Evaluation Research to Improve Newborn Health and Survival in the Integrated Nutrition and Health Program (INHP) II Area of CARE/India

Endline Report 2006

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LIST OF ACRONYMS

ANC	Antenatal check-up
ANM	Auxiliary nurse midwife
AWC	Anganwadi center
AWW	Anganwadi worker
CA	Change Agent (Community health volunteer)
CBR	Crude birth rate
CEB	Children ever born
ICDS	Integrated Child Development Service
IFA	Iron-folic acid (supplements)
IMR	Infant mortality rate
INHP	Integrated Nutrition and Health Project
GOI	Government of India
JHSPH	Johns Hopkins School of Public Health
KGMU	King George Medical University
LBW	Low birth weight
NFHS	National Family Health Survey of India
NMR	Neonatal mortality rate
RDW	Recently delivered women
SLI	Standard of living index
TBA	Traditional birth attendant
TFR	Total fertility rate
TT	Tetanus toxoid (immunization)

EXECUTIVE SUMMARY

Background: This report presents findings for the program evaluation of CARE-India's newborn health intervention, one of the six technical interventions of the Integrated Nutrition and Health Project II project. Despite declines in global under-five and infant mortality rates during recent decades, newborn mortality has remained relatively high. An estimated 1.2 million neonates die each year in India alone, amounting to more than one-fourth of all global newborn deaths. Two-thirds of infant deaths in India occur in the first month of life, and three-fourths of newborn deaths occur in the first week of life. As a result, neonatal health is increasingly viewed as a critical component of efforts to improve child survival, in India and globally.

CARE-India has been working with the government of India for decades to improve maternal and child health. Through USAID's support, CARE-India began collaborating with the government of India to implement the Integrated Child Development Services (ICDS) program in 1984. In 1996, CARE-India, the government of India and USAID began the INHP I, which transformed ICDS from provision of supplementary food into a maternal and child survival initiative. INHP Phase I spanned from 1996 until 2001, at which point an evaluation concluded that the project was successful in facilitating joint problem solving, convergence of services at the community level, and community spirit and ownership to address health problems. Building on the successes of the INHP I, CARE-India began implementing the INHP II in 2001. The objective of INHP II was to achieve sustainable improvement in the nutrition and health status of vulnerable families in the project area by 2006. The project area included 7 million women and children in approximately 70 districts across 8 states in India. Specifically, the program planned to :

- Improve the quality and coverage of maternal and child health services by community-based health service providers, especially auxiliary nurse midwives (ANM) and anganwadi workers (AWW).
- Strengthen key systems, including training, supply chain management and information management.
- Sustain community activities for improved maternal and child survival.

The INHP included 6 technical interventions: (1) Targeted supplemental feeding of pregnant and lactating women and children under 6 years of age; (2) Maternal and child immunization; (3) Antenatal care, including enhanced focus on nutrition, tetanus toxoid immunization, iron-folate supplementation, and birth planning; (4) Infant feeding; (5) Vitamin A supplementation for children under the age of 3 years; and (6) Newborn care at the community level.

Promoting newborn health in the context of Integrated Nutrition and Health Project II: The newborn care intervention was a new component of INHP. The newborn care package included technical interventions for both maternal and newborn care, including essential newborn care and strategies intended to improve care-seeking for newborn illnesses.

The maternal care interventions included: promotion of early registration of pregnancy, antenatal care (ANC) visits and at least 3 visits; iron-folic acid supplementation; tetanus toxoid vaccination; maternal nutrition and rest; mebendazole during the second trimester of pregnancy; chloroquine prophylaxis during the second and third trimesters of pregnancy; birth planning for a clean and safe delivery. This includes identification of a trained birth attendant [i.e., auxillary nurse midwife (ANM) or a trained traditional birth attendant (TBA)] and a clean place for

delivery; savings for emergency transportation; identification of emergency obstetric care facility; and identification of someone to accompany the mother, baby or both during an emergency; preparation for clean delivery (clean hands, clean surface, minimize vaginal examinations), including preparation (or purchase) and use of a clean delivery kit; recognition of danger signs during pregnancy, childbirth and the postpartum period and appropriate care-seeking.The newborn care interventions were: immediate and exclusive breastfeeding; prevention of hypothermia through immediate drying, wrapping and delayed bathing; aseptic cord care; identification of small newborns and provision of extra attention, such as checking for hypothermia, providing skin-to-skin contact with the mother and giving extra feeding; identification of newborn danger signs, particularly inability to feed.

