Do Maternal Health Programmes Improve Child Health? Evidence From the KCR Kit Scheme in Telangana, India

Nagaraju Kadire[1*], Prof. Anji Reddy Koppula[2]

[1]Research Scholar, Department of Economics, Mahatma Gandhi University, Nalgonda, Telangana-508254

[2]Professor of Economics, Department of Economics, Mahatma Gandhi University, Nalgonda, Telangana-508254

DOI: https://doi.org/10.47772/IJRISS.2026.101000584

Received: 25 October 2026; Accepted: 30 October 2026; Published: 12 November 2026

ABSTRACT

The typical evaluation of demand-side maternal programmes uses maternal outcomes; however, there is potential for the benefits to extend to future generations. This study assesses whether Telangana's KCR Kit Scheme, a programme bundling a newborn-care kit, a staged cash transfer and an explicit wage-loss compensation, leads to improved child-health outcomes. We used primary data from 1,100 women (800 beneficiaries and 300 non-beneficiaries), comparing both groups on eight child-health indicators. We also estimated ordered-logit, logit and probit models, confirming our estimates through nearest-neighbor propensity-score matching. Every child-health indicator was rated significantly better for the children of beneficiaries ($p < .01$). This included how their mothers would rate them, being more than a half point higher on a four-point rating scale (3.18 vs. 2.64); being approximately 15 percentage points more likely to have received all vaccinations due for their age; and having experienced repeated illnesses in the last three months at a fourteen per cent lower rate. Controlling for socio-demographic and obstetric factors, a child born to a beneficiary family was many times more likely to fall into a higher health-rating category (cumulative odds ratio = 4.35), and exposure to the programme reduced the likelihood of experiencing repeated illness by fifty-four per cent (odds ratio = .54). The average treatment effect on the treated, via nearest-neighbor matching, was .49 standard-deviation units, almost identical to the original group-mean difference. It is therefore reasonable to conclude that the observed benefit of the KCR Kit Scheme did not arise from differences in observable characteristics. Since each estimation method (regression, ordered response and matching) produced consistent estimates across multiple specifications (using a probit morbidity specification and alternative caliper-based matching), we can safely say that we have made it less probable that the result could be attributed to some form of error.

Keywords: child health; conditional cash transfer; maternity benefit; vaccination; propensity-score matching; KCR Kit Scheme; Telangana; India.

INTRODUCTION

The argument in favor of investment in maternal health comes from its benefits to subsequent generations. A pregnant woman and her infant, during their early years, are embedded in a nutritional and caregiving environment that determines birth weight, feeding practice, immunization and the morbidities that shape survival and long-term human capital.

Demand-based programmes that compensate (or incentivize) mothers to participate in the healthcare system have become a central tool for policymakers in developing countries; much has been written linking these programmes to better food security, greater dietary variety and utilization of preventive services (Bastagli et al., 2019; Owusu-Addo, Renzaho & Smith, 2018). While maternal improvements arising from demand-based interventions may lead to measurable child-health co-benefits, this is a further empirical issue, relevant to understanding the full social return on investment in these schemes.

There exists encouraging but limited Indian research on the subject. An independent review of India's flagship facility-delivery cash-transfer programme, the Janani Suraksha Yojana (JSY), identified decreases in perinatal and neonatal mortality among participants (Lim et al., 2010). More recent quasi-experimental research using propensity-score matching demonstrated that participation in JSY led to increases in childhood immunizations (between approximately 3% and 9%) and certain early breastfeeding practices (Carvalho et al., 2014). Spillover effects were also reported for health-insurance programmes in India. Participation in the RSBY, for example, increased child immunization regardless of whether vaccination was included as part of the insurance coverage (Aiyar & Sunder, 2024). While this research indicates that maternal demand-based programmes can positively affect child-health outcomes, it focuses primarily on national-level schemes and specific outcomes, and therefore lacks detail regarding a bundled state programme's total child-health profile.

Telangana's KCR Kit Scheme represents a unique case in this regard, since it uses three different tools to provide support: a physical newborn-care kit, a staged cash payment totaling ₹12,000 (₹13,000 if the child is female), and an explicit compensation rationale for wages lost through participating in the programme (Government of Telangana, 2017).

Having previously demonstrated the positive impacts of the KCR Kit Scheme on maternal-health outcomes, the purpose of this paper is to determine whether these impacts similarly affect child-health outcomes. This objective is achieved by comparing beneficiary children with non-beneficiary children on eight child-health measures. Conditional models are subsequently estimated for each outcome measure, including an ordered logit model of child-health ratings, logit models evaluating full vaccination status and frequency of repeated illnesses, and an ordered logit model assessing nutritional status. Finally, propensity-score matching is used to calculate the average treatment effect on the treated (ATT) for child-health ratings.

This paper contributes to the existing body of research in two ways. Firstly, it provides a broad-based assessment of the child-health impacts of a bundled state maternal programme. Secondly, it uses multiple estimators (group comparisons, ordered-response and binary models, and two matching algorithms) so that the conclusions drawn regarding child-health impacts are robust to assumptions about functional form and identification. The remainder of the paper is structured as follows. Section 2 reviews the literature; Section 3 describes the data and methodology employed; Section 4 reports the findings from the analysis; Section 5 interprets these findings; Section 6 identifies potential policy applications; and Section 7 summarizes the key points.

