Impact of an integrated nutrition and health programme on neonatal mortality in rural northern India

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Objective To assess the impact of the newborn health component of a large-scale community-based integrated nutrition and health programme.

Methods Using a quasi-experimental design, we evaluated a programme facilitated by a nongovernmental organization that was implemented by the Indian government within existing infrastructure in two rural districts of Uttar Pradesh, northern India. Mothers who had given birth in the 2 years preceding the surveys were interviewed during the baseline (n = 14 952) and endline (n = 13 826) surveys. The primary outcome measure was reduction of neonatal mortality.

Findings In the intervention district, the frequency of home visits by community-based workers increased during both antenatal (from 16% to 56%) and postnatal (from 3% to 39%) periods, as did frequency of maternal and newborn care practices. In the comparison district, no improvement in home visits was observed and the only notable behaviour change was that women had saved money for emergency medical treatment. Neonatal mortality rates remained unchanged in both districts when only an antenatal visit was received. However, neonates who received a postnatal home visit within 28 days of birth had 34% lower neonatal mortality (35.7 deaths per 1000 live births, 95% confidence interval, CI: 29.2–42.1) than those who received no postnatal visit (53.8 deaths per 1000 live births, 95% CI: 48.9–58.8), after adjusting for sociodemographic variables. Three-quarters of the mortality reduction was seen in those who were visited within the first 3 days after birth. The effect on mortality remained statistically significant when excluding babies who died on the day of birth.

Conclusion The limited programme coverage did not enable an effect on neonatal mortality to be observed at the population level. A reduction in neonatal mortality rates in those receiving postnatal home visits shows potential for the programme to have an effect on neonatal deaths.

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Une traduction en français de ce résumé figure à la fin de l'article. *Al final del artículo se facilita una traducción al español.* الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

The neonatal period is recognized as a brief, critical time that requires focused interventions to reach the Millennium Development Goal of a two-thirds reduction in child mortality by 2015. In India there are one million neonatal deaths every year, representing approximately a quarter of all global neonatal deaths.[1,2] Neonatal deaths account for about 38% of the annual 10.6 million child deaths recorded worldwide and nearly half of the deaths in children under 5 years in India.[1,3]

In developing countries, the primary causes of neonatal deaths are infections (36%), complications of preterm birth (28%) and birth asphyxia (23%), with low birth weight as the primary contributory cause.[1] High coverage of a few simple and cost-effective interventions would reduce neonatal mortality.[4–7] Interventions at the family and community level can save lives, especially where health systems are weak.[4,8] Several community-based efficacy trials have evaluated service delivery strategies to improve newborn survival.[7,9–16] Those trials were conducted under controlled conditions to ensure high programme coverage and usually employed workers who delivered only the intervention being studied. However, population-level data on the impact of family and community-based neonatal care from large-scale programmes is scarce. A need exists to implement proven interventions at scale, across the continuum of care, without losing impact.

Here, we evaluate the effect of a community-based package of maternal and newborn interventions that was implemented at scale using existing government infrastructure through an integrated nutrition and health programme in eight states of India. This evaluation was conducted in two rural districts of the state of Uttar Pradesh, India.