Newborn Evluation Research Study Design: The purpose of this program evaluation was to demonstrate the level of impact that a basic maternal and newborn intervention package could achieve, in terms of use of improved maternal and newborn care practices and reduction of neonatal mortality. Although the project was implemented at scale in 8 states, its impact on neonatal mortality was evaluated under controlled conditions in one program district of Uttar Pradesh state. A quasi-experimental design was employed; one INHP II district, Barabanki, served as the intervention district, while a district receiving standard government health and ICDS services, Unnao, acted as the comparison. Nine rural blocks in the intervention district and eight rural blocks in the comparison district were randomly selected for the program evaluation. A baseline survey was conducted in 2003, before the launch of INHP II, and an endline survey was conducted in 2006. In addition, three smaller scale "adequacy" surveys were conducted to assess various process indicators related to coverage and adherence with the intervention..

Service Providers' Training, Knowledge and Facilities: Capacity building was one of the critical components of the program. The project aimed to train all auxillary nurse midwives (ANMs) and anganwari workers (AWWs). As one component of the intervention 80% of AWWs and 43% of ANMs received training on pregnancy care, delivery care, and newborn care. In addition, a new category of volunteers from each village, called change agents, were recruited and trained. Changes in workers' knowledge, from baseline to endline, were assessed in both the intervention and comparison districts. Both saw improvements in ANMs' knowledge, but gains in the intervention area were more substantial. ANMs in the intervention area demonstrated improvements in all topic areas except knowledge of maternal post-partum danger signs, while in the comparison area ANMs demonstrated improvements in knowledge only of the five cleans of delivery and newborn danger signs. Reflecting the same trend, 38% of the AWWs in the intervention district received a knowledge score of 50% or higher at endline, compared with 28% at baseline. No change was observed in AWWs' knowledge in the comparison district. The knowledge scores of CAs also increased from baseline to endline, suggesting that this group was able to master some key messages relayed during training. However, these findings also suggest that some persistent lapses remained in service providers' knowledge. For example, only 27% of ANMs in the intervention area were able to list five or more delivery complications requiring immediate referral. Although topic-specific knowledge of CAs for newborn infection prevention and thermal care practices increased to11% and 13%, respectively, at endline, they were still low.

Antenatal Care Indicators: In this report, an antenatal home visit refers to a health education session, while antenatal check-ups refer to sessions, usually conducted in a health facility, where pregnant women's health was assessed by a doctor, nurse, ANM, or other qualified provider. The proportion of women visited during pregnancy at home increased in the intervention from 16% to 55%. The AWWs showed the greatest improvement in coverage with antenatal home visits, from 5% of women at baseline to 48% at endline survey in the intervention area. The auxiliary nurse midwives also showed improvement, from 12% at baseline to 36% at endline. There was no increase in antenatal home visits in the comparison area. Moreover, the percentage of women that received at least one antenatal check-up increased in the intervention area from 18% at baseline to 37% at endline, while no practical change was seen in the comparison area (26% to 30%). However, only 13% of women in the intervention area received the three ANC visits recommended by the World Health Organization. Therefore, indicators moved in a positive direction but remained low by international standards. The program resulted in greatly improved coverage, but did not approach universal coverage.

Behavior change communication (BCC) usually occurred in the context of home visits, or during Nutrition Health Days, designated days on which ANMs' visits to a village coincided with ICDS food distribution. BCC promoted the use of antenatal care, tetanus toxoid immunization and iron-folate supplementation during pregnancy, birth planning, clean delivery and essential newborn care. The quality of antenatal counseling was assessed by asking women both unprompted and prompted questions regarding the information that was conveyed to them during pregnancy and also by assessing mother's knowledge of danger signs. In general, most women in both the comparison and intervention areas received information about the importance of TT immunization and IFA supplementation at baseline, and small, equal increases in awareness were seen in both the intervention and comparison areas. About 15-30% of women in the intervention area indicated that the ANMs and AWWs had provided information about birth planning, the five cleans and essential newborn care practices, including immediate and exclusive breastfeeding, immediate drying and wrapping and delayed bathing, whereas few women (about 1-5%) in the comparison area had been given these messages during pregnancy. In contrast, messages about recognition of pregnancy or delivery complications or newborn danger signs were rarely recalled by mothers in the intervention or comparison areas. Furthermore, when maternal knowledge was assessed by asking women to list danger signs during pregnancy, childbirth, postpartum and the neonatal period newborns, knowledge scores of mothers in both arms increased only slightly. Therefore, it seems that both program coverage and quality improved during the antenatal period, but awareness of danger signs may have increased only marginally.