REVIEW OF LITERATURE

Demand-Side Maternal Programmes and Child Health

To begin, there is evidence that cash and demand-side maternal programmes increase institutional deliveries, antenatal visits and preventive-service utilization, leading to improved newborn survival. Lim et al. (2010) used an independent evaluation of JSY and found that the programme led to lower rates of perinatal and neonatal death. This indicates that the programme may reduce infant mortality through a reduction in births attended by unskilled attendants, and through an increase in facility deliveries. Given that many vaccinations are given at or near the time of birth, facility-based programmes can also increase immunization coverage. Carvalho et al. (2014) conducted a matching-based evaluation of JSY and found that it resulted in a significant improvement in full vaccination and specific antigen coverage.

The evidence for other related demand-side instruments supports the idea of spillovers. Aiyar and Sunder (2024) evaluated India's national health-insurance scheme and found that it had a positive impact on child immunization and use of postnatal care, even though neither was covered under the scheme, likely owing to an increase in maternal interaction with the health system. Systematic reviews also indicate that cash transfers lead to improved food security and dietary diversity, which are intermediate factors in improving child nutrition. However, studies evaluating the effect of cash transfers on nutritional status show variable results depending on whether the cash-transfer amount is adequate and how well services are provided locally (Crosta et al., 2024; Bastagli et al., 2019; Owusu-Addo et al., 2018).

Bundled Kit-And-Cash Programmes and the Identification Challenge

Programmes that bundle an in-kind kit, cash and wage-loss compensation, as KCR does, are common across government policy. However, they create an identifiability problem, because there is typically only one administrative mechanism and therefore no exogenous variation in any of the individual instruments that could allow researchers to identify each instrument's marginal effect on child health (Bastagli et al., 2019). It was therefore decided to use alternative estimation techniques to establish the total relationship between programme participation and child-health outcomes, and to assess the robustness of this relationship, rather than to try to identify which aspect of programme design contributes most to these outcomes.

DATA AND METHODOLOGY

Study Setting and Programme Eligibility

The KCR Kit Scheme was launched by the Government of Telangana in June 2017. It covers pregnant women who register for antenatal care in the public health system and deliver in a government health facility, for a maximum of two deliveries. Each beneficiary receives a newborn-care kit at discharge and a cash entitlement of ₹12,000 (₹13,000 for a girl child), paid by direct benefit transfer in instalments linked to antenatal check-ups, institutional delivery and the child's scheduled immunizations; the final instalments are released only after the child has been vaccinated (Government of Telangana, 2017). Mothers who deliver in a private facility or at home, mothers delivering a third or higher-order child, and eligible mothers who do not register for or claim the benefit are not covered. These mothers make up the population from which non-beneficiaries were drawn (Section 3.3).

Data, Sampling Frame and Geographical Coverage

The analysis uses primary data collected directly from respondents on 1,100 women in Telangana: 800 KCR beneficiaries and 300 non-beneficiaries, sampled from the same localities, as described below. The instrument recorded socio-economic characteristics (age, education, occupation, family size, income, residence, social category, health insurance), obstetric history (parity, gravida, birth-weight category), and eight child-health indicators: a four-point maternal rating of child health, a three-point child nutritional-status category, full vaccination, repeated illness in the previous three months, birth-weight category, breastfeeding-initiation timing, exclusive-breastfeeding duration, and check-up frequency.

The data were collected from respondents through a structured, interviewer-administered questionnaire in Telangana state of India covering both rural and urban localities. Beneficiaries were identified from the KCR Kit beneficiary lists maintained by the government health facilities serving the selected localities, and non-beneficiaries were identified in the same localities (Section 3.3). The analytical sample of 1,100 respondents (800 beneficiaries and 300 non-beneficiaries) was drawn by simple random selection, with a fixed random seed for reproducibility, from the full set of completed survey interviews. Because the sample is drawn from selected districts, the findings describe the programme in these districts rather than in Telangana as a whole.

Eligibility Criteria, Identification of Non-Beneficiaries and Recruitment

A woman was eligible for the survey if (i) she was a usual resident of a selected locality; (ii) she had given birth after the launch of the scheme, the child of that birth being the index child for all child-health questions; (iii) the index child was alive and living with her; and (iv) she gave informed consent to be interviewed. A woman was classified as a beneficiary if she had enrolled in the KCR Kit Scheme for the index pregnancy and received its benefits, and as a non-beneficiary if she had not enrolled. All 800 beneficiaries reported the month of pregnancy in which they enrolled, whereas no non-beneficiary did.

Because non-beneficiaries do not appear in programme records, they were identified within the same localities as the beneficiaries, among mothers who had given birth in the same period but had not enrolled in the scheme. Drawing both groups from the same localities holds constant the local supply of health services and the immunization schedule in force. Lack of awareness was the main reason for non-participation: 146 of the 300

non-beneficiaries (48.7 per cent) reported that they had not heard of the scheme, compared with 1 of the 800 beneficiaries, and the remaining 154 non-beneficiaries knew of the scheme but had not enrolled. Non-participation is therefore not random, which is why the baseline comparison in Section 3.4 and the covariate adjustment and matching in Section 3.6 are central to the analysis.

