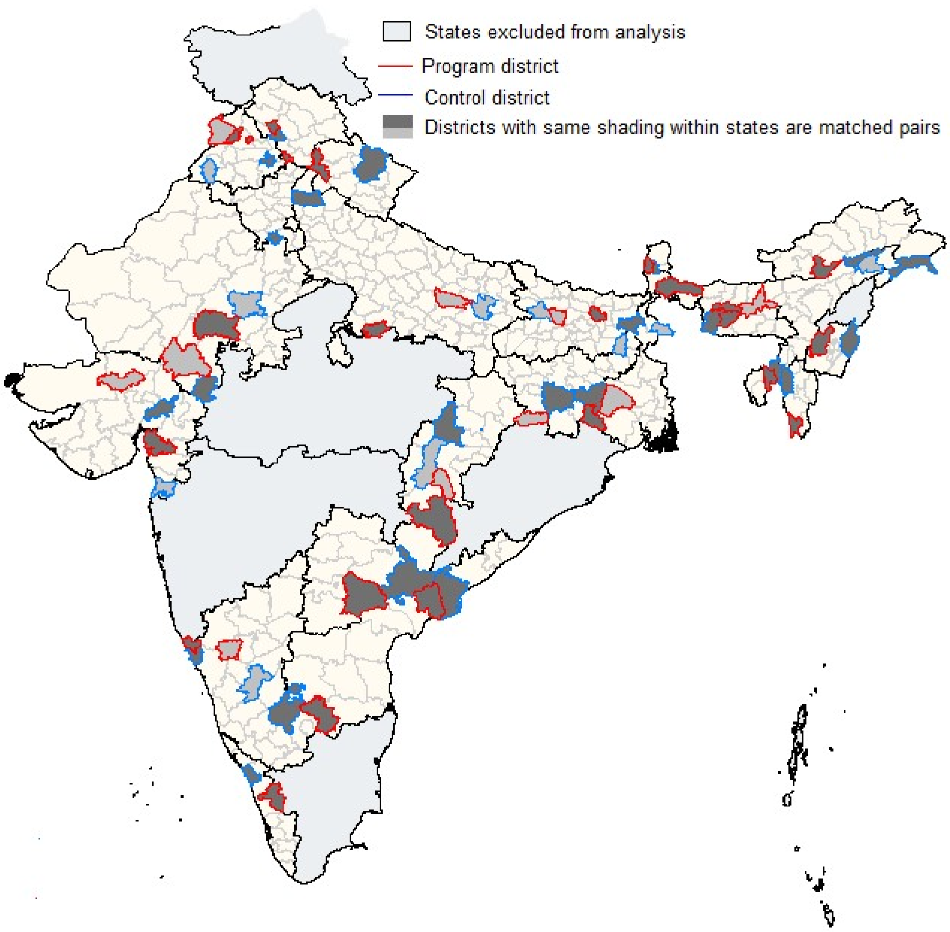
In sum, regarding birth spacing, we anticipate two opposing effects: a positive one from trainings and more frequent interactions with the government health system which strongly promotes family planning, as well as a greater focus of parents on child quality rather than quantity; and, at least for the first birth interval, a negative one from the prospect of extra cash for the next pregnancy. We expect an unambiguous positive effect on health service use, in particular vaccination, and maternal health. While the literature suggests large gains in child health and mortality through these outcomes in the long term (WHO 2010), immediate effects on indicators of perinatal service use and health may or may not exceed long-term effects as the immediate impact of the CCT may become diluted as time passes. In particular, effects on maternal health will likely dissipate faster than children's, as *in utero* and infant health has been shown to be particularly critical for longer-term health.

Of course, the program's impacts on different population groups may vary. If, due to poor implementation, the cash transfer does not reach eligible mothers, this will mitigate the program's effect on the children concerned. Similarly, individual and household characteristics likely play a role for the program's effectiveness. We expect traditionally disadvantaged households – those that are poor, from a scheduled caste or tribe (SC/ST) or living in the rural areas (Balarajan et al. 2011) – to profit more from the program (Gaarder et al. 2010), unless these characteristics restrict their access to the program (Powell-Jackson and Hanson 2012). In addition, effects may disproportionately benefit girls as Indian parents tend to invest more in boys' than in girls' health (Asfaw et al. 2010). Furthermore, we hypothesize that benefits are concentrated on first- and second-born children if the eligibility rules are enforced.

3. Empirical approach

We approach the pilot phase of the program as a natural experiment. Similar to the methodology of Ghosh and Kochar (2018), we elicit intention-to-treat effects (ITT) of IGMSY through a matched-pairs difference-in-difference approach. We compare the effect of the program on children that were eligible for the program and those that were not along two dimensions: first by taking the difference between eligible and ineligible cohorts within each district and second by comparing pilot to control districts.

Figure 2: Matched pairs of pilot and control districts



We identify one control district for each pilot district through a matched-pair design. First, we recalculate for all districts the health development index used by the Indian government to select pilot districts, based on data from DLHS-3 reports (IIPS 2010). Index scores of all districts in our analysis are set out in Table A2 of the appendix. Next, we select within each state the nearest neighbor of each pilot district in terms of this index.[6]

[6] For the selection of control districts within states we treat Telangana, which separated from Andhra Pradesh in 2014, as part of Andhra Pradesh.

Ghosh and Kochar (2018) report that pilot districts were chosen randomly. If the selection of pilot districts within each stratum were non-random but driven by political or need considerations, however, this could bias naïve cross-sectional estimates of the program's effect. Our empirical approach addresses this concern in two ways, first by selecting control districts that are most similar to the program districts according to a pre-determined score. Second, in addition to the cross-sectional comparison, we also compare across exposed and not-exposed birth cohorts within each district. Differences between the latter are very unlikely to be affected by administrative selection as both types of cohorts are born subsequent to the program's planning stage in early 2010.

In principle, all women who fulfilled the eligibility criteria in December 2010 and thereafter were eligible to receive IGMSY benefits (Ministry of Women and Child Development 2011). However, given that the training of the ICDS staff was scheduled to be completed no earlier than June 2010, we expect registration of beneficiaries, which is possible until the fourth month of pregnancy, not to have started much before August 2011. As a consequence, the first cohort of children that profited from IGMSY would be born five months later in January 2012. Therefore, our estimator compares the difference in outcomes of children born in 2011 or earlier to children born in 2012 or later within pilot districts to the same difference in control districts of the same state. Due to the fuzzy onset of the program and our conservative approach by which some children in the control cohort might already have had access to the program, our estimator delivers a lower bound of the actual program effect.

Our key regression equation is

$$H_{sdit} = \alpha_{sd} + \mu_t + (\delta_s \times eligbirth_t) + \beta(P_{sd} \times eligbirth_t) + \gamma X_{sdit} + u_{sdit}, \quad (1)$$

where s indexes states, d districts, i children and t birth year; H_{sdti} is an outcome of interest; P_{sd} is a dummy variable indicating whether a child lives in a program (or pilot) district; $eligbirth_t$ specifies whether a child was born in 2012 or later; X_{sdit} is a vector of individual and household-level control variables;[7] α_{sd} and μ_t are district and birth year fixed effects, respectively: the former account for cohort-independent differences between districts (thus absorbing cohort-independent differences between program and control districts); the latter capture average cohort-specific differences between children common to both pilot and control districts (and thus includes spatially independent differences between children born before and after the program's onset). The term $\delta_s \times eligbirth_t$ captures state-specific time trends and u is a stochastic error term. The coefficient β gives the ITT effect of IGMSY. In line with common practice, we cluster standard errors at the level at which program status varies, the district (Abadie et al. 2017). The empirical approach to estimate the effect on mothers' outcomes is analogous, with eligibility defined by a dummy variable that takes on a

[7] We do not control for father's characteristics as these are only available for a small subsample.

value of one if the mother gave birth to a first or second-born child in 2012 or later (for the detailed regression equation, see appendix A1).

We account for the threat of falsely rejecting the null-hypothesis of no effect when estimating several outcome variables with the same sample by adjusting the p-values for the respective null hypotheses for families of outcomes as suggested by Romano and Wolf (2005). This method corrects for multiple inference through bootstrapping by controlling the family-wise error rate.

4. Data

4.1 The National Family Health Survey

Our data source for health service use as well as health outcomes is the seventh round of the Indian Demographic and Health Survey (IIPS and IFG 2018), commonly known as the fourth National Family and Health Survey (NFHS-4). This survey of more than half a million households was fielded between January 2015 and December 2016. We derive our outcome and control variables from the children's dataset, which contains data on 259,627 children born five years before the survey took place and later. This means our data covers roughly half of the 2010 birth cohort and all children in later cohorts. We use the sampling weights included in the data throughout to make all figures representative for the respective populations.

We use only a subset of the observations in the NFHS children's module. First, to ensure that control districts are free from other similar programs, we eliminate states that operated additional state-specific and state-wide maternity benefit programs with cash transfers in 2011 or 2012.[8] Second, we exclude UTs[9] and Nagaland, which were not surveyed in the DLHS-3, as well as Jammu and Kashmir since districts in the latter cannot be matched unequivocally with districts in the NFHS. Third, in accordance with IGMSY's eligibility rules, we restrict the analysis to children of mothers aged at least 19 years at the time of birth of the child. Fourth, to make the cohorts exposed to the program as comparable as possible to the older cohorts not exposed to IGMSY, we focus on children born in the four years around IGMSY's onset. Hence, we restrict the children's sample to the birth cohorts 2010, 2011, 2012 and 2013. Finally, we exclude observations with a missing value among the control variables.[10] We do not restrict our sample to the officially eligible first and second-born children due to the possibility of imperfect compliance with this rule. The dataset for our empirical analyses contains 13,367 children in 70 districts (35 program and control districts each) of 24 states, which host around 70 percent of India's population.