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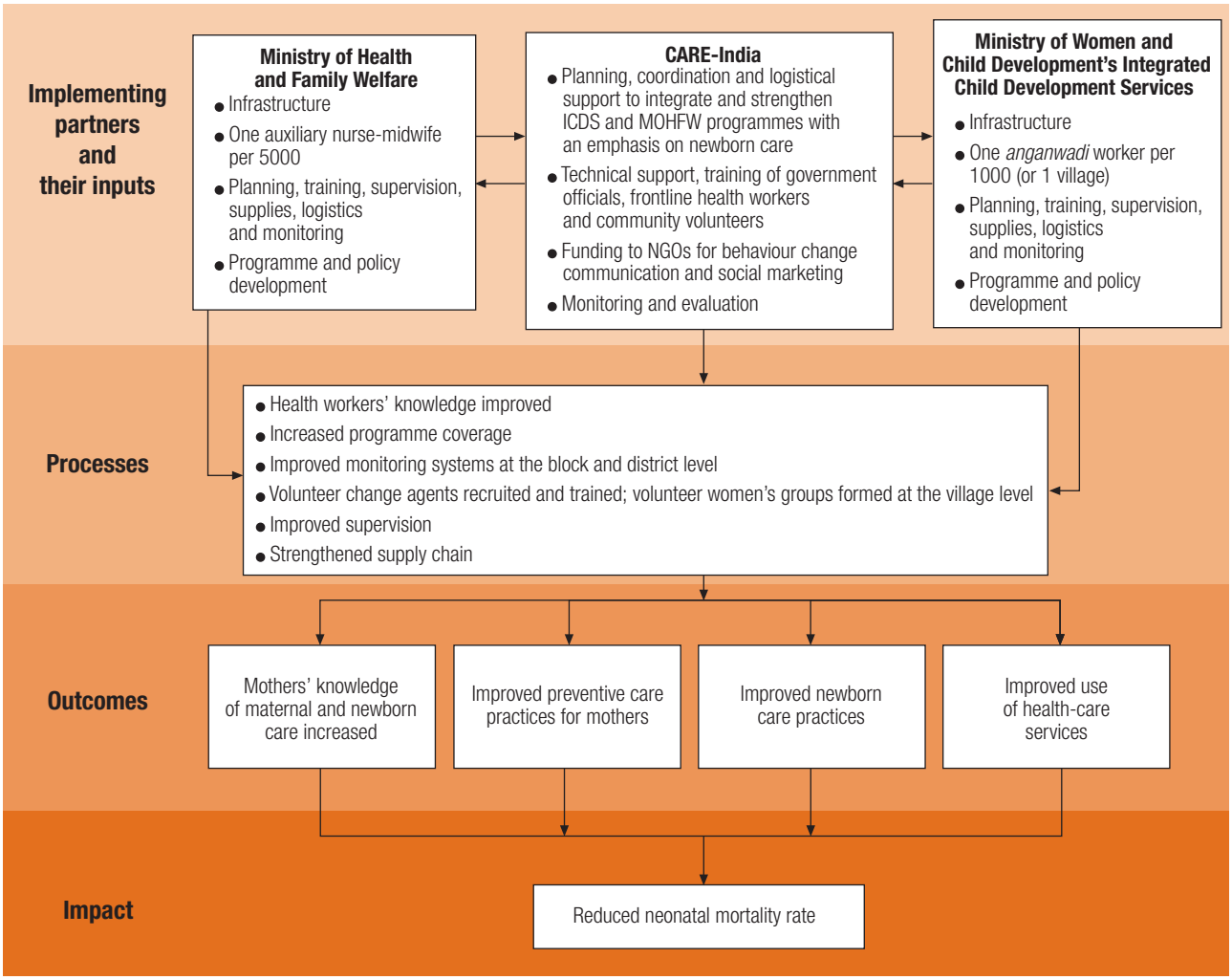
Fig. 1. **Conceptual model for promotion of newborn care within the INHP**



anganwadi, government child-care and mother-care centre; ICDS, Integrated and Development Services; INHP, Integrated Nutrition and Health Programme; MOHFW, Ministry of Health and Family Welfare; NGO, nongovernmental organization.

Methods

Programme description

The Integrated Nutrition and Health Programme (INHP) was a partnership of an international nongovernmental organization (NGO), CARE-India, with the Indian government and local NGOs. The programme was implemented through the infrastructure of the government's Ministry of Women and Child Development's Integrated Child Development Services and the Ministry of Health and Family Welfare (Fig. 1). The newborn care package aimed to increase the frequency of behaviours during the antenatal, delivery and postnatal periods that have proven benefits for maternal and newborn survival (Table 1). The INHP also included interventions to improve immunization rates and the nutritional status of child-bearing women and children under the age of 5 years; these interventions were evaluated separately.

In both the INHP and standard government health services, health education and services are provided by two groups of government functionaries: auxiliary nurse-midwives, and maternal and child health promotion (*anganwadi)* workers. Auxiliary nurse-midwives work in health centres that serve a rural population of about 5000 people. They make home visits to promote home care and care-seeking, attend deliveries, provide immunization and encourage use of family planning methods. *Anganwadi* workers serve one village (a population of approximately 1000) and operate a facility called an *anganwadi* centre. They promote maternal, newborn and child health from fixed sites and through home visits, distribute supplementary food to poor families, and provide preschool education.[17–19] The INHP encouraged *anganwadi* workers to recruit community volunteers called "change agents" to further improve the reach of programmes. The *anganwadi* workers, auxiliary nurse-midwives, and change agents in the intervention district received a total of 6 days of training on the care of mothers and newborn babies; as a group, we refer to them as community-based workers. In the INHP, information to encourage behaviour change was usually communicated during antenatal and postnatal home visits by the community-based workers (Table 1).

Study location, population and design

Although the programme was implemented in eight states, we collected

Table 1. **Intervention components of the neonatal care package**

Period	Strategies related to newborn health	Behaviours promoted to mothers/families
Prenatal	Home visitation by auxiliary nurse-midwife, *aganwadi* worker and change agent to provide counselling on preventive care, nutrition, preparedness for child birth, and health-care utilization for complications. Food supplements provided to poor families at *anganwadi* centre.	• Early registration of pregnancy with *aganwadi* worker and auxiliary nurse-midwife • At least three antenatal check-ups • Two doses of tetanus toxoid immunization per pregnancy • Daily iron-folic acid supplements for 3 months • Reduction of pregnant women's workload (rest at least 2 hours/day) • Consumption of an additional meal or snack per day and micronutrient rich foods • Birth preparedness: identification of trained provider and a clean delivery site, savings for emergency, arrangement for transport if needed • Obtaining disposable delivery kit or prepare delivery kit • Identify and seek care for danger signs in mothers and neonates
Delivery	Encourage families to call auxiliary nurse-midwife or trained traditional birth attendant to attend delivery.	• Practice five cleans: clean surface for delivery, clean hands, new blade, clean cord tie, clean cloth to wrap neonate • Breastfeed within 1 hour of delivery • Thermal care: dry and wrap neonate immediately after birth, delay first bath for 3 days • Seek trained care promptly in case of danger signs for mother or baby
0–27 days postnatal	Visit by community-based worker as soon as possible after birth to provide counselling on breastfeeding, essential newborn care (thermal care, hygiene, clean cord care), maternal and newborn danger signs and health-care utilization; follow-up visits for sick, premature or low-birth-weight neonates.	• Essential newborn care: early and exclusive breastfeeding, cord care and thermal care • Apply no substance to the cord stump • Detect danger signs and seek care from trained health providers.