Interviews were conducted face to face in Telugu at the respondent's home by trained field investigators. Investigators explained the purpose of the study, assured respondents that participation would not affect any entitlement, and obtained informed consent before the interview. All information was reported by the mother; no anthropometric measurements were taken.

Baseline Comparability of Beneficiaries and Non-Beneficiaries

Table 1 compares the two groups on all characteristics measured in the survey that were determined before, or independently of, exposure to the programme: maternal age group, education, occupation, monthly household income, family size, residence, religion, social category, health insurance, distance to the nearest health facility, gravida and parity. Birth weight and the other child-health indicators are excluded because they are potential outcomes of the programme. For each characteristic we report the mean and standard deviation (continuous and ordinal variables) or the percentage (categorical variables) in each group, the difference between the groups and a test of that difference (Welch's t-test for continuous and ordinal variables; χ^2 test for categorical variables).

Because p-values depend on sample size, balance is judged primarily by the standardized mean difference (SMD) (Austin, 2009). For a continuous or ordinal variable, $SMD = (\bar{x}_B - \bar{x}_N) / \sqrt{[(s^2_B + s^2_N) / 2]}$, where $\bar{x}$ and s^2 are the group mean and variance and the subscripts B and N denote beneficiaries and non-beneficiaries. For a binary variable, or for each category of a categorical variable, $SMD = (p_B - p_N) / \sqrt{\{[p_B(1 - p_B) + p_N(1 - p_N)] / 2\}}$, where p is the group proportion. An absolute SMD below 0.10 is taken to indicate negligible imbalance (Austin, 2009; Stuart, 2010). The final column of Table 1 reports the same SMDs in the matched sample (Section 3.6), using the pre-matching standard deviations as the denominator.

The two groups are closely comparable. Apart from distance to the nearest health facility, no characteristic differs significantly between them, and every other row of Table 1 has an absolute SMD below 0.10 except two small categories (occupation code 4, 2.8 vs. 1.0 per cent, SMD = 0.13; religion code 1, SMD = −0.11). Distance is the only material imbalance: beneficiaries live closer to a health facility than non-beneficiaries (mean distance band 1.98 vs. 2.28; SMD = −0.32; $p < .01$). Matching reduces this imbalance but does not remove it (SMD = −0.19), because distance is not among the matching covariates. Distance is therefore controlled for directly in the morbidity model (Table 5), and the residual imbalance is acknowledged as a limitation (Section 5). After matching, a few small categories move slightly above the 0.10 threshold (largest absolute value 0.15), reflecting the reuse of a limited pool of 229 matched controls.

Table 1. Baseline characteristics of beneficiaries and non-beneficiaries.

Characteristic	Code	Benef. (n = 800)	Non-benef. (n = 300)	Diff.	p-value	SMD before matching	SMD after matching
Maternal and household characteristics							
Age group (1–3), mean (SD)	Age	1.48 (0.59)	1.46 (0.54)	0.02	0.536	0.041	-0.049
Education level (1–6), mean (SD)	Educ	3.47 (1.28)	3.48 (1.25)	-0.01	0.872	-0.011	0.051
Occupation: occ = 1 (%)	Farmer = 1	23.4	22.7	0.7	0.422	0.017	0.128
Occupation: occ = 2 (%)	Labor = 2	31.6	32.7	-1.0		-0.022	-0.021
Occupation: occ = 3 (%)	Self-employed =	14.6	13.3	1.3		0.037	0.025

	3						
Occupation: occ = 4 (%)	Salaried employed = 4	2.8	1.0	1.8		0.129	0.129
Occupation: occ = 5 (%)	Others = 5	27.6	30.3	-2.7		-0.060	-0.154
Monthly household income (₹), mean (SD)	Inc	13,619 (3,764)	13,933 (4,247)	-315	0.260	-0.078	-0.090
Family size (members), mean (SD)	Fsize	4.02 (0.87)	4.04 (0.86)	-0.02	0.706	-0.026	0.016
Urban residence (%)	urban = 1	4.8	5.7	-0.9	0.534	-0.041	0.079
Religion: code 1 (%)	Hindu = 1	85.1	88.7	-3.5	0.308	-0.105	-0.111
Religion: code 2 (%)	Muslim = 2	10.1	8.0	2.1		0.074	0.070
Religion: code 3 (%)	Christian = 3	4.8	3.3	1.4		0.072	0.089
Social category: SC (%)	scat = 1	23.4	23.7	-0.3	0.954	-0.007	-0.053
Social category: ST (%)	scat = 2	16.5	15.3	1.2		0.032	0.133
Social category: OBC (%)	scat = 3	57.1	58.3	-1.2		-0.024	-0.071
Social category: General (%)	scat = 4	3.0	2.7	0.3		0.020	0.053
Covered by health insurance (%)	hins = 1	26.6	28.7	-2.0	0.498	-0.046	-0.120
Distance to health facility (band 1–4), mean (SD)	Rdist	1.98 (0.90)	2.28 (1.00)	-0.30	0.000	-0.319	-0.194
Obstetric history							
Gravida, mean (SD)	Rgrav	2.01 (1.05)	2.06 (1.01)	-0.06	0.410	-0.055	0.118
Parity, mean (SD)	Rpar	1.86 (0.90)	1.83 (0.89)	0.03	0.564	0.039	0.011