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[8] These states (programs) are Madya Pradesh (Mukhyamantri Mazdoor Suraksha Yojana), Maharashtra (Matrutva Anudan Yojana), Odisha (Mamata) and Tamil Nadu (Dr. Muthulakshmi Maternity Assistance Scheme).

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

[10] Detailed observation numbers documenting how we arrive at our estimation sample contains Table A3 of the appendix.

4.2 Outcome variables

The outcomes of interest we consider can be partitioned into two broad categories. First, intermediary outcomes through which we expect an impact on child health. These comprise birth spacing, maternal health, and use of health services conducive to maternal and child health. The latter include self-reported use of public health care as well as completion of basic vaccinations. The second set of outcomes are health markers of children, low birthweight reported by the mother, as well as anthropometric and hemoglobin measurements taken at the survey interview, and mortality.

We measure birth spacing as the number of months between a child's birth and the succeeding birth. For maternal health, we use health outcomes of mothers at the time of interview. Following the standard WHO (2011) thresholds, we code a mother as anemic if her hemoglobin level lies below 12g/dl (below 11 g/dl for pregnant women). We define a mother as underweight if her BMI falls short of 18.5.

As we have laid out in Section 2, a central objective of IGMSY/PMMVY is to improve pregnant women's and lactating mothers' use of health services. The program's implementation rules mandate that the corresponding incentivized activities – those that are conditions for obtaining cash transfers – are provided by Anganwadi centers. Therefore, we include all survey questions in the NFHS children's dataset which literally contain the word "Anganwadi" and are administered either for all children aged five and younger or all women aged 15 to 49. These are first, the incidence of benefits from Anganwadi centers, essentially health services and products received by the mother during pregnancy or lactation, which we take as measures of antenatal and postnatal health care respectively; second, the incidence of Anganwadi benefits among children as well as contacts of their mothers with Anganwadi staff during the months preceding the survey interview, which we take as measures of the program's medium-term effects on access to government health care.

Regarding immunization, our principal interest is in the incidence of complete child immunization by India's national definition, which comprises one dose of BCG, typically given right after birth, three shots of DPT (DPT-3) and polio (polio-3), given within the first four months, and one dose of measles vaccine, which should be administered after nine months at the earliest (Ministry of Health and Family Welfare 2019). Since all these vaccinations should be completed by the age of two at the latest, our sample, in which children are on average three years old, is well suited to assess complete immunization status. We also consider the vaccinations BCG, DPT-3, polio-3, and measles separately. Under IGMSY/PMMVY, BCG, DPT-3 and polio-3 are directly incentivized, while the measles immunization is beyond the program's scope, which ends six months postpartum. We thus view any effects on measles immunization status as an indirect or spillover effect of the program.

We define child health outcomes following WHO standards. According to these, a child exhibits low birth weight if it weighs less than 2,500 grams at birth (WHO 2014). A child is underweight at the time of the survey if its weight-for-age z-score (WAZ), the number of standard deviations from the WHO reference population's median, is smaller than -2 (WHO 2018b). Similarly, a child is stunted if its height-for-age z-score (HAZ) is smaller than -2. We code a child as anemic if its hemoglobin level falls short of 11 g/dl (WHO 2011). We focus on these binary indicators because they capture deprivations, whose overcoming is the ultimate policy goal. Finally, we measure mortality through a variable indicating whether a child is no longer alive at the time of interview.

According to the summary statistics set out in Tables A5 and A6 of the appendix, the sample means for the districts in our research design are close to the all-India averages of the outcome variables (Dhirar et al. 2018). While the NFHS includes a number of measures of activities incentivized by IGMSY/PMMVY in addition to the ones just discussed, we choose to ignore them in our analysis because they are recorded only for the last delivery of a woman.

4.3 Balancing test

For an unbiased estimate of the program effect, children in our control and pilot districts should be similar with respect to outcomes and other observable characteristics at baseline (Kahn-Lang and Lang 2020). We assert this in a balancing test set out in Table 1. There are no significant differences in outcomes and other observable characteristics between children in pilot and control districts before the start of the program except for the percentage of children with low birth weight, which is significant at the 10% level.

Another potential threat to our identification strategy is a selection bias introduced by families moving from control to pilot districts in order to profit from the program. However, we find no effect of IGMSY on years of residence in the current location (see Table A8).

Table 1: Balancing test

	Control districts		Pilot districts			
	Mean	Stand. dev.	Mean	Stand. dev.	Pr |T|>t difference in means	Obs.
Outome variables						
Median birth interval first-second born	36.00	13.41	36.00	13.97	1.00	1608
Mother underweight (%)	16.49	37.11	16.81	37.40	0.90	7413
Mother anemic (%)	55.14	49.74	56.81	49.54	0.60	7383
AWC benefits during pregnancy (%)	52.39	49.95	56.71	49.56	0.60	4666
AWC benefits during breastfeeding (%)	48.04	49.97	52.29	49.96	0.62	4657
AWC benefits in last 12 months (child) (%)	49.22	50.01	55.63	49.69	0.33	4482
Mother saw AWW in last 3 months (%)	40.27	49.06	41.48	49.28	0.84	4669
BCG vaccinated (%)	90.29	29.61	91.60	27.74	0.54	4482
DPT-3 vaccinated (%)	79.62	40.29	80.58	39.57	0.83	4482
Polio-3 vaccinated (%)	67.50	46.85	69.52	46.04	0.71	4482
Measles vaccinated (%)	83.83	36.83	85.14	35.57	0.70	4482
Complete vaccination (%)	59.11	49.17	61.21	48.74	0.74	4482
Low birth weight (%)	9.96	29.95	14.32	35.04	0.06	4482
Underweight (%)	36.64	48.19	39.45	48.89	0.44	4190
Stunted (%)	38.89	48.76	37.96	48.54	0.87	4190
Anemic (%)	47.49	49.95	47.10	49.93	0.92	4203
Mortality (%)	3.75	19.00	3.98	19.54	0.84	4669
Other characteristics						
Child age	3.72	0.45	3.72	0.45	0.96	4482
Female (%)	45.58	49.82	47.09	49.93	0.45	4669
Mother's height (cm)	151.19	6.24	151.44	5.89	0.88	4669
Mother's age	28.96	4.69	28.89	4.74	0.70	4669
Mother formally educated (%)	65.67	47.49	65.50	47.55	0.98	4669
SC/ST (%)	32.33	46.78	35.73	47.93	0.48	4669
Hindu (%)	81.25	39.04	81.64	38.72	0.94	4669
Wealth index quantile						
First	26.24	44.00	28.05	44.93	0.84	4669
Second	22.85	42.00	19.82	39.87	0.40	4669
Third	17.97	38.40	19.33	39.50	0.66	4669
Fourth	17.99	38.42	18.26	38.64	0.95	4669
Fifth	14.94	35.66	14.54	35.26	0.94	4669
Rural (%)	70.89	45.43	76.78	42.23	0.00	4669

Notes: The p-values are corrected for clustering at the district level. Sample: children born in 2010 and 2011 to mothers aged at least 19 at birth in the 70 districts of our research design. AWC (AWW) abbreviates Anganwadi Center (Worker). Stand. dev. stands for standard deviation from the mean. P-values for the differences in medians in the birth interval are calculated using quantile regression, which does not allow to cluster standard errors at the district level. However, when calculating 95% confidence intervals adjusted for clustering at district level, the difference remains statistically insignificant.

5. Results

5.1 Main Results

We start by exploring the program's impact on the intermediary outcomes birth spacing, maternal health and health service use. The results for the former are set out in Table 2. For first born children, column 2 documents a 17 percent decrease in the hazard rate for the occurrence of the second birth, which roughly corresponds to a stretching of the median expected birth interval between first and second births by 5.2 months. While there is also a significant 11 percent decrease in the birth hazard rate in the whole sample (an increase by 7.3 months of the median interval), we obtain no significant effects for the subsamples of second-born children, who are eligible for IGMSY benefits, and higher parities, who are not.

Table 2: Program effect on birth spacing

Sample split by:		Birth order		
	Full sample	First born	Second born	Third or higher
	(1)	(2)	(3)	(4)
Program district x birth year 2012 or later	0.89**	0.83***	1.01	1.10
	(0.05)	(0.06)	(0.10)	(0.11)
		{0.02}	{0.93}	{0.63}
Control median birth interval (months)	59	35	censored	censored
Observations	13897	4880	4502	4515
Clusters	70	70	70	70

Notes: Cox proportional hazards model with separate baseline hazards by sex (columns (1)-(4)) and birth order (columns (1) and (4)). The table reports birth hazard ratios (one indicates no effect). *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: children alive at time of interview, born 2010-2013 to mothers aged at least 19 at birth of child, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific state fixed effects. Robust standard errors clustered at the district level in parentheses. Romano-Wolf bootstrapped q-values (p-values adjusted for multiple inference of models (2) -(4)) in curly brackets. Stars and q-values are for the null hypothesis that the hazard ratio equals one.

* p<0.10 ** p<0.05 *** p<0.01

Table 3 includes the program effects on two health markers of mothers, underweight and anemia at the time of the interview. While underweight decreases by ten percent according to column 1, the estimated effect is not statistically different from zero due to the relatively large standard error.

Table 4 contains results regarding the program's impact on Anganwadi health service use. While all estimates have the expected positive sign, by far the greatest effect occurs for the outcome with the shortest recall period, the probability that a mother met an Anganwadi worker in the three months preceding the survey interview, which increases by 13 percent. This result is significant at the 1% level even when adjusting for multiple inference.