anganwadi, government child-care and mother-care centre.

data from Uttar Pradesh state only. A quasi-experimental design was used and the study design, data collection and analysis were conducted by a team of independent researchers who were not involved in the implementation of the intervention. Two of the authors of this paper (UK and DP) were involved in programme implementation.

One INHP district, Barabanki, served as the intervention district, while a district receiving standard government health and Integrated Child Development Services, Unnao, was used as a comparison district. From the 15 rural blocks in each district, we used a computer programme to randomly select nine blocks in the intervention district and eight blocks in the comparison district (the difference in the number of blocks selected was due to differences in population size of the blocks in Barabanki and Unnao). One sector, an area with 15–25 *anganwadi* centres and an estimated population of 20 000 to 25 000 people, was randomly selected from each of the selected blocks. The sample size was calculated to detect a 20% reduction in neonatal mortality following the intervention with 80% power at a 5% significance level.

A baseline household survey was conducted between January and June 2003 to establish rates of programme coverage, maternal knowledge and practices, and neonatal mortality. The newborn component of INHP began in July 2003. Household surveys were repeated at the end of the project, between January and March 2006. All households in the selected sectors were included in both surveys; respondents were women who had had a live birth or stillbirth within the reference period: calendar years 2001–2002 for baseline and 2004–2005 for endline. Only live births were included in this analysis. Data collection included information on household and maternal characteristics, exposure to the intervention, maternal and newborn care practices, and pregnancy history.

Data collection was contracted out to an independent survey research agency (TNS India), which recruited data collectors with at least a 10th grade education who were fluent in the local language and dialect. The data collectors received 7 days of didactic training and 3 days of field practice and were deployed only if they qualified in a post-training test. In addition to the agency's data quality assurance, investigators set up an independent data quality assurance system that included re-interviewing 5% of households, weekly comparisons of original and re-interview data to identify disagreements, and additional field visits and training to data collectors to resolve discrepancies.

Statistical analysis

Descriptive statistics were calculated with use of standard methods. A household standard-of-living index was constructed as an additive scale of household assets using the same methodology as in India's National Family Health Survey (NFHS).[20] Scores were created by assigning points for household type, sanitation facilities, electricity and water supply, ownership of land and livestock, and household goods. Labels of low, medium and high were assigned based on NFHS categories. χ^2 analysis was used to test for homogeneity of household socioeconomic and demographic factors and maternal characteristics between the intervention and comparison districts at baseline and endline.

All indicators of exposure to the intervention and behaviour change were based on survey respondents' self-report. Programme coverage was

considered as the proportion of women who reported being visited at home by either an auxiliary nurse-midwife, *anganwadi* worker or change agent during pregnancy (antenatal coverage) and during the first 28 days after delivery (postnatal coverage). Qualified doctors, nurses, lady health visitors and auxiliary nurse-midwives were considered skilled providers for antenatal, delivery and newborn care. Women were deemed to have had a skilled birth attendant if they reported giving birth at a government, NGO or private health facility or if a skilled provider attended their home delivery. Intervention exposure and behaviour change indicators were analysed using a difference-in-difference test to compare the change from baseline to endline for intervention versus comparison districts.[21] Linear probability regression models were used with interaction terms for time (baseline versus endline) and intervention district to test the null hypothesis that the difference-in-difference equals zero, controlling for maternal age, education, parity, religion and standard-of-living score. Logistic models were not used due to the problem of using them with interaction terms.[22]

Neonatal deaths were those that occurred within 28 days of a live birth. Neonatal mortality rates – i.e. number of neonatal deaths per 1000 live births – were calculated separately for intervention and comparison districts and 95% confidence intervals (CIs) were calculated with binomial estimation method for a variance of proportion.

Neonatal mortality rates were also calculated after stratification by antenatal and postnatal home visitation status, combining data from both districts. The rates were then adjusted using direct standardization[23] to account for differences in maternal age, education, parity, religion and standard-of-living score. Using coefficients from adjusted logistic regression, we estimated the marginal changes in neonatal mortality for various levels of coverage of antenatal and postnatal home visits. The effect of antenatal visits was assessed by varying the antenatal coverage levels from 0% to 100% assuming no postnatal visits had occurred. Coverage of postnatal visitation within 28 days was varied between 0% and 100% keeping antenatal coverage at the same level. For example, if postnatal coverage was estimated at 50%, we estimated that antenatal coverage was also 50%. We used Stata, version 8 (StataCorp. LP, College Station, TX, United States of America) for statistical analysis.[24]

Results

Baseline sociodemographic characteristics of study participants are shown in Table 2. Increases in coverage were measured in the intervention district for the proportion of women who received only an antenatal home visit (from 14% to 22%) and the proportion who received an antenatal and a postnatal visit within 28 days (from 2% to 34%), while these indicators showed little change in the comparison district ($P < 0.001$; Table 3). At endline, coverage of antenatal visits was 56% for the intervention district and 21% for the comparison district, while coverage of postnatal visits within 28 days was 39% for the intervention district and 6% for the comparison district. Those who received a home visit were slightly more likely to be Hindu, or to have a middle or high standard of living; these differences were adjusted for in subsequent analyses.