Note: N = 1,100. Benef. = beneficiaries; Non-benef. = non-beneficiaries; Diff. = beneficiaries minus non-beneficiaries (percentage points for categorical variables). Values are means (SD) for continuous and ordinal variables and percentages for categorical variables. p-values are from Welch's t-test (continuous and ordinal variables) or the χ^2 test (categorical variables; one p-value per variable, reported on its first row). SMD = standardized mean difference (Section 3.4); |SMD| < 0.10 indicates negligible imbalance. Matched SMDs refer to 1:1 nearest-neighbour matching with replacement on a logit propensity score estimated from the covariates listed under Table 6. Code = variable name and category value in the estimation dataset. SC = Scheduled Caste; ST = Scheduled Tribe; OBC = Other Backward Classes. Source: computed by the authors from the primary data.

Definition and Measurement of Child-Health Indicators

All eight child-health indicators refer to the index child and were reported by the mother in the interview. Table 2 gives, for each indicator, the question on which it is based, the reference period and the coding used in the analysis.

Table 2. Definition, reference period and coding of child-health indicators.

Indicator	Code	Measurement	Reference period	Coding used in the analysis
Child-health rating	chrt	Mother's rating of her child's overall health	Current (day of interview)	1 = Poor; 2 = Fair; 3 = Good; 4 = Excellent
Nutritional status	cnut	Mother's assessment of her child's nutritional status	Current (day of interview)	1 = Poor; 2 = Average; 3 = Good
Fully vaccinated	fullvac	Mother's report of whether the child had received all vaccinations	From birth to interview	1 = yes; 0 = no

		due for the child's age under the Universal Immunization Programme		
Repeated illness	repill	Number of episodes of illness the child experienced, recorded in five ordered categories	Previous three months	1 = two or more episodes; 0 = none or one
Birth-weight category	bwcat	Weight of the child at birth, recorded in four ordered categories	At birth	1 = low birth weight (< 2.5 kg; lbw = 1); 2–4 = successively higher weight bands
Early breastfeeding initiation (reverse-coded)	bfinit	Time from birth to the first breastfeed, recorded in four ordered categories	Index birth	4 = within the first hour; 3, 2, 1 = successively later initiation
Exclusive-breastfeeding duration	exbf	Length of time the child received only breast milk, recorded in four ordered categories	Infancy (first six months)	1–4 = successively longer duration
Check-up frequency	checkfreq	How often the child was taken for routine health check-ups	Since birth	1 = most frequent; 2 = intermediate; 3 = least frequent. Lower = better

Note: Code = variable name in the estimation dataset; each derived variable is constructed from a survey item: chrt from Child_health_rating; cnut from Child_nutritional_status; fullvac from Child_vaccinations_full (1 = yes, 2 = no in the survey); repill from R32_ChildIllness_Last3Months (categories 3–5 coded 1); bwcat from R27_BirthWeight_Category; bfinit = 5 − R29_BreastfeedingInitiation; exbf from R30_ExclusiveBreastfeedingDuration; checkfreq from Child_checkup_frequency.

All indicators were reported by the mother. Low birth weight follows WHO (2014); early initiation of breastfeeding follows WHO and UNICEF (2021); vaccinations due for age follow the National Immunization Schedule (Ministry of Health and Family Welfare, n.d.).

Ordinal indicators are coded so that higher values denote better outcomes, with two exceptions: repeated illness, coded 1 for the adverse outcome, and check-up frequency, whose original response order is retained so that a lower value denotes more frequent check-ups. Breastfeeding initiation was recorded with 1 for the earliest category (within the first hour) and was reverse-coded so that higher values denote earlier initiation.

Repeated illness is derived from the five-category illness-frequency question by coding the three highest categories (two or more episodes) as 1. Full vaccination is assessed against the vaccines due for the child's age under India's National Immunization Schedule (Ministry of Health and Family Welfare, n.d.).

Low birth weight follows the WHO definition of a weight at birth below 2,500 g (WHO, 2014), and early initiation of breastfeeding follows the WHO–UNICEF definition of putting the newborn to the breast within one hour of birth (WHO & UNICEF, 2021).

The covariates are recorded as follows: maternal age group (three ordered categories); education (six ordered levels); occupation (five categories); monthly household income in rupees, entered in logarithms in the models; residence (1 = urban); family size (number of household members); religion (three categories); social category (Scheduled Caste, Scheduled Tribe, Other Backward Classes, General); health insurance (1 = covered); distance to the nearest health facility (four ordered distance bands); gravida (number of pregnancies, including the index pregnancy); and parity (number of births).