Table 3: Program effect on mothers‘ health outcomes

	Underweight	Anemia
	(1)	(2)
Program district x eligible mother	-1.65	-0.21
	(1.19)	(1.48)
	{0.29}	{0.89}
Control mean (percent)	16.55	56.03
Observations	14881	14807
Clusters	70	70

Notes: Linear probability models. The dependent variables are dummies indicating that the mother is underweight (BMI below 18.5) or anemic (hemoglobin level below 12 g/dl, 11 g/dl for pregnant women). Coefficients in percentage points. *Eligible mother* 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 mother lives in a district where IGMSY was active from 2011 onward. Additional controls included but not reported in the table are educational level, marital status, 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. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific state fixed effects. Sample: mothers aged at least 19 with a first or second child born between 2010 and 2013 in the 70 districts of our research design. Robust standard errors clustered at the district level in parentheses, Romano-Wolf bootstrapped q-values (p-values adjusted for multiple inference in columns (1)-(2)) in curly brackets.

* p<0.10 ** p<0.05 *** p<0.01

Table 4: Program effect on Anganwadi center contact

	Prenatal benefits mother	Postnatal benefits mother	Mother met AWW last 3 months	Child benefits in last 12 months
	(1)	(2)	(3)	(4)
Program district x birth year 2012 or later	1.85	0.97	5.56***	0.91
	(1.26)	(1.35)	(1.08)	(1.27)
	{0.31}	{0.71}	{0.00}	{0.71}
Control mean (percent)	52.4	48.0	40.3	49.2
Observations	13886	13854	13897	13308
Clusters	70	70	70	70

Notes: Linear probability models. The dependent variables are dummies indicating that the mother received Anganwadi/ICDS center benefits or services during pregnancy (1) or lactation (2), that the child received such benefits or services during the 12 months preceding the interview (4) and that the mother met an Anganwadi worker (AWW), ASHA or other community health worker during the 3 months preceding the interview (3). *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: children alive at time of interview, born 2010-2013 to mothers aged at least 19 at birth of child, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific state fixed effects. Robust standard errors clustered at the district level in parentheses. Romano-Wolf bootstrapped q-values (p-values adjusted for multiple inference in columns (1)-(4)) in curly brackets.

* p<0.10 ** p<0.05 *** p<0.01

Table 5 sets out the ITT effects on immunization. The coefficients all have the expected positive sign, with larger effects for immunizations where vaccination rates at baseline are low. Column 5 shows that children eligible for the program are on average 9 percent more likely to be fully immunized. Interestingly, despite this significant overall improvement and a significant point estimate for polio-3 vaccination, we find no statistically significant effects for the individual vaccinations (columns 1 - 4) when we account for multiple inference.

Table 5: Program effect on child immunization

	Vaccinations by Type				Complete Vacc.
	BCG	DPT-3	Polio-3	Measles	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	0.93	1.53	2.58**	1.11	5.31***
	(1.15)	(1.68)	(1.28)	(1.38)	(1.56)
	{0.60}	{0.60}	{0.12}	{0.60}	
Control mean (percent)	90.3	79.6	67.5	83.8	59.1
Observations	13308	13308	13308	13308	13308
Clusters	70	70	70	70	70

Notes: Linear probability models. The dependent variables are dummies indicating BCG, DPT-3, Polio-3 and measles vaccinations, and complete vaccination. *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: children alive at time of interview, born 2010-2013 to mothers aged at least 19 at birth of child, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific state fixed effects. Robust standard errors clustered at the district level in parentheses. Romano-Wolf bootstrapped q-values (p-values adjusted for multiple inference in columns (1)-(4)) in curly brackets.

* $p<0.10$ ** $p<0.05$ *** $p<0.01$

We now turn to the question whether IGMSY and the above-documented improvements in intermediary outcomes also improve child health. Table 6 provides estimates of the program's effects on child health markers and mortality. According to column 1, the program significantly decreases the incidence of low birth weight by four percentage points, which equals 40 percent of the control group's mean. This effect is significant at the five percent level when accounting for multiple inference. Following Kahn-Lang and Lang (2020), we take this result with some caution as the balancing test in section 4.3 shows a borderline significant positive difference between pilot and control districts of almost three percentage points. The program reduces underweight at the time of interview, when children are one to five years old, by 4.6 percentage points (column 2). As for low birthweight, this result is significant at the 5 percent level when accounting for multiple inference. According to column 5, IGMSY has a beneficial and relatively large effect on child mortality. On the other hand, the point estimates for stunting and anemia are positive (columns 3-4). However, neither of these outcomes attains statistical significance when accounting for multiple inference.

Table 6: Program effect on child health and mortality

	Health Outcomes				Mortality
	Low Birth Weight	Underweight	Stunting	Anemia	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	-4.03***	-4.63***	0.43	3.90**	-1.02*
	(1.17)	(1.66)	(2.10)	(1.90)	(0.56)
	{0.01}	{0.02}	{0.83}	{0.12}	{0.13}
Control mean (percent)	10.0	36.6	38.9	47.5	3.7
Observations	13308	12390	12390	12523	13897
Clusters	70	70	70	70	70

Notes: Linear probability models. Dependent variables are dummies indicating low birth weight as recalled by the mother; underweight, stunting and anemia at the survey interview; and whether the child has died before the survey interview. 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: children born between 2010 and 2013 to mothers aged at least 19 at birth in the 70 districts of our research design. Except for columns (1) and (5), which comprise all livebirths, the sample consists only of children alive at the time of interview, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific state fixed effects. Robust standard errors clustered at the district level in parentheses. Romano-Wolf bootstrapped q-values (p-values adjusted for multiple inference in columns (1)-(5)) in curly brackets.
* p<0.10 ** p<0.05 *** p<0.01

5.2 Robustness

To assess whether the key assumption underlying our matched-pair difference-in-difference approach - parallel trends in outcomes absent IGMSY - is internally valid, we conduct a placebo test (Kahn-Lang and Lang 2020). To this end, we repeat our main analysis with data from India's third District Level Household Survey, DLHS-3 (IIPS 2010), which was fielded in 2007 and 2008, well before the onset of IGMSY. We choose this survey for the following reasons. The preceding demographic and health survey NFHS-3, fielded in 2005 and 2006, contains only state but no district identifiers. On the other hand, the latest DLHS, the DLHS-4 from 2012, does not cover nine major Indian states which feature prominently in our main estimation sample. The complementary AHS (Annual Health Survey), which covers those nine states, does not allow the combination of the household, woman and children's modules. We therefore select the DLHS-3. While its household sample is twenty percent larger than in NFHS-4, it contains no information on child anthropometrics and no comparable information about Anganwadi service use, and vaccinations as well as mortality are recorded for children only up to three years of age instead of five as in the NFHS-4. More precisely, DLHS-3 contains only the birth cohorts 2004, 2005 and 2006, while the cohorts 2010-2016 are featured in NFHS-4. In parallel to our main estimations, where the oldest two cohorts featured by the survey constitute the ineligible children in treated districts, we use the oldest two cohorts in DLHS-3 for this purpose – which leaves us with only the 2006 cohort as placebo-eligible children.

Descriptive statistics for the placebo sample are set out in Table A7 in the appendix and the estimation results in Table 7. Consistent with the relatively large sample size in DLHS-3 and a higher fertility rate in the 2000s compared to the 2010s, there are around 25 percent more observations in the placebo than in our main sample. Among the five outcomes there is a single one, DPT-3, which is negative and borderline significant. However, the p-value equals merely 0.22 when accounting for multiple inference. We conclude that our research design passes muster in terms of this placebo test.

Table 7: Placebo test with DLHS-3 data (children born between 2004 and 2006)

	Single Vaccinations				Complete Vacc.	Mortality
	BCG	DPT-3	Polio-3	Measles		
	(1)	(2)	(3)	(4)	(5)	(6)
Program district x birth year 2012 or later	0.15	-2.59*	-1.39	-0.13	-0.42	-0.05
	(1.17)	(1.47)	(1.33)	(1.26)	(1.44)	(0.58)
	{0.99}	{0.22}	{0.59}	{0.99}		
Control mean (percent)	80.7	62.9	57.7	73.3	50.2	3.4
Observations	17990	17990	17990	17990	17990	18676
Clusters	70	70	70	70	70	70

Notes: Birth year 2006 or later is a dummy variable indicating whether a child is born in 2006 or later. Outcomes represent percentages. *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, 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 between 2004 and 2006 to mothers aged at least 19 at birth in the 70 districts included in our research design. Except for columns (1) and (5), which comprise all livebirths, the sample consists only of children alive at the time of interview, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific state fixed effects. Robust standard errors clustered at the district level in parentheses. Romano-Wolf bootstrapped q-values (p-values adjusted for multiple inference in columns (1)-(5)) in curly brackets.

* $p<0.10$ ** $p<0.05$ *** $p<0.01$

As discussed in section 3, some children born between June and December 2011 may have profited early from the program, leading to an underestimation of the program effect. To test whether the definition of treated cohorts influences our results, we exclude children that could have potentially benefited from the program (those born June to December 2011) from the control group. While this reduces contamination of the control group, it renders the treatment and control group in our research design slightly less comparable, e.g. regarding age. As expected, the magnitude of the point estimates in Tables A9 to A13 overall increases for most outcomes. In particular, IGMSY's effect on child mortality now becomes significant at the one percent level even when accounting for multiple inference. On the other hand, the coefficient for underweight drops to almost half of its previous value and becomes insignificant at conventional levels. Due to this sensitivity, we judge our previous finding regarding underweight as less robust.

Finally, we conduct two robustness checks to assess whether our results are sensitive to the functional form of the estimating equation and the inclusion of control variables. First, we estimate equation (1) without control variables and second, we employ a logit instead of a linear probability model.[11] The results are set out in Tables A14 to A18 and A19 to A22, respectively. They are all very similar to the ones reported in Tables 2 through 6.

5.3 Magnitude of effects and cost-effectiveness

According to our theory of change, a maternal CCT's effect on birth spacing is ambiguous. Yet, we document a large decrease in birth hazard rates for second-born children. Within our complete set of findings, the most likely explanation for this is the increased interaction of mothers with Anganwadi workers, who also conduct family-planning counseling. Our finding is in line with Ghosh and Kochar's (2018) results for IGMSY in two districts of Bihar. On the other hand, they contrast the findings of Powell-Jackson et al. (2015) for the JSY program, which does not incentivize such trainings or interactions with Anganwadi workers. Taken together, these findings suggest that improved access to the government health system combined with counseling is effective for reducing fertility.