Indicators related to the compliance with antenatal counseling varied. At baseline, about half of all women in the intervention area (47%) and just over half in the comparison area (58%) had received TTimmunization during their most recent pregnancy. This proportion increased to 69% in the intervention area while remaining nearly the same in the comparison area at 62%. Receiving adequate supplementation of IFA (100 tablets) increased in both comparison and intervention areas, while consuming adequate supplementation increased only in the intervention arm, from 5% to 21%. While this indicator shows significant gain from baseline, only about one in five women took sufficient IFA. In addition, small gains have been observed in the proportion of women that complied with specific birth planning steps in both areas.

Delivery Care and Essential Newborn Care: Most women in this setting give birth at home assisted by family members or others who have no formal midwifery training. Increasing institutional deliveries or birth attendance by doctors, nurses and ANMs was not a primary goal of this program, but patterns in birth attendance are presented because they are related to birth outcomes. Data suggest a modest trend toward more institutional births, from 11% to 15% in the comparison area and 12% to 17% in the intervention area. The cesarean section rate remained low at 2-3% in both communities, suggesting poor access to emergency obstetric care. Moreover, the proportion of women with self-reported delivery complications that received skilled birth attendance at home or in a facility remained unchanged.

Behavior change communications in the intervention area focused on promoting essential newborn care practices, preventive care practices that have been shown to reduce risk of infection and hypothermia. Four key newborn care practices promoted through the intervention included: (a) cutting the umbilical cord with a blade that is new or boiled and tying it with boiled thread; (b) delaying the newborn's first bath until for 3 or more days after delivery; (c) drying and wrapping the newborn immediately after delivery; (d) initiation of breastfeeding immediately (i.e., within 1 hour) after delivery. Almost of all these practices showed significant increase in the intervention area from baseline to endline. For example, the proportion of home deliveries in the intervention area for which the combined practice of sterile cord cutting and tying was used increased to 68% from 32% at baseline. The proportion of newborns bathed more than 6 hours after birth increased from 24% at baseline to 60% at endline, and the proportion bathed 3 or more days after birth also increased from 4% to 43%. The proportion of newborns that were dried and wrapped before the placenta was delivered more than doubled in the intervention area from 18% at baseline to 45% at endline. At baseline, most women in both study districts delayed the start of breastfeeding for several days after birth. Initiation of breastfeeding within 1 hour of delivery increased in the intervention area from 6% at baseline to 34% at endline. Initiation of breastfeeding during the first day of life rose from 20% to 64% in the intervention area. The comparison area saw no change in these essential newborn care indicators. Similarly, colostrum feeding increased from 20% to 88% in the intervention area, while little change (14% to 20%) was seen in the comparison area. These findings suggest that the program was successful in sharing information about essential newborn care with the communities.

The program also emphasized postpartum home visitation to promote healthy newborn care practices and care-seeking for illnesses. Postpartum home visits by ANMs or AWWs were rare at baseline (< 2%) and remained that way in the comparison area at endline. In the intervention area, the greatest success in postpartum home visitation within 1 week of birth was achieved by the AWWs, which reached 23% at endline, followed by the change agents (17%) and the ANMs (9%). Rates of postpartum home visitations within 3 days were lower, 16% for AWWs, 13% for change agents and 6% for ANMs. These gains in coverage were notable and statistically significant, yet may have still represented lower than optimum coverage to impact mortality. Furthermore, in the intervention area only 1 in 3 sick newborns received care from a trained provider, and 27% received no care from outside the home. Reaching newborns during the first few days after birth clearly presents a logistical problem, and it remained challenging despite inroads made by the program.

Equity of Program Coverage: The INHP II program was intended to cover all geographic sectors in the intervention district and to improve equity of coverage, regardless of socio-cultural factors. The program particularly sought to reach out to women from lower caste and lower socioeconomic groups, who might have been excluded by government programs in the past. Though some geographic variations were present, program coverage was relatively equal across sectors and improved within each sector over the course of the intervention. Most indicators showed relatively equal coverage among the low, medium, and high standard of living (SLI) households, and disparities that were present at baseline diminished at the endline. However, care-seeking outside of the program services continued to show striking disparities by wealth; for example, antenatal care coverage (low: 31%, high: 58%) and use of skilled attendance (low: 16%, high: 42%) showed large differences by socioeconomic conditions, suggesting differential access to care. Similar patterns emerged when lower caste groups were compared with other groups with regard to care-seeking behavior. Anganwadi worker and change agent coverage for antenatal and postpartum visits showed slightly better coverage for lower caste households at the endline survey. One highly positive findings of this study is that improvements in coverage and practices were inclusive of all socioeconomic groups. However, it remains clear that barriers to care-seeking, though outside the scope of this project, remain significant.