Empirical Strategy

We proceed in three stages of analysis. First, Welch's t-tests compare beneficiaries and non-beneficiaries on each indicator, with variance allowed to differ between groups. Secondly, we use conditional models controlling for potential confounders: an ordered logit model of child-health rating on a four-point scale; logit models of full vaccination and repeated illness (with odds ratios); and an ordered logit model of nutritional status. Thirdly, nearest-neighbor propensity-score matching estimates the ATT for child-health rating by relaxing the functional-form assumption, comparing each beneficiary child with the most similar non-beneficiary child in propensity-score space.

Covariate balance in the matched sample is assessed with the SMDs reported in the final column of Table 1. Robustness is examined through an augmentation of the ordered logit model with obstetric controls; a probit morbidity model; a caliper-matching estimator; diagnostics of variance-inflation factors; a Brant-type proportional-odds test; and a multinomial logit check where proportional odds are not satisfied. Statistical significance is denoted at the 1, 5 and 10 per cent levels throughout.

RESULTS

Group Comparisons of Child-Health Indicators

The data in Table 3 demonstrate that the mother's report of her child's health was more than a half point higher for beneficiary children than for non-beneficiary children (3.18 vs. 2.64). The chances of being fully vaccinated were also much greater for beneficiary children (around 15 per cent). The birth weight of beneficiary children was larger.

The initiation time of breastfeeding, as well as its duration, were both longer. The number of times the child received medical checks during this period was also considerably more frequent. Lastly, it should be noted that the incidence of sickness experienced by the child in the last three months was notably lower for beneficiary children (14% lower than for non-beneficiary children, .33 vs. .47), and each measure is statistically significant at the 99th percentile.

Table 3. Child-health indicators by beneficiary status (Welch t-tests).

Indicator	Benef.	Non-benef.	Diff.	t-stat	p-value
Child-health rating (1–4) (chrt)	3.176	2.637	0.540	9.72	0.000***
Child nutritional status (1–3) (cnut)	2.049	1.893	0.155	3.85	0.000***
Fully vaccinated (0/1) (fullvac)	0.993	0.843	0.149	7.02	0.000***
Repeated illness (0/1) (repill)	0.333	0.473	−0.141	−4.22	0.000***
Birth-weight category (1–4) (bwcat)	2.743	2.423	0.319	4.81	0.000***
Early BF initiation (rev.) (bfinit)	3.263	2.840	0.423	6.46	0.000***
Excl. breastfeeding duration (1–4) (exbf)	2.830	2.597	0.233	3.79	0.000***
Check-up frequency (1–3, lower better) (checkfreq)	1.170	1.480	−0.310	−7.09	0.000***

Note: N = 1,100. For 'repeated illness' and 'check-up frequency (lower better)', a negative difference favors beneficiaries. *** p<0.01. Source: All the tables and the figures in the paper are estimated by the authors based on the primary data.

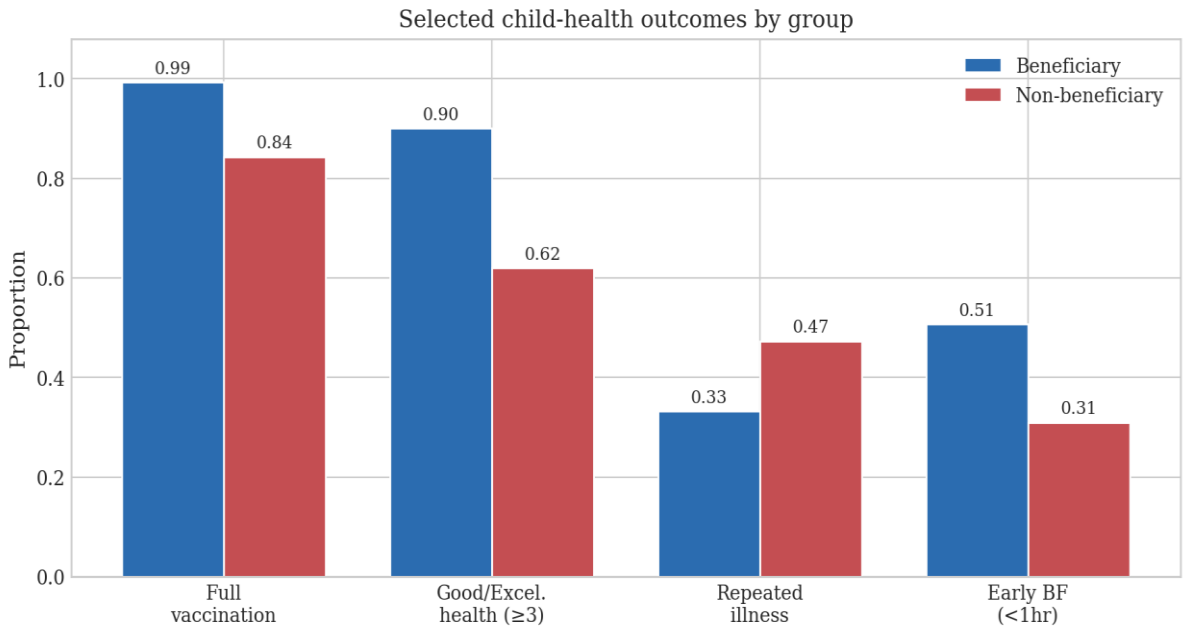

Figure 1. Selected child-health outcomes by group.