Regarding maternal health, the relatively large beneficial but statistically insignificant effect on mothers' underweight is consistent with our theory of change. A limitation of our analysis in this context is that any moderately-sized instantaneous effects of a perinatal CCT program on maternal health may be too short-lived to be detectable at the time of the survey interview, three to five years after program participation.

Regarding immunization, it is remarkable that there are only insignificant effects on individual vaccinations, while full vaccination rates increase by a sizable nine percent. This suggests that the more frequent contacts with the health system have particularly important orchestration effects, helping parents to complete a comprehensive vaccination schedule. Given a recommended 95 percent coverage goal and the vaccination rates in our sample before the onset of IGMSY, the program has the potential to close India's immunization gap by 7 percent.

Perhaps our most remarkable finding is the 14 percent increase in interactions with local public health centers three to five years subsequent to delivery, which suggests that a perinatal CCT can be long-term effective regarding access to maternal and child health care. Taken together, our results regarding Anganwadi interactions and immunization suggest that health service use significantly expanded through IGMSY, consistent with findings reported in the meta-analysis of Ranganathan and Lagarde (2012) for other geographical contexts. While we cannot isolate the channels by which these improvements occur, they are likely due to an orchestration of increased health-services demand triggered by the program conditions and expanded health service supply associated with IGMSY.

[11] While Ai and Norton (2003) argue against logit models with interaction terms, Kahn-Lang and Lang (2020) show that a double-difference logit model can be justified if it captures the correct functional form of the data-generating process.

Taken together we cannot conclude that IGMSY has had any transformative impacts on child health markers. On the one hand, while there are some indications of improvements in children's weight-related outcomes, the respective estimates suffer from a lack of robustness. On the other hand, we find no improvements for two other markers recorded three to five years after program benefits have elapsed, anemia and stunting. These patterns are consistent with Rivera et al.'s (2004) evaluation of Mexico's Progresa program as well as a meta-study of CCTs in other country contexts by Manley et al. (2013) and perhaps not surprising given the rather small magnitude of changes in health inputs during infancy of no more than five percentage points.

While a full cost-benefit analysis is beyond the scope of this paper, we present some simple back-of-the-envelope calculations of the program's cost-effectiveness with respect to two outcomes, immunization and underweight. We put these estimates into perspective by comparing them to the cost-effectiveness of a vaccination intervention in India (Banerjee et al., (2010) and another CCT program, the Nicaraguan Red de Protecciòn Social, evaluated by Maluccio and Flores (2005). The estimated cost per additional fully immunized child in IGMSY/PMMVY amounts to ₹ 49,906 (659.88 US$).[12] These costs are excessive compared to Banerjee et al. (2010), who estimate the costs for non-cash incentives and recruiting per fully immunized child in their study at ₹ 2,011. The discrepancy is not surprising, given that a policy tailored to improve a particular indicator should be more cost-effective than a cash transfer, which can be spent in a number of ways and may improve a range of indicators, albeit each one only to a limited extent (Banerjee et al. 2019). Moreover, average treatment effects as estimated by Banerjee et al. (2010) usually surpass intent-to-treat effects such as ours. A rough estimate based on Maluccio and Flores' (2005) findings regarding the Nicaraguan CCT arrives at US$ 6,161.29 per child lifted out of underweight. This estimate is three times larger than our estimated cost of ₹ 71,571.49 (US$ 2,282.47) per child prevented from being underweight by IGMSY, suggesting a favorable performance of India's program regarding this outcome.

5.4 A closer look at immunization

In our exploration of potential differences in program effects for different population sub-groups, we focus on one of the two outcomes for which we find the most robust effects, full immunization. We estimate heterogeneous program effects on vaccination by child and household characteristics as well as the intensity of program implementation. The p-values of the differences in the estimated treatment effects across subsamples are adjusted for multiple inference with Benjamini and Hochberg's method (Benjamini and Hochberg 1995). Table 8 contains IGMSY's effect on vaccination rates for various sample splits and the differences

[12] See appendix A3 for the cost-effectiveness calculation.

Table 8: Heterogeneous program effects on complete vaccination

Sample split by:	Individual and household characteristics										Intensity of program implementation (by state)	
	Birth order		Sex		Wealth		Social group		Residence			
	First/second	Third/higher	Female	Male	Bottom 40%	Upper 60%	SC/ST	Other	Rural	Urban	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Program district x birth	6.64***	1.84	7.98***	2.47	4.05**	5.51**	8.13**	4.02**	6.00***	-0.97	2.30	5.61***
year 2012 or later	(1.91)	(3.12)	(2.02)	(2.31)	(1.82)	(2.44)	(3.22)	(1.94)	(1.77)	(4.14)	(3.45)	(2.01)
Difference	4.73		5.49		-1.46		3.95		6.92		3.24	
	[0.21]		[0.07]		[0.62]		[0.33]		[0.13]		[0.42]	
	{0.625}		{0.350}		{0.625}		{0.625}		{0.512}			
Control mean (Percent)	63.2	53.0	59.3	60.8	54.3	65.4	61.0	59.6	59.0	63.1	63.3	61.0
Observations	9016	4292	6476	6832	6536	6772	5888	7420	10257	3051	6515	6510
Clusters	70	70	70	70	69	70	70	68	67	70	34	34

Notes: Linear probability model. The dependent variable is complete vaccination. *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. Subsamples: Wealth is based on the asset index included in the survey. Low (high) intensity of program implementation is based on total expenditures 2012 and 2013 per eligible case (first and second births of mothers aged at least nineteen years old in pilot districts) below (equal to or above) the median. Sample: children alive at time of interview, born 2010-2013 to mothers aged at least 19 at birth of child, 70 districts. All estimates are computed using sampling weights, birth year and district fixed effects as well as cohort-specific state fixed effects. Robust standard errors clustered at the district level in parentheses; p-values for differences between two complementary groups are in square brackets; Benjamini-Hochberg q-values (p-values for subgroup differences adjusted for multiple inference across the five differences reported for columns 1 through 10 are in curly brackets.

* p<0.10 ** p<0.05 *** p<0.01

between the corresponding subsamples. While the coefficients between wealthy and poorer households differ only slightly, the coefficients for children of the first two birth orders, girls and children living in SC/ST and rural households are much larger in magnitude than those for the respective complimentary group. The same applies to states with a high program intensity, which we define by an above-median (Rs 1,578) expenditure per eligible case in 2012 and 2013 (see appendix A2 for details). In line with expectations, these results provide suggestive evidence that disadvantaged groups and directly targeted children benefit disproportionately from the program. The latter finding is also consistent with the effects on birth spacing between first and second-born children that we have documented and discussed above. However, the associated difference between the two sub-groups is borderline significant at conventional levels only for child's sex. Accordingly, the program increases the incidence of full immunization for girls on average by 5.5 percentage points more than for boys. On the other hand, none of the differences between subsamples is statistically significant when accounting for multiple inference. Heterogeneous effects for other outcomes are displayed in the appendix (Tables A23 to A25). Accordingly, the pattern for mothers' interactions with health-center staff around the time of the survey interview is very similar to the one just discussed.

6. Conclusions

In this paper we have investigated the effects of the five-year long pilot phase of India's thus far largest conditional cash transfer program on health inputs and outcomes. Consistent with evidence from other countries, we find sizable, though not transformative, increases in access to formal health care as well as some of the incentivized health inputs. Our findings on health outcomes suggest improvements in children's anthropometric markers as well as mortality, but the limited geographical scope of the program's pilot phase puts limitations on the precision of these estimates.

Conditional cash transfers have the potential to influence a broad range of behaviors, even if not directly incentivized. We have found important effects on birth intervals at low parities, in particular after a woman's first birth. In contrast to Powell-Jackson et al. (2015), who document fertility increases as a consequence of a CCT for institutional deliveries, the fertility effects of IGMSY support the program's broader objectives, to improve maternal and child health. These seemingly contradictory findings highlight the importance of implementation details of a CCT: while IGMSY directives explicitly mention extended birth spacing as an element of monetarily incentivized educational sessions, JSY's guidelines do not.

A convincing explanation for the only small to moderate magnitude of the effects of this large program is its failure to reach out to eligible populations at large and selection into the program by mothers who would have sought ante- and postnatal care anyway. According to Falcao et al. (2015), IGMSY has reached no more than 50 to 60 percent of target populations during its early years. While these administrative figures are certainly upper bounds for the program's actual outreach, they equal precisely the order of magnitude of key outcome variables prior to the program's onset. Hence, at the extreme, there could be no effects at all if only mothers enrolled in the program who would have sought government healthcare even in the absence of the incentive. Such a pattern is more than likely given that such women face the lowest opportunity costs of enrolling and meeting the program conditions. This highlights the importance of a health-related CCT's outreach at the intensive margin: while an expansion of IGMSY/PMMVY to other districts can be expected to yield moderate improvements similar to the ones reported here, expanding the outreach within program districts, e.g. by more active recruitment and awareness campaigns, promises much greater improvements regarding both health inputs and outcomes.

Which lessons can be learned from our evaluation of the IGMSY pilot for its successor PMMVY, which has been universal since 2017? The only major difference between the two is PMMVY's restriction of eligibility to a woman's first birth, while IGMSY has covered the first two parities. While our data does not allow us to quantify spillover effects to younger, ineligible siblings, there exists evidence for two studies of parent-focused medical care and counseling interventions covering exclusively first-born infants in vulnerable US households. These document spillover effects to later-born siblings of a magnitude similar to the direct effect on eligible children (Ruggiero et al. 2020; Seitz and Apfel 1994). This evidence suggests that the effect of PMMVY on mothers' health-system contacts, birth spacing and immunization among children of all parities will be similar to the effects we have documented for IGMSY. On the other hand, PMMVY's budget allocation, which allows to fund no more than roughly half of all first births in India, makes effects larger than the ones reported here unlikely, and the main lessons learned from IGMSY apply to PMMVY.