The behaviours that were promoted through the programme showed greater increases in frequency in the intervention district than in the comparison district, after controlling for maternal and household characteristics, although the size of the changes varied (Table 3). For example, the proportion of households that practiced clean cord care more than doubled in the intervention district (from 32% at baseline to 68% at endline), while coverage of skilled birth attendance increased from 16% to 22%.

Adjusted baseline neonatal mortality rates did not differ between the intervention (46.4 deaths per 1000 live births, 95% CI: 42.0–50.8) and comparison districts (45.8 deaths per 1000 live births, 95% CI: 40.6–51.0) and showed no evidence of change from baseline to endline (Table 4). At endline, neonates of women in both districts who received a visit from a community-based worker during the antenatal period only, did not have a lower neonatal mortality rate (54.0 deaths per 1000 live births, 95% CI: 45.9–62.1) than those of women who received no visit (53.8 deaths per 1000 live births, 95% CI: 48.9–58.8; Table 4). However, in the group of women who received a postnatal visit within 28 days, the neonatal mortality rate of 35.7 deaths per 1000 live births (95% CI: 29.2–42.1) was significantly lower than that in the group who received either no visit (53.8, 95% CI: 48.9–58.8) or only an antenatal visit (54.0, 95% CI: 45.9–62.1). Women who received a postnatal visit within 3 days of delivery had a 25% lower neonatal mortality rate than did those who received no visit, which was also statistically significant (Table 4). Since neonates who died in the first few hours of life might have a lower probability of receiving a postnatal visit, we repeated the analysis excluding deaths that occurred on the day of birth. In this subset, the reduction due to postnatal visits was still statistically significant at 28%, compared to those who received no antenatal or postnatal visit (data not shown).

The predicted model indicated that increasing coverage of antenatal and postnatal visits during the first 28 days from 10% to 50%, would reduce the neonatal mortality rate by 19%; increasing coverage from 10% to 90% would yield a 34% reduction (Fig. 2; available at: http://www.who.int/bulletin/volumes/10/07-042226/en/index.html).

Discussion

We have shown that an INHP with a newborn component increased coverage of antenatal and postnatal health-promotion visits, and improved some neonatal-care practices. However, most of the gain in coverage was in the antenatal period, and fewer than one in four neonates received a home visit within the crucial first 3 days of life, when half of all neonatal deaths occurred.[25] Moreover, only three of the selected behaviours – receiving two tetanus toxoid immunizations, saving money for childbirth and maintaining clean cord care – were adopted by most women in the intervention district.

Although the programme failed to reduce neonatal mortality, those women who received a postnatal visit were significantly less likely to have their neonate die, and our simulation analysis suggested that 90% programme coverage with an antenatal visit and a postnatal home visit within the first 28 days could reduce the neonatal mortality rate by 34% from baseline.

Table 2. **Selected maternal and household characteristics of recently delivered women by study district: baseline (2001–2002) and endline (2004–2005) surveys**

Characteristic[a]	Number of recently delivered women (%)			
	Baseline survey		Endline survey	
	Comparison district (*n* = 6 196)	Intervention district (*n* = 8 756)	Comparison district (*n* = 6 014)	Intervention district (*n* = 7 812)
Maternal characteristics				
Age at most recent birth				
< 20 years	1267 (20.4)	2012 (23.0)	941 (15.7)	1366 (17.5)
20–34 years	4498 (72.6)	6000 (68.5)	4613 (76.8)	5663 (72.6)
35–49 years	431 (7.0)	742 (8.5)	453 (7.5)	775 (9.9)
Education level				
Illiterate	3914 (63.2)	6707 (76.6)	3532 (58.7)	5845 (74.8)
Literate, but middle school not completed	988 (15.9)	1161 (13.3)	915 (15.2)	991 (12.7)
Middle school completed	766 (12.4)	559 (6.4)	907 (15.1)	608 (7.8)
High school completed and above	528 (8.5)	329 (3.7)	660 (11.0)	368 (4.7)
Parity				
1	1269 (20.5)	1648 (18.8)	1313 (21.9)	1546 (19.8)
2–3	2313 (37.3)	3080 (35.2)	2401 (39.9)	2850 (36.5)
4–5	1504 (24.3)	2241 (25.6)	1396 (23.2)	2011 (25.7)
≥ 6	1110 (17.9)	1787 (20.4)	904 (15.0)	1405 (18.0)
Household characteristics				
Religion				
Hindu	5834 (94.2)	7128 (81.4)	5666 (94.2)	6265 (80.2)
Muslim/other	362 (5.8)	1628 (18.6)	348 (5.8)	1547 (19.8)
Caste				
Scheduled castes/tribes	2179 (43.8)	2874 (40.6)	2566 (42.7)	3166 (40.6)
Other backward class[b]	2163 (43.5)	3371 (47.6)	2583 (43.0)	3723 (47.7)
Others	634 (12.7)	834 (11.8)	858 (14.3)	1775 (11.7)
Standard-of-living index score				
Low	3293 (53.2)	4072 (46.5)	2921 (48.6)	3122 (40.0)
Medium	1977 (31.9)	3526 (40.3)	1926 (32.0)	3153 (40.3)
High	926 (14.9)	1158 (13.2)	1167 (19.4)	1537 (19.7)