Ordered logit of child-health rating

Table 4 displays a statistically significant, highly ordered logit model for the four-level child-health ratings, controlling for both socio-demographic and obstetric history. As expected, the coefficient on the treatment variable was large and highly statistically significant ($\beta = 1.47$; $p < .01$), which represents a cumulative odds ratio of approximately 4.3. In other words, all else equal, there is a substantial increase in the likelihood that children whose mothers received the programme will have higher levels of health status. A second finding indicates that household income positively affects the health-status rating of children, consistent with the concept of a 'resource gradient' in child health. Finally, although each of the obstetric-history variables was individually statistically insignificant when controlling for treatment and socio-economic characteristics, they were still retained in the equation as additional control variables.

Table 4. Ordered logit of child-health rating (1–4).

Variable (code)	Coef.	Std. err.	z	P>|z|	Odds ratio
KCR beneficiary (grp)	1.470***	0.144	10.18	0.000	4.347***
Age group (age)	−0.204*	0.105	−1.94	0.053	0.816*
Education (educ)	0.071	0.049	1.45	0.146	1.074
Log(income) (linc)	0.573*	0.303	1.89	0.058	1.774*
Urban residence (urban)	0.304	0.263	1.16	0.247	1.355
Family size (fsize)	0.113	0.071	1.58	0.114	1.119
Parity (rpar)	0.066	0.066	1.01	0.314	1.068
Gravida (rgrav)	0.022	0.057	0.39	0.698	1.022

Note: N = 1,100; log-likelihood = −1127.37. Positive coefficients raise the probability of higher (better) ratings. *** p<0.01, ** p<0.05, * p<0.10.

Vaccination and Morbidity

A chi-squared test confirmed a difference in the proportion of vaccinated versus unvaccinated children ($\chi^2 = 105.86$, $p < .01$). The logit model for recurring childhood illnesses reported in Table 5 indicates that beneficiary status has a protective and significant effect; this is evident in the odds ratio of 0.536, which

indicates that participating as a beneficiary nearly halves the odds of having two or more illnesses over the course of three months. This represents a large and beneficial relationship, consistent with the enhanced immunization, nutritional status and increased care-seeking behavior documented among the sample. In addition, a companion logit model assessing full vaccination (results not reported owing to space limitations) indicated that beneficiary status increases the odds of receiving full vaccination, and an ordered logit model assessing nutritional status found that beneficiary children are more likely to achieve better-than-poor nutritional status.

Table 5. Logit of repeated child illness, odds ratios (1 = two or more episodes).

Variable (code)	**Odds ratio**	**P>|z|**
KCR beneficiary (grp)	0.536***	0.000
Social cat: General (scat = 4)	1.760	0.141
Age group (age)	0.925	0.490
Education (educ)	0.927	0.145
Log(income) (linc)	1.122	0.693
Urban residence (urban)	1.279	0.388
Distance to facility (rdist)	0.918	0.216

Note: N = 1,100; log-likelihood = −711.68; LR χ^2 = 27.40 (p = 0.004). An odds ratio below 1 for the beneficiary indicator denote a protective effect. The model also controls for parity, gravida and the remaining social categories (ST and OBC; reference = SC), whose odds ratios are not shown (rpar, rgrav, scat = 2, scat = 3). *** p<0.01.

Propensity-score matching: ATT on child-health rating

The regression model adjusts for each confounding variable parametrically, while propensity-score matching removes the constraint of a specific functional form. There is common support across the full propensity-score range. As indicated in the table, the average treatment effect on the treated (ATT) for the child-health rating with respect to beneficiary status is 0.485 points using the nearest-neighbor method (standard error 0.038, t = 12.94, n = 800). This estimate is very close to the simple group comparison of 0.54 shown in Table 3. This close agreement suggests that no observable compositional characteristics are driving the beneficiary advantage in child health.

Table 6. Nearest-neighbor propensity-score matching, ATT on child-health rating.

Estimand	**Estimate**	**Std. err.**	**t-stat**	**Matched treated (n)**
ATT (child-health rating, 1–4) (chrt)	0.485	0.0375	12.94	800

Note: 1:1 nearest-neighbor matching with replacement on the estimated propensity score; covariates include age, education, log-income, residence, family size, social category, parity, gravida and health insurance (age, educ, linc, urban, fsize, scat, rpar, rgrav, hins). Codes in parentheses in Tables 3–6 are the variable names in the estimation dataset. A caliper-matching robustness check (0.05-SD caliper) yields ATT = 0.48 (SE = 0.037, t = 12.72), and a probit morbidity model reproduces the protective illness effect.

Birth Weight, Breastfeeding and Robustness

The advantages of the programme can be observed in the immediate determinants of infant health. Infants of beneficiary mothers were more likely to have a normal birth weight than those of non-beneficiary mothers: 10.3 per cent of beneficiary infants had low birth weight, compared with 22.7 per cent of non-beneficiary infants. Beneficiary status also reduced the likelihood of low-birth-weight babies, which has been identified as the single most important determinant of newborn mortality. Beneficiary infants also began breastfeeding

sooner than their counterparts: 50.8 per cent began breastfeeding during the optimal first hour after delivery, compared with 31.0 per cent of non-beneficiary infants.