Overall, our impression of India's maternal conditional cash transfer program IGMSY/PMMVY is more optimistic than Jackson-Powell et al.'s (2015) assessment of JSY, which focuses on institutional deliveries. Our evidence suggests that Indian policy makers have learned from the experiences with this earlier program and designed IGMSY/PMMVY more carefully. According to our findings, maternal CCTs can be an important, albeit not transformative element for improving access to health care and health outcomes in low- and middle-income countries. However, to increase their effectiveness, the problem of outreach among the target groups deserves more attention.

References

[Dataset] IIPS (2010): District Level Household and Facility Survey. Available online at https://data.gov.in/catalog/district-level-household-and-facility-survey-dlhs-3?filters%5Bfield_catalog_reference%5D=163825&format=json&offset=0&limit=6&sort%5Bcreated%5D=desc, checked on 7/1/2019.

[Dataset] IIPS; IFG (2018): Demographic and Health Survey (DHS) / National Family Health Survey (NFHS-4), 2015-16: India. Available online at dhsprogram.com, checked on July 2018.

Abadie, Alberto; Athey, Susan; Imbens, Guido W.; Wooldridge, Jeffrey (2017): When should you adjust standard errors for clustering? National Bureau of Economic Research.

Ai, Chunrong; Norton, Edward C. (2003): Interaction terms in logit and probit models. In *Economics Letters* 80 (1), pp. 123–129.

Amarante, Verónica; Manacorda, Marco; Miguel, Edward; Vigorito, Andrea (2011): Do cash transfers improve birth outcomes? Evidence from matched vital statistics, social security and program data. National Bureau of Economic Research (0898-2937).

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.

Balarajan, Yarlini; Selvaraj, Selvaraj; Subramanian, S. V. (2011): Health care and equity in India. In *The Lancet* 377 (9764), pp. 505–515.

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

Banerjee, Abhijit Vinayak; Duflo, Esther; Glennerster, Rachel; Kothari, Dhruva (2010): Improving immunisation coverage in rural India. Clustered randomised controlled evaluation of immunisation campaigns with and without incentives. In *The BMJ* 340, c2220.

Barber, Sarah L.; Gertler, Paul J. (2010): Empowering women. How Mexico's conditional cash transfer programme raised prenatal care quality and birth weight. In *Journal of Development Effectiveness* 2 (1), pp. 51–73.

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.

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.

Dhirar, Nonita; Dudeja, Sankalp; Khandekar, Jyoti; Bachani, Damodar (2018): Childhood morbidity and mortality in India—Analysis of National Family Health Survey 4 (NFHS-4) findings. In *Indian Pediatrics* 55 (4), pp. 335–338.

Falcao, Vanita Leah; Khanuja, Jasmeet; Matharu, Sonal; Nehra, Shikha; Sinha, Dipa (2015): Report on the study of the Indira Gandhi Matritva Sahyog Yojana. In *New Delhi: Centre for Equity Studies.*

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

Gaarder, Marie M.; Glassman, Amanda; Todd, Jessica E. (2010): Conditional cash transfers and health. Unpacking the causal chain. In *Journal of Development Effectiveness* 2 (1), pp. 6–50.

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), 48-66.

Grépin, Karen A.; Habyarimana, James; Jack, William (2019): Cash on delivery. Results of a randomized experiment to promote maternal health care in Kenya. In *Journal of Health Economics* 65, pp. 15–30. DOI: 10.1016/j.jhealeco.2018.12.001.

Hunter, Benjamin M.; Harrison, Sean; Portela, Anayda; Bick, Debra (2017): The effects of cash transfers and vouchers on the use and quality of maternity care services. A systematic review. In *PLoS One* 12 (3).

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

Kahn-Lang, Ariella; Lang, Kevin (2020): The promise and pitfalls of differences-in-differences. Reflections on 16 and pregnant and other applications. In *Journal of Business & Economic Statistics* 38 (3), pp. 613–620.

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.

Lim, Stephen S.; Dandona, Lalit; Hoisington, Joseph A.; James, Spencer L.; Hogan, Margaret C.; Gakidou, Emmanuela (2010): India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities. An impact evaluation. In *The Lancet* 375 (9730), pp. 2009–2023. DOI: 10.1016/S0140-6736(10)60744-1.

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.

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 Health and Family Welfare (2011a): Indira Ghandi Matritva Sahyog Yojana. A conditional maternity benefit scheme. Training module.

Ministry of Health and Family Welfare (2011b): Janani Suraksha Yojana. Guidelines for implementation. Available online at https://www.ilo.org/dyn/travail/docs/683/JananiSurakshaYojanaGuidelines/MinistryofHealthandFamilyWelfare.pdf, checked on 8/15/2020.

Ministry of Health and Family Welfare (2019): Roadmap to achieving 90% full immunization.

Ministry of Statistics and Programme Implementation (2011): Millennium Development Goals. India country report 2011. New Delhi.

Ministry of Statistics and Programme Implementation (2017): Millennium Development Goals - Final country report of India. New Delhi.

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 (2019): Annual reports. Available online at https://wcd.nic.in/annual-report, updated on 2019, checked on 8/12/2019.

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

PBI (2010): Implementation of Indira Gandhi Matritva Sahyog Yojana on pilot basis in 52 districts approved. New Delhi. Press Information Bureau [Press release]. 20 October. Available online at https://pib.gov.in/newsite/archiveReleases.aspx.

PBI (2017): Maternity benefits under Pradhan Mantri Matru Vandana Yojana. Press Information Bureau [Press release]. 28 December. Available online at https://pib.gov.in/newsite/PrintRelease.aspx?relid=174949, checked on 4/9/2020.

PBI (2019): Maternity benefits under PMMVY. Press Information Bureau [Press release]. 6 December. Available online at https://pib.gov.in/Pressreleaseshare.aspx?PRID=1595251, checked on 4/9/2020.

Powell-Jackson, Timothy; Hanson, Kara (2012): Financial incentives for maternal health. Impact of a national programme in Nepal. In *Journal of Health Economics* 31 (1), pp. 271–284. DOI: 10.1016/j.jhealeco.2011.10.010.

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.

Rivera, Juan A.; Sotres-Alvarez, Daniela; Habicht, Jean-Pierre; Shamah, Teresa; Villalpando, Salvador (2004): Impact of the Mexican program for education, health, and nutrition (Progresa) on rates of growth and anemia in infants and young children. A randomized effectiveness study. In *Jama* 291 (21), pp. 2563–2570.

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.

Ruggiero, Cara F.; Hohman, Emily E.; Birch, Leann L.; Paul, Ian M.; Savage, Jennifer S. (2020): The Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) responsive parenting intervention for firstborns impacts feeding of secondborns. In *The American Journal of Clinical Nutrition* 111 (1), pp. 21–27.

Seitz, Victoria; Apfel, Nancy H. (1994): Parent-focused intervention. Diffusion effects on siblings. In *Child Development* 65 (2), pp. 677–683.

Sinha, Dipa; Nehra, Shikha; Matharu, Sonal; Khanuja, Jasmeet; Leah Falcao, Vanita (2016): Realising universal maternity entitlements. Lessons from Indira Gandhi Matritva Sahyog Yojana. In *Economic and Political Weekly* 51 (34).

Triyana, Margaret (2016): Do health care providers respond to demand-side incentives? Evidence from Indonesia. In *American Economic Journal: Economic Policy* 8 (4), pp. 255–288.

United Nations Development Program (2015): The Millennium Development Goals report 2015. Available online at https://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf, checked on 3/26/2020.

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.

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

WHO (2011): Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity (WHO/NMH/NHD/MNM/11.1). Vitamin and Mineral Nutrition Information System. World Health Organization (WHO). Geneva. Available online at https://www.who.int/vmnis/indicators/haemoglobin/en/, checked on 2/1/2020.

WHO (2012): World Health Statistics 2012. Geneva: World Health Organization (World Health Statistics, 2012). Available online at http://www.who.int/gho/publications/world_health_statistics/EN_WHS2012_Full.pdf.

WHO (2014): Global nutrition targets 2025: Low birth weight policy brief (WHO/NMH/NHD/14.5). Geneva.

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

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

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.

Appendix

A1. Empirical approach for mothers' outcomes

Whether a mother is eligible is measured via a dummy variable that takes on one if the mother gave birth to a first or second born child after the year 2011.

$$H_{sdti} = \alpha_{sd} + \mu_t + (\delta_s \times elig\_w_t) + \beta(P_{sd} \times elig\_w_t) + \gamma X_{sdit} + u_{sdit} \,, \qquad (3)$$

where subscript i indicates mother, d district, s state, and t birth year of mother

- H: health outcome (underweight, anemia)
- $\boldsymbol{\beta}$: ITT effect
- P: dummy for pilot program district
- $elig\_w$: eligibility of the mother
- X_{sdit}: control variables
- α_{sd} : district fixed effects
- δ_s : state fixed effects
- μ_t: mother's birth year fixed effects
- u_{sdit}: robust standard errors clustered at the district level
- Sample: mothers aged at least 19 who had a first or second child between 2010 and 2013 (in order to assure a relatively even sample split and comparability)

A2. Measure of program implementation

In order to detect heterogeneous program effects by intensity of implementation, we use each state's disbursements per potentially eligible woman between 2011 and 2014 under IGMSY. For state-wise program expenditures we draw on data from Falcao et al. (2015). We define the number of eligible cases in each state by calculating the state-wise share of first and second births of mothers aged at least nineteen years old in pilot districts (years 2012 and 2013) in the overall number of births for the same period using NFHS – 4 data and then multiplying it with the Indian population (in thousands) and the Indian birthrate (sourced from World Bank (2019)). The share of eligible children in all births in pilot districts is roughly 65 percent. A state is considered a high implementation state if it has an above-median (₹ 1,578) expenditure per eligible case in 2012 and 2013. We choose this measure instead of the state-wise number of beneficiaries reported by the government since our measure is more strongly correlated with survey measures of program coverage from Niti Aayog and DMEO (2017). Moreover, it corresponds more closely to the ITT effects we are estimating.