[a] χ^2 analyses for difference in distribution between intervention and comparison at baseline and endline were all significant at $P < 0.05$.
[b] As notified by central government of India who are entitled for positive discrimination and 27% of government jobs are reserved for them.

Most of the reduction in mortality was in the group who were visited within the first 3 days of birth. To check for survivor bias, we re-analysed the data excluding babies who died on the first day of life and noted that the effect on mortality remained statistically significant. The effect of postnatal visits on rates of neonatal deaths was most likely due to promotion of essential newborn care practices including early and exclusive breastfeeding, thermal care and clean cord care as well as through identification and referral of neonates with signs of illness. Because the number of women who received a postnatal visit but no antenatal visit was so small, our ability to draw conclusions about the effect of a postnatal visit without a preceding antenatal visit was hampered; however, in practice antenatal visits would be necessary to establish contact with pregnant women to plan for postnatal visits.

To our knowledge, this is the first study to assess the impact on mortality of a large-scale community-based neonatal health programme implemented with use of multipurpose government health workers. Few large-scale programmes are rigorously evaluated with mortality as the outcome. Furthermore, our study was conducted by a team that was independent of programme implementation. This study shows the value of large-scale programme evaluations and our findings reinforce the need to not only validate existing methods but also develop new methods to assess the quality, coverage, and impact of programmes.

This study has limitations. Although CARE-India implemented the INHP at scale in 70 districts of eight states of India, this evaluation was conducted only in Uttar Pradesh. A quasi-experimental design was selected because a cluster-randomized trial was not feasible. Assessment of behaviours was based on respondents' report, which might have led to some recall error. However, an independent data quality-assurance system was established to improve data quality, and the rate of recall error should not have differed between the intervention and comparison groups.

Table 3. **Programme exposure and behaviour change in recently delivered women by study district: baseline (2001–2002) and endline (2004–2005)**

Indicator	Number of recently delivered women (%)				
	Baseline survey		Endline survey		Adjusted *P*-value[a]
	Comparison district (*n* = 6 196)	Intervention district (*n* = 8 756)	Comparison district (*n* = 6 014)	Intervention district (*n* = 7 812)	
Exposure to intervention					
Home visits					< 0.001[b]
No visit	4623 (74.6)	7249 (82.8)	4673 (77.7)	2995 (38.3)	
Only antenatal visit	1241 (20.0)	1212 (13.9)	1010 (16.8)	1747 (22.4)	
Only postnatal visit within 28 days	123 (2.0)	116 (1.3)	91 (1.5)	450 (5.8)	
Antenatal visit and postnatal visit:					
within 28 days	209 (3.4)	179 (2.0)	240 (4.0)	2620 (33.5)	
within 3 days	99 (1.6)	79 (0.9)	119 (2.0)	1585 (20.3)	< 0.001
within 7 days	129 (2.1)	111 (1.2)	149 (2.5)	2025 (25.9)	< 0.001
Behaviour change					
Antenatal care					
Proportion of mothers who:					
Received ≥ 1 antenatal check-up[c]	1517 (24.5)	1451 (16.6)	1653 (27.5)	2771 (35.5)	< 0.001
Received ≥ 3 antenatal check-ups[c]	426 (6.9)	316 (3.6)	538 (9.0)	952 (12.2)	< 0.001
Received ≥ 2 tetanus immunizations	3590 (57.9)	4189 (47.8)	3764 (62.6)	5495 (70.3)	< 0.001
Consumed ≥ 100 iron-folic acid tablets	412 (6.7)	436 (5.0)	497 (8.3)	1663 (21.3)	< 0.001
Saved money for childbirth	758 (12.2)	1294 (14.8)	1795 (29.9)	3936 (50.4)	< 0.001
Took any other birth planning step[d]	1232 (19.9)	933 (10.7)	1082 (18.0)	2707 (34.6)	< 0.001
Delivery and newborn care					
Proportion of mothers who:					
Delivered in a health facility or at home with a skilled birth attendant[c]	1085 (17.5)	1423 (16.3)	1314 (21.8)	1756 (22.5)	< 0.009
Practiced clean cord care[e]	1992 (36.0)	2471 (32.1)	2117 (41.5)	4488 (68.4)	< 0.001
Practiced newborn thermal care at least for first 6 hours[f]	47 (0.8)	341 (3.9)	38 (0.6)	1900 (24.3)	< 0.001
Initiated breastfeeding in first hour	148 (2.4)	268 (3.1)	347 (5.8)	2948 (37.7)	< 0.001
Newborn check-up:[c]					
within 3 days	263 (4.2)	101 (1.2)	483 (8.0)	1297 (16.6)	< 0.001
within 7 days	383 (6.2)	152 (1.7)	552 (9.2)	1529 (19.6)	< 0.001
within 28 days	571 (9.2)	209 (2.4)	712 (11.8)	1887 (24.2)	< 0.001