Figure 2 shows the distribution of birth weights among all the infants surveyed. As noted above, the child-health benefits associated with the programme remain consistent across each of the various sensitivity checks performed. For example, when using an ordered logit model that incorporates obstetric control variables (such as parity and birth-weight category), the estimated coefficient for beneficiary status remains nearly identical ($\beta = 1.47$, $p < .01$). The variance-inflation factors also remain close to one, indicating no evidence of multicollinearity. Lastly, although a Brant-type test gave some indication that the rating variable may have violated the proportional-odds assumption, a subsequent multinomial logit indicated that beneficiary status significantly increased the log-odds of being rated in any category above 'Fair' (that is, 'Good' and 'Excellent').

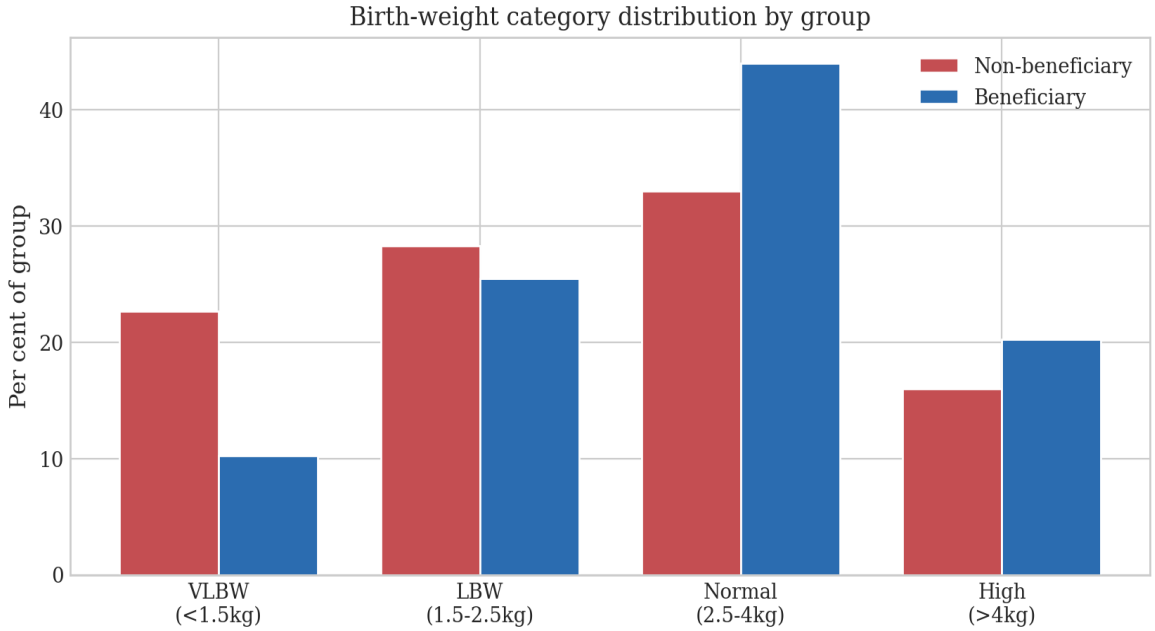

Figure 2. Birth-weight category distribution by group.

DISCUSSION

The health of children is in line with what would have been expected from the programme's maternity impacts: the same institutional-delivery, antenatal-care and nutritional pathways that reduce the risk of adverse pregnancy outcomes also improve the child's birth weight, rate of vaccination, ability to feed well and frequency of illness. The nearly four-fold increase in the cumulative odds ratio for the child-health rating and the almost halved odds of repeated illness are both very large by the standards used in evaluating spillovers from maternal programmes, and are consistent with prior studies demonstrating positive immunization and survival spillovers for JSY and RSBY (Lim et al., 2010; Aiyar & Sunder, 2024; Carvalho et al., 2014). The similarity between the raw differences and the matched ATT estimates suggests there is minimal variation due to observable selection. While it is impossible to rule out variation due to unobservable selection when using a single wave of data, it is improbable that this accounts for all of the variance, because three different types of analysis generate similar findings.

This study has three key limitations that constrain the generalizability of its findings. The child-health rating is a maternal self-assessment, so beneficiary mothers who report positively could lead to an overestimation of actual ratings. The other indicators, including vaccination and birth weight, are also maternal reports and may contain recall error. In addition, because the final cash instalments are released only after the child is vaccinated, the near-universal vaccination coverage among beneficiaries partly reflects the programme's conditionality rather than an independent health effect. Beneficiaries also live closer to a health facility than non-beneficiaries (Table 1), and part of their advantage may reflect easier access to services. The study uses a

cross-sectional design, so it can show only associations between variables given observed characteristics. Finally, because each mother receives a bundle that includes cash and insurance as part of the coverage, further research using either a longitudinal design or a randomized design at the level of components will be necessary to isolate individual mechanisms.

Policy Implications

Firstly, by including the health benefits to the next generation in the measured returns of the programme, this research adds to the economic justification for programmes that bundle services for mothers: evaluations that focus only on the health of mothers will understate the total social benefit, since they exclude the documented child-health co-benefits found in this study.