A3. Cost effectiveness calculation

The cost effectiveness of the intervention was estimated as follows:

$$\frac{Average\ program\ expenditure\ per\ eligible\ case\ \ 2012-\ 2013/14}{Program\ effect\ \ on\ first\ and\ second\ born\ children\ \ (share)}$$

For a description of how we arrive at the yearly expenditure per eligible case, see A2. Maluccio and Flores (2005) find a 6.2 percentage point reduction in underweight (ITT-effect) and their reported average value of received direct cash transfer and health related in-kind benefits per year amount in total to US$ 382 per child. Note that this cost estimate does not include administrative costs for running the program, as does our estimated cost for IGMSY.

A4. Additional tables

Table A1: Timing of conditions and cash 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 counseling 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-1 and DPT-1 vaccination (9) Child has received Polio-2 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) counseling 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-3 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 tetanus 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

Notes: sources: Ministry of Women and Child Development (2011) and Niti Aayog and DMEO (2017)

Table A2: Ranking of index scores of pilot and matched control districts

District	State	Maternity Index	Performance Group	Pilot / Control	District	State	Maternity Index	Performance Group	Pilot / Control
Katihar	Bihar	139.2	low	C	Dehradun	Uttarakhand	348.2	middle	P
Saharsa	Bihar	139.3	low	P	Purbi Singhbhum	Jharkhand	349.2	middle	P
Godda	Jharkhand	165.2	low	C	West District	Sikkim	352.7	middle	P
Simdega	Jharkhand	165.9	low	P	South	Delhi	356.8	middle	C
Tamenglong	Manipur	179.7	low	P	North West	Delhi	359.5	middle	P
Vaishali	Bihar	191.8	low	P	Dhamtari	Chhattisgarh	359.6	middle	P
Saran	Bihar	192.6	low	C	South District	Sikkim	362.7	middle	C
Muzaffarnagar	Uttar Pradesh	192.9	low	C	Rewari	Haryana	364.8	middle	C
Mahoba	Uttar Pradesh	194.1	low	P	Panchkula	Haryana	368.3	middle	P
Sultanpur	Uttar Pradesh	203.6	low	P	Patan	Gujarat	372.4	middle	P
Azamgarh	Uttar Pradesh	207.3	low	C	Fatehgarh Sahib	Punjab	373.7	middle	C
East Garo Hills	Meghalaya	210.8	low	P	Kapurthala	Punjab	374.0	middle	P
West Garo Hills	Meghalaya	234.8	low	C	Valsad	Gujarat	374.2	middle	C
Banswara	Rajasthan	246.1	low	C	Kamrup	Assam	376.8	middle	P
Ukhrul	Manipur	248.9	low	C	Dibrugarh	Assam	379.5	middle	C
Bilaspur	Chhattisgarh	251.0	low	C	Kheda	Gujarat	379.7	middle	C
Bhilwara	Rajasthan	251.7	low	P	West	Delhi	382.6	middle	P
Udaipur	Rajasthan	252.7	low	P	Bharuch	Gujarat	382.7	middle	P
Dhalai	Tripura	252.8	low	P	East	Delhi	383.6	middle	C
Bastar	Chhattisgarh	257.5	middle	P	Nalgonda	Telangana	391.2	middle	P
Tonk	Rajasthan	257.7	middle	C	Y.S.R.	Andhra Pradesh	392.4	middle	C
Dhemaji	Assam	263.7	middle	C	Davanagere	Karnataka	403.4	high	C
Goalpara	Assam	266.5	middle	P	Bilaspur	Himachal Pradesl	413.7	high	C
Ranchi	Jharkhand	276.1	middle	C	Dharwad	Karnataka	421.0	high	P
North Tripura	Tripura	280.2	middle	C	Muktsar	Punjab	421.6	high	C
Changlang	Arunachal Prades	306.7	middle	C	Amritsar	Punjab	426.5	high	P
Lawngtlai	Mizoram	307.8	middle	P	Kolar	Karnataka	428.0	high	P
Chamoli	Uttarakhand	313.4	middle	C	Rangareddy	Telangana	433.6	high	C
Puruliya	West Bengal	320.5	middle	C	West Godavari	Andhra Pradesh	435.8	high	P
Jalpaiguri	West Bengal	328.5	middle	P	Tumkur	Karnataka	442.2	high	C
Durg	Chhattisgarh	329.0	middle	C	Hamirpur	Himachal Pradesl	470.1	high	P
Bankura	West Bengal	343.5	middle	P	Palakkad	Kerala	488.1	high	P
Mamit	Mizoram	345.3	middle	C	Kozhikode	Kerala	501.1	high	C
Dakshin Dinajpu	West Bengal	346.2	middle	C	North Goa	Goa	502.3	high	P
Papumpare	Arunachal Prades	347.2	middle	P	South Goa	Goa	517.8	high	C

Note: Index calculated from District Level Household Survey 2007-08. Components: (i) % literate female population (age 7 +), (ii) % mothers registered their pregnancy in the 1st trimester , (iii) % mothers who had at least 3 antenatal care visits during their last pregnancy, (iv) % institutional births, (v) % children (12-23 months) fully immunized (BCG, 3 DPTs, Polio and measles), and (vi) % children breastfed within one hour of birth.

Table A3: Data restrictions and number of observations

Restriction	*N children*
Original dataset (NFHS-4, children schedule)	259,627
Excluding UTs	252,064
Restricted to program and control districts	32,741
Excluding states with other maternity programs	26,573
Excluding Jammu and Kashmir	25,170
Restricted to children of mothers who were at least 19 at the birth of the respective child	23,762
Restricted to children born between 2010 and 2013	14,721
Restricted to observations for which data is available for at least one main outcome	14,721
Restricted to observations for which data is available for all controls	13,897

Table A4: Description of variables

Unit of observation	**Variable**	**Description**	**Source**
		Outcome variables	
Child	Anemia	Dummy variable, equals one if the child has mild, severe or moderate anemia (hemoglobin level below 11 g/dl)	Generated from NFHS-4
	Birth spacing	Succeeding birth interval in months (if birth interval missing but a birth took place after the respective child: months since last birth of mother)	Generated from NFHS-4
Child	BCG	Dummy variable, equals one if a child has been administered the Bacillus-Calmette-Guèrin-vaccination. Following standard DHS procedure, "Don't know" is recoded to "No" for all vaccinations	NFHS-4
Child	Complete vaccination	Dummy variable, equals one if the child has been administered one BCG, one measles, three DPT and three polio doses	
Child	DPT-3	Dummy variable, equals one if child has been administered the last combined diphtheria, pertussis and tetanus vaccination dose	NFHS-4
Child	Low birth weight	Dummy variable, equals one if weight at birth lies below 2.5 kg	Calculated from NFHS-4
Child	Measles	Dummy variable, equals one if the child has been administered one measles dose	NFHS-4
Child	Mortality	Dummy variable, equals one if the child has perished	Calculated from NFHS-4
Child	Polio-3	Dummy variable, equals one if child has been administered the last polio vaccination dose	
Child	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	NFHS-4

		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	Underweight	Dummy variable, equals one if weight for age z-score (using the WHO reference population) (WAZ) below -2	NFHS-4
Mother	Anemia	Dummy variable, equals one if the mother has mild, severe or moderate anemia (hemoglobin level below 11 g/dl for pregnant women and below 12 g/dl for all other adult women)	Generated from NFHS-4
Mother	Underweight	Dummy variable, equals one if Body Mass Index lies below 18.5	NFHS-4
		Control variables and variables employed for heterogeneous effects estimation	
Child	Birth order	Birth order of the child	NFHS-4
Child	Sex	Dummy variable, equals one if the child is female	NFHS-4
Mother	Age	Age in years	NFHS-4
Mother	Educational level	Woman's highest educational level. Consists of the following categories: no education, primary education, secondary education, higher education	NFHS-4
Mother	Height	Height in cm	NFHS-4
Mother	Marital status	Marital status of the mother, consists of the following categories: never in union, married, widowed/separated	Generated from NFHS-4
Mother	Squared age	Squared age in years	Calculated from NFHS-4
Household	Poor	Dummy variable, equals one if a household belongs to the poorest 40% in the NFHS-4 sample in terms of the wealth index	NFHS-4
Household	Rural	Dummy variable, equals one if the place of residence lies in a rural area	NFHS-4
Household	Religion	Religion of the household. Consists of the following categories: Hindu, Muslim, Christian, Sikh, Buddhist, no or other religion	Generated fom NFHS-4
Household	SC/ST	Dummy variable, equals one if household belongs to a scheduled caste or tribe	Generated from NFHS-4

Household	Wealth	Quintiles of a continuous measure of relative wealth of a household equal to the factor score of an index of owned assets (range of index: -2.25822 to 2.86687)	NFHS-4
State	State implementation	Dummy variable, equals one for states with average IGMSY expenditure between 2011-2014 per eligible case above the median (eligible are first and second born children of mothers at least 19 at birth in pilot districts)	Generated from expenditure (Falcao et al. (2015)) and population data (World Bank (2019)), NFHS-4
		Treatment and eligibility variables	
Child	Birth year 2012 or later (Elig_birth)	Dummy variable, equals one if child was born in 2012 or later	Generated from NFHS-4
District	Program district	Dummy variable, equals one for districts in which IGMSY was implemented in 2011. The variable equals 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 pilot districts, in the same state)	Pilot districts (Ministry of Women and Child Development 2019), control districts matched by authors

Table A5: Summary statistics NFHS-4 (Children, full sample)