[a] *P*-value for difference-in-difference test adjusted for age, education, parity, religion and standard-of-living score.
[b] For change in coverage of all home visits (i.e. postnatal and antenatal) from baseline to endline (comparison group versus intervention group).
[c] From a medically qualified doctor, nurse, lady health visitor or auxiliary nurse-midwife; newborn check-up includes care sought for sick babies and well baby care.
[d] At least one of the following: suitable location for delivery, person to deliver baby, hospital/clinic to be attended in case of complication, arrangement for transport and disposable delivery kit.
[e] Umbilical cord cut with boiled blade and tied with sterile thread.
[f] Neonate dried and wrapped immediately after delivery and first bath delayed for at least 6 hours.

Most deaths in children younger than 5 years – including neonatal deaths – could be prevented if simple, proven interventions were implemented at scale.[4,6] Our simulation analysis finding was consistent with modelled results from the *Lancet* Neonatal Survival Series, which suggested that a package of family-community care at 90% coverage could reduce neonatal mortality by 18–37%.[4] Seminal work on child health and nutrition in rural India also showed an inverse relationship between the intensity of services received from auxiliary health workers and mortality rates.[26] The multi-country evaluation of Integrated Management of Childhood Illness (IMCI) also found varying degrees of effectiveness,[27–31] largely due to variations in the health system contexts and how well the programme had been implemented.[32] While the training of health workers improved quality of care,[28,31,33] coverage of community activities remained low and researchers noted little effect on care-seeking or health services coverage.[8,29–31] In previous evaluations of programmes from the Integrated Child Development Services, nutritional supplementation to children and mothers was increased, but only to 53% and 26%, respectively, after almost 10 years of implementation.[17] By comparison, coverage of childhood immunization reached more than 60% after 5 years.[34]

We suspect that the lack of a population-level effect on mortality was related to the degree of scale-up

of the intervention. The intervention was scaled up to an extent in that the community-based workers were present throughout the study area, and 43% of auxiliary nurse-midwives, 91% of *anganwadi* workers and 98% of the change agents received the training in neonatal care. However, scale-up was limited in the sense that coverage was not as good as it could have been.

Through interviews with programme managers and community-based workers, we identified that the workers' competency in the new neonatal component of the programme, their workload and inadequate management and supervision were possible barriers to higher coverage. CARE-India conducted an evaluation and noted that change agents' reach was lower than expected. Further, they identified that *anganwadi* workers and auxiliary nurse-midwives needed simple systems to prioritize their competing job priorities, more frequent and effective field supervision and more intensive trainings with better field-based assessment of skills.[35]

Reaching newborn babies at the community level is crucial in settings where the availability and utilization of facility-based care is low. While the training of multipurpose health and nutrition workers in essential newborn care is necessary, systems must also be put in place to ensure that these workers visit neonates at home during the first hours and days after birth and that they can provide a link to competent health services. ■

Table 4. **Neonatal mortality rate by study district and by postnatal visit status: baseline (2001–2002) and endline (2004–2005) surveys**

Study district and postnatal visit status	Live births	Deaths	Unadjusted mortality rate per 1000 live births (95% CI)	Adjusted mortality rate per 1000 live births[a] (95% CI)
Intervention district				
Baseline survey	8 756	431	49.2 (44.8–54.0)	46.4 (42.0–50.8)
Endline survey	7 812	393	50.3 (45.6–55.4)	52.1 (47.2–57.0)
Comparison district				
Baseline survey	6 196	296	47.8 (42.6–53.4)	45.8 (40.6–51.0)
Endline survey	6 014	299	49.7 (44.4–55.5)	48.6 (42.9–54.2)
Both districts				
Baseline survey				
No visit	11 872	588	49.5 (45.7–53.6)	47.9 (44.1–51.6)
Antenatal visit only	2 453	123	50.1 (41.8–59.5)	44.8 (36.8–52.9)
Postnatal visit:				
any[b]	627	16	25.5 (14.7–41.1)	16.0 (7.5–24.5)
within 3 days	276	5	18.1 (5.9–41.8)	8.9 (1.2–16.7)
within 7 days	372	8	21.5 (9.3–41.9)	14.6 (4.4–24.8)
Subtotal	14 952	727	48.6 (45.2–52.2)	47.1 (46.9–54.2)
Endline survey				
No visit	7 668	426	55.6 (50.5–60.9)	53.8 (48.9–58.8)
Antenatal visit only	2 757	154	55.9 (47.6–65.1)	54.0 (45.9–62.1)
Postnatal visit:				
any[b]	3 401	112	32.9 (27.2–39.5)	35.7 (29.2–42.1)
within 3 days	1995	78	39.1 (31.0–48.6)	40.2 (31.8–48.6)
within 7 days	2 547	92	36.1 (29.2–44.1)	39.4 (32.0–46.8)
Subtotal	13 826	692	50.1 (46.5–53.8)	50.6 (46.9–54.2)

[a] Adjusted for age, education, parity, religion and standard-of-living scores using direct standardization.
[b] Includes women who received antenatal visits and those who did not; of those receiving a postnatal visit, 62% ($N = 388$) at baseline and 84% ($N = 2860$) at endline also received an antenatal visit.