Secondly, the fact that the advantages appear to concentrate in three areas (vaccination, birth weight and early breastfeeding) underscores the value of maintaining the connections to the immunization system and the prenatal-nutrition delivery system that the bundle establishes. The findings suggest that it is through these two systems that children derive benefit from their mothers' participation.

Thirdly, because the child-health benefits arise from continued interaction between families and the health system, and not simply from receipt of a single payment or delivery, both the continued availability of kits (and other tools) and the continued disbursal of cash and counselling should be viewed as mechanisms that protect child and maternal health together.

Finally, this study demonstrates that, to attribute improvements in child health to specific components of a bundle of maternal services, researchers need to build component-level variation into the design of any future implementation. Where such variation is absent, estimates of total participation effects derived using techniques such as matching, as used in this study, remain the best available means of demonstrating causality.

CONCLUSION

This study examines whether children of mothers who benefited from the KCR Kit Scheme show greater improvements in child health than children whose mothers did not use the service. To determine whether such a relationship exists, the study employed three different methods to examine the effect of the KCR Kit Scheme on the child-health status of 1,100 mothers and their children: examining differences between groups; analyzing responses using both ordered-response and binary models; and using propensity-score matching to compare outcomes for those selected into the programme with similar individuals who were not. Overall, the results indicate that children of mothers who used the KCR Kit Scheme were positively affected on all eight measured child-health factors.

A number of specific findings can be identified. Controlling for other variables that may affect the outcome, the likelihood of a child being classified into one of the upper health-rating categories is approximately four times as high for children whose mothers received services through the KCR Kit Scheme as for those whose mothers did not. In addition, the probability of experiencing repeated illness is lowered by about half among children whose mothers received services under the programme. Finally, when comparing the average treatment effect on the treated (ATT) across matched samples, the estimated value of 0.49 was very close to the estimated raw difference in means. Taken together, these estimates suggest that the observed child-health advantages of children of KCR beneficiaries are real, and not artefacts of either observable composition or particular model specifications. The fact that multiple methods produced consistent estimates further supports the view that these advantages reflect a causal effect. It therefore appears reasonable to conclude that the benefits of the KCR Kit Scheme extend beyond the current cohort to subsequent generations. Ultimately, establishing how each component of the bundle contributes to these benefits, and determining whether any unobserved sources of heterogeneity remain, should be the top priorities for further research.

REFERENCES

1. Aiyar, A., & Sunder, N. (2024). Health insurance and child mortality: Evidence from India. Health Economics, 33(5), 870–893. https://doi.org/10.1002/hec.4798
2. Austin, P. C. (2009). Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Statistics in Medicine, 28(25), 3083–3107. https://doi.org/10.1002/sim.3697
3. Bastagli, F., Hagen-Zanker, J., Harman, L., Barca, V., Sturge, G., & Schmidt, T. (2019). The impact of cash transfers: A review of the evidence from low- and middle-income countries. Journal of Social Policy, 48(3), 569–594. https://doi.org/10.1017/S0047279418000715
4. Carvalho, N., Thacker, N., Gupta, S. S., & Salomon, J. A. (2014). More evidence on the impact of India's conditional cash transfer program, Janani Suraksha Yojana: Quasi-experimental evaluation of the effects on childhood immunization and other reproductive and child health outcomes. PLoS ONE, 9(10), e109311. https://doi.org/10.1371/journal.pone.0109311
5. Crosta, T., Karlan, D., Ong, F., Rüschenpöhler, J., & Udry, C. R. (2024). Unconditional cash transfers: A Bayesian meta-analysis of randomized evaluations in low and middle income countries (NBER Working Paper No. 32779). National Bureau of Economic Research. https://doi.org/10.3386/w32779
6. Government of Telangana. (2017). KCR Kit Scheme: Objectives and guidelines. Department of Health, Medical and Family Welfare, Government of Telangana, Hyderabad.
7. Lim, S. S., Dandona, L., Hoisington, J. A., James, S. L., Hogan, M. C., & Gakidou, E. (2010). India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: An impact evaluation. The Lancet, 375(9730), 2009–2023. https://doi.org/10.1016/S0140-6736(10)60744-1
8. Ministry of Health and Family Welfare. (n.d.). National immunization schedule (NIS) for infants, children and pregnant women. Government of India, New Delhi.
9. Owusu-Addo, E., Renzaho, A. M. N., & Smith, B. J. (2018). The impact of cash transfers on social determinants of health and health inequalities in sub-Saharan Africa: A systematic review. Health Policy and Planning, 33(5), 675–696. https://doi.org/10.1093/heapol/czy020
10. Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. Statistical Science, 25(1), 1–21. https://doi.org/10.1214/09-STS313
11. World Health Organization. (2014). Global nutrition targets 2025: Low birth weight policy brief (WHO/NMH/NHD/14.5). World Health Organization, Geneva.
12. World Health Organization & United Nations Children's Fund. (2021). Indicators for assessing infant and young child feeding practices: Definitions and measurement methods. World Health Organization, Geneva.