	Mean	SD	N
Outcome variables (child)			
Succeeding birth interval (median)	33.00	12.42	13897
Anganwadi contact			
AWC benefits during pregnancy (%)	56.82	49.53	13886
AWC benefits during breastfeeding (%)	51.73	49.97	13854
AWC benefits in last 12 months (child) (%)	56.32	49.60	13308
Mother saw AWW in last 3 months (%)	44.44	49.69	13897
Vaccination			
BCG vaccinated (%)	91.30	28.18	13308
DPT-3 vaccinated (%)	81.25	39.03	13308
Polio-3 vaccinated (%)	72.29	44.76	13308
Measles vaccinated (%)	84.60	36.10	13308
Complete vaccination (%)	63.76	48.07	13308
Health			
Low birth weight (%)	13.60	34.28	13308
Underweight (%)	37.95	48.53	12390
Stunted (%)	40.80	49.15	12390
Anemic (%)	55.68	49.68	12523
Mortality (%)	4.41	20.53	13897
Child characteristics			
Female (%)	47.54	49.94	13897
Age (months)	40.17	11.61	13125
Mother characteristics			
Height (cm)	151.40	6.13	13897
Age (years)	28.05	4.79	13897
Education			
None (%)	32.96	47.01	13897
Primary (%)	14.28	34.99	13897
Secondary (%)	42.24	49.40	13897
Higher (%)	10.52	30.68	13897
Household characteristics			
Notes: Underweight: BMI below 18.5. Anemi	72.65	44.57	13897
SC/ST (%)	34.35	47.49	13897
Religion			
Hindu (%)	80.40	39.70	13897
Muslim (%)	13.91	34.61	13897
Christian (%)	2.78	16.43	13897
Sikh (%)	2.05	14.18	13897
Buddhist (%)	0.22	4.72	13897
None or other religion (%)	0.63	7.92	13897
Wealth quintile			
First (%)	26.51	44.14	13897
Second (%)	20.96	40.71	13897
Third (%)	18.74	39.03	13897
Fourth (%)	18.05	38.46	13897
Fifth (%)	15.74	36.42	13897
Eligibility variable			
Born 2012 or later (share)	0.65	0.48	13897

Notes: AWC benefit: received goods or services from Anganwadi center. 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 quintiles included in NFHS-4 (derived from the factor score of principal component analysis of a 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: Children born 2010-2013 to mothers aged at least 19 at birth of child, 70 districts.

Table A6: Summary statistics NFHS-4 (Mothers, full sample)

	Mean	SD	N
Outcome variables (mother)			
Underweight (%)	20.23	40.18	14881
Anemia (%)	57.89	49.37	14807
Mother characteristics			
Age (years)	28.64	6.13	14807
Education			
None (%)	23.76	42.56	14807
Primary (%)	13.13	33.77	14807
Secondary (%)	48.69	49.98	14807
Higher (%)	14.43	35.14	14807
Marital status			
Married (%)	95.66	20.37	14807
Never in union (%)	0.11	3.36	14807
Widowed or separated (%)	4.23	20.12	14807
Household characteristics			
Rural (%)	65.41	47.57	14807
SC/ST (%)	32.04	46.66	14807
Religion			
Hindu (%)	82.80	37.74	14807
Muslim (%)	10.42	30.55	14807
Christian (%)	2.82	16.57	14807
Sikh (%)	2.82	16.55	14807
Buddhist (%)	0.29	5.38	14807
None or other (%)	0.85	9.19	14807
Wealth quintile			
First (%)	18.12	38.52	14807
Second (%)	18.22	38.60	14807
Third (%)	19.25	39.43	14807
Fourth (%)	21.48	41.07	14807
Fifth (%)	22.93	42.04	14807
Eligibility variable			
Gave birth to first or second child in 2012 or later (share)	0.52	0.50	14807

Notes: Underweight: BMI below 18.5. Anemic: hemoglobin level below 12 g/dl, below 11 g/dl for pregnant women. Wealth index quintiles included in NFHS-4 (derived from the factor score of principal component analysis of a 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: mothers aged at least 19 with a first or second child born between 2010 and 2013, 70 districts.

Table A7: Summary statistics DLHS-3

	Mean	SD	N
Outcome variables (child)			
Vaccination			
BCG vaccinated (%)	82.00	38.42	17990
DPT-3 vaccinated (%)	64.16	47.96	17990
Polio-3 vaccinated (%)	58.99	49.19	17990
Measles vaccinated (%)	74.38	43.66	17990
Complete vaccination (%)	51.51	49.98	17990
Health			
Mortality (%)	3.62	18.67	18676
Child characteristics			
Female (%)	47.55	49.94	18676
Mother characteristics			
Age (years)	27.52	4.87	18676
Education			
No education (%)	39.09	48.80	18676
Primary education (%)	31.18	46.32	18676
Secondary education (%)	15.57	36.26	18676
Higher education (%)	14.16	34.86	18676
Household characteristics			
Rural (%)	69.81	45.91	18676
SC/ST (%)	42.14	49.38	18676
Religion			
Hindu (%)	68.65	46.39	18676
Muslim (%)	11.86	32.33	18676
Christian (%)	11.58	32.00	18676
Sikh (%)	4.30	20.28	18676
Buddhist (%)	1.82	13.36	18676
None or other religion (%)	1.79	13.26	18676
Wealth quintile			
First	23.52	42.42	18676
Second	19.34	39.50	18676
Third	19.08	39.30	18676
Fourth	18.71	39.00	18676
Fifth	19.34	39.50	18676
Eligibility variable			
Born 2005 or later (share)	0.72	0.45	18676

Notes: 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 quintiles derived from the factor score of principal component analysis of the DLHS-3 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 DLHS-3 and constructed using state mother/child sampling weights provided by DLHS-3. Sample: Children born 2004-2006 to mothers aged at least 19 at birth of child, 70 districts.

Table A8: Program effect on years of residence

	Years of residence
	(1)
Program district x eligible mother	0.28
	0.88
Control mean (years)	13.56
Observations	14,917
Clusters	70

Notes: The dependent variable are years of residence. *Eligible mother* 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: mothers aged at least 19 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 state fixed effects. Robust standard errors clustered at the district level in parentheses.

* $p<0.10$ ** $p<0.05$ *** $p<0.01$

Table A9: Program effect on birth spacing (excluding children born June-December 2011)

Sample split by:		Birth order		
	Full sample	First born	Second born	Third or higher
	(1)	(2)	(3)	(4)
Program district x birth year 2012 or later	0.89**	0.86	0.79*	1.08
	(0.05)	(0.08)	(0.10)	(0.15)
		{0.24}	{0.16}	{0.59}
Control median birth interval (months)	42.2	36.0	44.6	46.2
Observations	11407	3987	3666	3754
Clusters	70	70	70	70

Note: see table 2. Sample: children born 2010-2013 (excluding children born June-December 2011) to mothers aged at least 19 at birth of child.

* p<0.10 ** p<0.05 *** p<0.01

Table A10: Program effect on mothers' health (excluding children born June-December 2011)

	Underweight	Anemia
	(1)	(2)
Program district x eligible mother	-1.90	-0.10
	(1.28)	(1.57)
	{0.25}	{0.95}
Control mean (percent)	17	56
Observations	14489	14414
Clusters	70	70

Note: see table 3. Sample: mothers aged at least 19 at birth of a first or second child born between 2010 and 2013 in the 70 districts of our research design (excluding mothers with first and (if applicable) second child born June-December 2011).

* p<0.10 ** p<0.05 *** p<0.01

Table A11: Program effect on Anganwadi service use - Excluding children born June-December 2011

	Prenatal benefits mother	Postnatal benefits mother	Mother met AWW last 3 months	Child benefits in last 12 months
	(1)	(2)	(3)	(4)
Program district x birth year 2012 or later	1.85	0.97	5.56***	0.91
	(1.26)	(1.35)	(1.08)	(1.27)
	{0.31}	{0.71}	{0.00}	{0.71}
Control mean (percent)	52.4	48.0	40.3	49.2
Observations	13886	13854	13897	13308
Clusters	70	70	70	70

Notes: see table 4. Sample: children born 2010-2013 (excluding children born June-December 2011) to mothers aged at least 19 at birth of child.

* $p<0.10$ ** $p<0.05$ *** $p<0.01$

Table A12: Program effect on vaccination (excluding children born June-December 2011)

	Vaccinations by type				Complete vacc.
	BCG	DPT-3	Polio-3	Measles	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	0.93	1.53	2.58**	1.11	5.31***
	(1.15)	(1.68)	(1.28)	(1.38)	(1.56)
	{0.60}	{0.60}	{0.12}	{0.60}	
Control mean (percent)	90.3	79.6	67.5	83.8	59.1
Observations	13308	13308	13308	13308	13308
Clusters	70	70	70	70	70

Notes: see table 5. Sample: children born 2010-2013 (excluding children born June-December 2011) to mothers aged at least 19 at birth of child.

* p<0.10 ** p<0.05 *** p<0.01

Table A13: Program effect on child health and mortality (excluding children born June-December 2011)

	Health outcomes				Mortality
	Low birth weight	Underweight	Stunting	Anemia	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	-4.78**	-2.82	2.46	3.81	-2.05***
	(1.90)	(2.07)	(3.39)	(2.46)	(0.63)
	{0.05}	{0.29}	{0.50}	{0.29}	{0.01}
Control mean (percent)	10.0	38.6	41.1	46.8	3.0
Observations	10920	10146	10146	10281	11407
Clusters	70	70	70	70	70

Notes see table 6. Sample: children born 2010-2013 (excluding children born June-December 2011) to mothers aged at least 19 at birth of child.

* p<0.10 ** p<0.05 *** p<0.01

Table A14: Program effect on birth spacing (without additional controls)

Sample split by:		Birth order		
	Full sample	First born	Second born	Third or higher
	(1)	(2)	(3)	(4)
Program district x birth year 2012 or later	0.97	0.82***	0.82***	1.00
	(0.04)	(0.05)	(0.05)	(0.09)
		{0.01}	{0.97}	{0.85}
Control median birth interval (months)	40.6		35.8	42.3
Observations	13897		4880	4502
Clusters	70		70	70

Notes: see table 2. Without additional control variables.