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Résumé

Impact d'un programme intégré de nutrition et de santé sur la mortalité néonatale dans des districts ruraux du Nord de l'Inde

Objectif Evaluer l'impact de la composante sanitaire d'un programme communautaire intégré à grande échelle de nutrition et de santé.

Méthodes En faisant appel à une méthode quasi-expérimentale, nous avons évalué un programme partenaire d'une organisation non gouvernementale et mis en place par le gouvernement indien dans les infrastructures existantes de deux districts ruraux de l'Uttar Pradesh, au Nord de l'Inde. Les mères ayant donné naissance à un enfant dans les 2 ans précédant les enquêtes ont été interrogées dans l'enquête de référence (n = 14 952) et dans l'enquête finale (n = 13 826). La principale mesure de résultat était la baisse de la mortalité néonatale.

Résultats Dans le district d'intervention, la fréquence des visites à domicile par des agents de santé communautaires a augmenté à

la fois pendant la période anténatale (de 16 à 56 %) et postnatale (de 3 à 39 %), tout comme la fréquence des soins apportés à la mère et au nouveau-né. Dans le district de comparaison, aucune progression des visites à domicile n'a été observée et le seul changement comportemental notable a été la mise de côté par les femmes d'argent destiné aux traitements médicaux d'urgence. Les taux de mortalité néonatale restaient inchangés dans les deux districts tant que les nouveau-nés n'avaient reçu qu'une visite anténatale. Toutefois, les nouveau-nés ayant reçu une visite postnatale à domicile dans les 28 jours suivant la naissance présentaient un taux de mortalité néonatale inférieur de 34 % (35,7 décès pour 1000 naissances vivantes, intervalle de confiance à 95 % : 29,2-42,1) à celui des nouveaux-nés n'ayant pas reçu de visite postnatale (53,8 décès pour 1000 naissances vivantes, IC à 95 % : 48,9-58,8), après ajustement en fonction des variables sociodémographiques. Les trois-quarts de la réduction de mortalité ont été relevés chez les nouveau-nés visités dans les 3 jours suivant la naissance. Cet effet sur la mortalité restait statistiquement significatif lorsqu'on excluait les décès de nourrissons intervenus le jour de la naissance.

Conclusion La couverture limitée du programme ne permettait pas d'observer un effet sur la mortalité néonatale à l'échelle d'une population. La réduction constatée du taux de mortalité des nouveau-nés ayant reçu des visites domiciliaires postnatales prouve la capacité du programme à influer sur la mortalité néonatale.

Resumen

Impacto de un programa integrado de nutrición y salud en la mortalidad neonatal en una zona rural del norte de la India

Objetivo Evaluar los efectos del componente de salud neonatal de un programa comunitario en gran escala que integraba medidas de nutrición y de salud.

Métodos Utilizando un diseño cuasiexperimental, evaluamos los resultados de un programa promovido por una organización no gubernamental y aplicado por el Gobierno de la India en el marco de la infraestructura existente en dos distritos rurales de Uttar Pradesh, en el norte del país. Se entrevistó a madres que habían dado a luz en los dos años que precedieron a las encuestas (n = 14 952 en la encuesta basal, y n = 13 826 en la encuesta final). La variable de evaluación principal fue la reducción de la mortalidad neonatal.

Resultados En el distrito de intervención, las visitas domiciliarias por agentes comunitarios aumentaron tanto durante el periodo prenatal (del 16% al 56%) como durante el periodo posnatal (del 3% al 39%), al igual que la frecuencia de prácticas de atención de la madre y el recién nacido. En el distrito de comparación no se observó mejora alguna de las visitas domiciliarias, y el único cambio de comportamiento destacable fue que las mujeres habían ahorrado dinero para un posible tratamiento médico de urgencia. Las tasas de mortalidad neonatal se mantuvieron inalteradas en ambos distritos en los casos en que sólo se recibió una visita de atención prenatal. Sin embargo, entre los recién nacidos que recibieron una visita domiciliaria de atención posnatal en sus primeros 28 días de vida se observó una disminución del 34% de la mortalidad neonatal (35,7 defunciones por 1000 nacidos vivos, intervalo de confianza (IC) del 95%: 29,2–42,1) en comparación con los que no recibieron ninguna visita posnatal (53,8 defunciones por 1000 nacidos vivos, IC95%: 48,9–58,8), tras ajustar en función de las variables sociodemográficas. Las tres cuartas partes de esa reducción de la mortalidad se explican por los niños que recibieron la visita durante los tres primeros días posteriores al nacimiento. El efecto en la mortalidad seguía siendo estadísticamente significativo tras excluir del análisis a los niños fallecidos el mismo día en que nacieron.