* p<0.10 ** p<0.05 *** p<0.01

Table A15: Program effect on mothers' health (without additional controls)

	Underweight	Anemia
	(1)	(2)
Program district x eligible mother	-1.49	-0.47
	(1.15)	(1.52)
	{0.34}	{0.75}
Control mean (percent)	17	56
Observations	15500	15417
Clusters	70	70

Notes: see table 3. Without additional control variables.

* p<0.10 ** p<0.05 *** p<0.01

Table A16: Program effect on Anganwadi service use (without additional controls)

	Prenatal benefits mother	Postnatal benefits mother	Mother met AWW last 3 months	Child benefits in last 12 months
	(1)	(2)	(3)	(4)
Program district x birth year 2012 or later	1.69	0.76	5.25***	0.82
	(1.37)	(1.44)	(1.10)	(1.30)
	{0.44}	{0.76}	{0.00}	{0.76}
Control mean (percent)	52.4	48.0	40.3	49.2
Observations	13886	13854	13897	13308
Clusters	70	70	70	70

Notes: see table 4. Without additional control variables.

* p<0.10 ** p<0.05 *** p<0.01

Table A17: Program effect on vaccination (without additional controls)

	Vaccinations by type				Complete vacc.
	BCG	DPT-3	Polio-3	Measles	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	0.90	1.51	2.49*	1.08	5.22***
	(1.08)	(1.57)	(1.33)	(1.24)	(1.57)
	{0.58}	{0.58}	{0.17}	{0.58}	
Control mean (percent)	90.3	79.6	67.5	83.8	59.1
Observations	13308	13308	13308	13308	13308
Clusters	70	70	70	70	70

Notes: see table 5. Without additional control variables.

* p<0.10 ** p<0.05 *** p<0.01

Table A18: Program effect on child health and mortality (without additional controls)

	Health outcomes				Mortality
	Low birth weight	Underweight	Stunting	Anemia	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	-3.96***	-4.86***	0.17	3.61*	-1.04*
	(1.20)	(1.62)	(2.06)	(1.89)	(0.53)
	{0.01}	{0.01}	{0.93}	{0.14}	{0.14}
Control mean (percent)	10.0	36.6	38.9	47.5	3.7
Observations	13308	12390	12390	12523	13897
Clusters	70	70	70	70	70

Notes: see table 6. Without additional control variables.

* p<0.10 ** p<0.05 *** p<0.01

Table A19: Program effect on mothers' health (Logit model)

	Underweight	Anemia
	(1)	(2)
Program district x eligible mother	-1.91	-0.25
	(1.30)	(1.48)
Control mean (percent)	16.73	56.03
Observations	14772	14807
Clusters	69	70

Notes: see table 3. Average marginal effects of Logit model. Coefficients multiplied by 100 for comparability with linear probability model. Differences in observations to LPM model arise from some instances of perfect prediction. Computation of multiple inference adjusted p-values in logit model not possible due to large number of fixed effects.

* p<0.10 ** p<0.05 *** p<0.01

Table A20: Program effect on Anganwadi service use (Logit model)

	Prenatal benefits mother	Postnatal benefits mother	Mother met AWW last 3 months	Child benefits in last 12 months
	(1)	(2)	(3)	(4)
Program district x birth year 2012 or later	1.95*	1.46	4.50***	0.91
	(1.12)	(1.27)	(1.02)	(1.37)
Control mean (percent)	13886	13854	13897	13308
Observations	70	70	70	70
Clusters	13886	13854	13897	13308

Notes: see table 4. Average marginal effects of Logit model. Coefficients multiplied by 100 for comparability with linear probability model. Differences in observations to LPM model arise from some instances of perfect prediction. Computation of multiple inference adjusted p-values in logit model not possible due to large number of fixed effects.

* p<0.10 ** p<0.05 *** p<0.01

Table A21: Program effect on vaccinations (Logit model)

	Vaccinations by Type				Complete Vacc.
	BCG	DPT-3	Polio-3	Measles	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	0.73	1.09	2.73**	0.96	5.22***
	(1.22)	(1.55)	(1.23)	(1.35)	(1.52)
Control mean (percent)	90.3	79.6	67.5	83.8	59.1
Observations	12825	13308	13308	13308	13308
Clusters	66	70	70	70	70

Notes: see table 5. Average marginal effects of Logit model. Coefficients multiplied by 100 for comparability with linear probability model. Differences in observations to LPM model arise from some instances of perfect prediction. Computation of multiple inference adjusted p-values in logit model not possible due to large number of fixed effects.

* p<0.10 ** p<0.05 *** p<0.01

Table A22: Program effect on child health and mortality (Logit model)

	Health outcomes				Mortality
	Low birth weight	Underweight	Stunting	Anemia	
	(1)	(2)	(3)	(4)	(5)
Program district x birth year 2012 or later	-4.45***	-4.52***	0.64	4.06**	-0.88
	(1.13)	(1.66)	(2.12)	(1.88)	(0.66)
Control mean (percent)	10.0	36.6	38.9	47.5	3.7
Observations	13308	12390	12390	12523	13799
Clusters	70	70	70	70	69

Notes: see table 6. Average marginal effects of Logit model. Coefficients multiplied by 100 for comparability with linear probability model. Differences in observations to LPM model arise from some instances of perfect prediction. Computation of multiple inference adjusted p-values in logit model not possible due to large number of fixed effects.

* p<0.10 ** p<0.05 *** p<0.01

Table A23: Heterogeneous program effects on Anganwadi service use

Sample split by:	Individual and household characteristics										Intensity of program implementation (by state)	
	Birth order		Sex		Wealth		Social group		Residence			
	First/second	Third/higher	Female	Male	Bottom 40%	Upper 60%	SC/ST	Other	Rural	Urban	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Program district x birth year 2012 or later	6.00***	2.39	6.22***	5.01**	4.33**	5.99***	5.40***	5.26***	4.98***	-1.02	7.72***	3.90**
	(1.67)	(2.77)	(2.02)	(2.08)	(1.88)	(2.00)	(1.86)	(1.78)	(1.51)	(4.26)	(1.82)	(1.48)
Difference	3.85		1.21		-1.66		0.29		6.06		-3.80	
	[0.31]		[0.73]		[0.60]		[0.92]		[0.21]		[0.10]	
	{0.922}		{0.922}		{0.922}		{0.922}		{0.922}			
Control mean (percent)	41.1	40.3	44.8	37.4	47.4	34.6	44.8	38.8	45.8	27.0	44.8	42.3
Observations	9382	4515	6734	7163	6891	7006	6173	7724	10753	3144	6812	6799
Clusters	70	70	70	70	69	70	70	68	67	70	34	34

Notes: See table 8. Outcome is a dummy variable equal to 1 if the mother met an Anganwadi worker in the three months before the survey interview.

* p<0.10 ** p<0.05 *** p<0.01

Table A24: Heterogeneous program effects on low birth weight

Sample split by:	Individual and household characteristics										Intensity of program implementation (by state)	
	Birth order		Sex		Wealth		Social group		Residence			
	First/second	Third/higher	Female	Male	Bottom 40%	Upper 60%	SC/ST	Other	Rural	Urban	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Program district x birth	-5.91***	0.21	-3.17**	-5.03**	-1.03	-6.35***	-0.94	-5.07***	-3.69***	-5.26	-5.68**	-4.06**
year 2012 or later	(1.54)	(1.83)	(1.48)	(2.17)	(1.22)	(1.79)	(1.85)	(1.47)	(1.10)	(3.61)	(2.15)	(1.56)
Difference	-5.86		1.85		5.33		3.94		1.42		1.53	
	[0.02]		[0.52]		[0.02]		[0.12]		[0.68]		[0.56]	
	{0.064}		{0.684}		{0.064}		{0.351}		{0.684}			
Control mean (percent)	13.8	7.9	12.0	12.0	9.1	14.6	11.5	12.3	10.9	15.0	10.7	12.8
Observations	9016	4292	6476	6832	6536	6772	5888	7420	10257	3051	6515	6510
Clusters	70	70	70	70	69	70	70	68	67	70	34	34

Notes : see table 8. Outcome is a dummy variable equal to 1 if a child is born with a weight of less than 2.5 kg.

* p<0.10 ** p<0.05 *** p<0.01

Table A25: Heterogeneous program effects on underweight

Sample split by:	Individual and household characteristics										Intensity of program implementation (by state)	
	Birth order		Sex		Wealth		Social group		Residence			
	First/second	Third/higher	Female	Male	Bottom 40%	Upper 60%	SC/ST	Other	Rural	Urban	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Program district x birth year 2012 or later	-5.49***	-2.70	-2.76	-5.95**	-7.41**	-2.25	-9.05***	-1.91	-4.82**	-5.55	-7.00*	-2.68
	(1.68)	(3.22)	(2.95)	(2.35)	(3.00)	(2.30)	(3.02)	(1.80)	(2.11)	(4.07)	(3.45)	(2.12)
Difference	-3.01		3.28		-5.15		-6.89		0.68		4.16	
	[0.35]		[0.42]		[0.16]		[0.04]		[0.89]		[0.29]	
	{0.844}		{0.844}		{0.648}		{0.205}		{0.888}			
Control mean (percent)	35.1	44.2	41.7	34.7	47.2	29.3	41.4	36.2	40.7	30.4	34.6	41.6
Observations	8381	4009	6013	6377	6096	6294	5473	6917	9566	2824	6100	6029
Clusters	70	70	70	70	69	70	70	68	67	70	34	34

Notes: see table 8. Outcome is a dummy variable equal to 1 if a child is underweight (WAZ below -2).

* p<0.10 ** p<0.05 *** p<0.01