Conclusión La limitada cobertura del programa impide determinar cualquier efecto en la mortalidad neonatal a nivel poblacional. La reducción de las tasas de mortalidad neonatal entre quienes recibieron visitas domiciliarias posnatales demuestra el potencial del programa para influir en las defunciones neonatales.

ملخص

تأثّر التغذية المتكاملة والبرنامج الصحي على وفيات الولدان في المناطق الريفية الواقعة شمال الهند

الغرض: تقييم تأثّر مكون صحة الولدان في برنامج مجتمعي واسع النطاق للتغذية المتكاملة والصحة.

الطريقة: تم استخدام تصميم تجربة غير كاملة في تقييم برنامج نفذته الحكومة الهندية بمساعدة المنظمات اللاحكومية، في منطقتين ريفيتين في أوتار برادش، شمال الهند، وذلك بالاعتماد على البنية الأساسية الحالية. وأجريت لقاءات مع الأمهات اللاتي وضعن حملهن في العامين السابقين لإجراء المسوحات، أثناء المسوحات في بداية الأنشطة (العدد = 14952) والمسوحات في نهاية الأنشطة (العدد = 13826). وكان قياس النتيجة الأولية هو تخفيض وفيات الولدان.

النتائج: شهدت منطقة المداخلات زيادة الزيارات المنزلية من قِبَل العاملين المجتمعيين في كل من الفترة السابقة للولادة (من 16% إلى 56%) وفي الفترة التالية للولادة (من 3% إلى 39%)، وكذلك معدل تكرار ممارسات رعاية الأمهات والولدان. أما المنطقة الأخرى محل المقارنة، فلم نلحظ أي تحسّن في الزيارات المنزلية، وأن التغير السلوكي الوحيد الملحوظ هو ادخار السيدات للأموال تحسباً للمعالجة الطبية الطارئة. وظلت معدّلات وفيات الولدان في المنطقتين دون تغير، بيد أن الولدان الذين تلقوا زيارات منزلية تالية للولادة خلال 28 يوماً من الميلاد، شهدوا انخفاضاً في معدل وفيات الولدان بنحو 34% (35.7 وفاة لكل 1000 وليد حي، بفاصل ثقة 95%، إذ تراوح معدّل الأرجحية بين 29.2 و42.1)، بالمقارنة مع من لم يتلقوا زيارات تالية للولادة (53.8 وفاة لكل 1000 وليد حي، بفاصل ثقة 95%، إذ تراوح معدّل الأرجحية بين 48.9 و58.8)، بما يتوافق مع المتغيرات الاجتماعية والديموغرافية. وقد وقعت ثلاثة أرباع الانخفاض في الوفيات بين الأطفال الذين تمت زيارتهم في الأيام الثلاثة الأولى من الميلاد. وقد ظل الأثر على الوفيات يعتد به إحصائياً عند استبعاد الأطفال الذين ماتوا في يوم الولادة.

الاستنتاج: إن التغطية المحدودة للبرنامج لم تمكن من ملاحظة الأثر على وفيات الولدان على مستوى السكان. إن انخفاض معدلات وفيات الولدان بين من يتلقّون زيارات منزلية تالية للولادة، يظهر إمكانية تأثّر البرنامج على وفيات الولدان.

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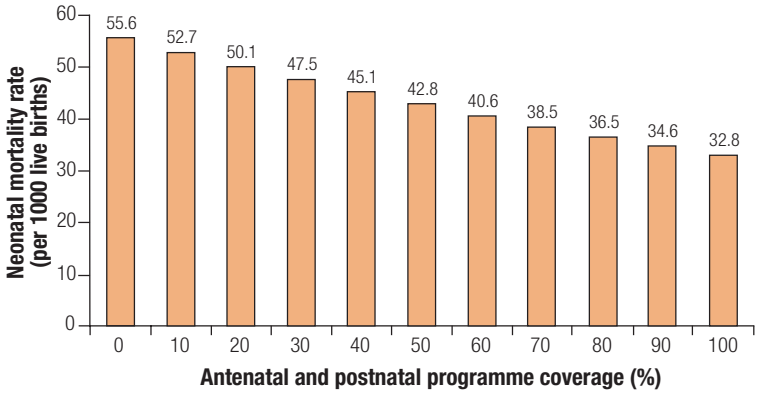
Fig. 2. **Predicted neonatal mortality rates varying antenatal and postnatal programme coverage equally**[a]



[a] Using coefficients from adjusted logistic regression, the marginal changes in neonatal mortality were estimated for various levels of coverage of antenatal and postnatal home visits; the effect of antenatal visits was assessed by varying the antenatal coverage levels from 0% to 100% assuming no postnatal visitation. Coverage of postnatal visitation within 28 days was varied between 0% and 100% keeping antenatal coverage at the same level. For example, if postnatal coverage was estimated at 50%, antenatal was also estimated at 50%.