Trends in Neonatal Mortality: Neonatal mortality rates were constant in both the comparison and intervention areas from baseline to endline. The neonatal mortality rate in the comparison area was 47.3 per 1,000 live births at baseline and 49.8 per 1,000 live births at endline. The neonatal mortality rate in the intervention area was 50.5 per 1,000 live births at baseline and 47.8 per 1,000 live births at endline. No differences were seen in early neonatal, late neonatal or stillbirth rates.

Conclusions and Recommendations: In summary, this program evaluation has identified a number of program strengths. The inputs that were provided were achieved at scale within a limited time frame. The increases in coverage were achieved mostly by improved management and training, without increasing the number of paid community-based workers. Greater gains in program coverage were seen in the antenatal period. However, improvements in essential newborn care practices were dramatic and suggest that the methods used to disseminate health information were effective. One of the critical lessons learned from this project is that it is possible to improve coverage of essential newborn care practices at scale through community-based programs. Moreover, the improvements were made irrespective of socioeconomic status or caste distinction, which is an important achievement for a community-based program.

These findings also suggest some program limitations. The quality of home visits remains an issue of concern; specifically, very few mothers recalled receiving information about postpartum complications or newborn dangers signs. Having this information is one necessary prerequisite to obtaining health care for complications. Skilled attendance at birth and use of trained providers for complication remained low and differentials among the rich and poor remain striking. Skilled birth attendance and access to emergency obstetric care are critical to reducing maternal and newborn mortality. Increasing program coverage during the postpartum period proved challenging. Less than one-fourth of all newborns were checked by a trained provider. The proportion of newborns that received trained care increased from 20% to 30% in the intervention area.

Some program strategies were clearly effective, and some areas for improvement are suggested by the findings of this study. Ultimately, the improvements in process indicators were not reflected in a reduction in neonatal mortality in the intervention area. It is difficult to isolate specific factors that were responsible for the lack of impact. However, a few areas of concern emerged from these. The first is that extra care for small or low birth weight newborns – such as steps to prevent hypothermia and infection - may have been insufficient to impact deaths. Another problem clearly related to the timely identification of and treament for neonatal complications. Approximately one-fourth of deaths occurred on the first day of life, and three-quarters of deaths took place during the first week. Findings suggest that significant barriers to accessing health care remain, particularly for poor and lower caste women. Developing effective strategies for community-based management of pneumonia and sepsis will be important to achieving reductions in neonatal mortality. Maintaining the knowledge and counseling abilities of community-based workers is one critical issue. In addition, it will be useful to develop strategies to help women and families retain the information conveyed in behavior change communication. Barriers to care, particularly skilled birth attendance and emergency obstetric care, mostly likely hindered the program's impact on neonatal mortality. Overcoming these barriers should be a goal for future programs.

Although proven interventions to reduce newborn deaths are known, much work needs to be done to determine how to deliver these interventions at scale without losing program effectiveness. This study was the first to examine the large-scale effectiveness of a neonatal health package implemented through existing governmental and nongovernmental organization services. Therefore, this study provides a significant contribution to researchers' understanding of how to reduce newborn deaths in low-resource settings.

CHAPTER 1. OVERVIEW OF NEWBORN MORTALITY

Magnitude of the newborn health problem at the global level

Despite declines in global under-five and infant mortality rates during recent decades, newborn mortality has remained relatively high (1, 2). Approximately two-thirds of infant deaths and 38% of under-five deaths now occur in the first month of life (2). An estimated 4 million newborns die globally each year, and approximately 98% of these deaths occur in developing countries (2). Another 3 million babies are stillborn during the last trimester of pregnancy (6). Perinatal mortality, which includes stillbirths of more than 28 weeks gestational age and newborn deaths during the first week of life, now nearly equals mortality during the entire first year of life (4, 7). The risk of dying per month is approximately 15 times higher in the first month of life than in each of the remaining 11 months of infancy. The risk of dying during the first month of life is also approximately 30 times greater than at any month during young childhood (months 12- 59) (8, 9). In South Asia, the loss of healthy life from newborn deaths represents 13.6% of the disease burden, or 53 million years of life lost (3). In order to achieve further gains in child survival, a new focus on improving newborn health is needed, particularly with regard to outcomes in the perinatal period (10-12).

The three major causes of newborn death are infections (36%), birth asphyxia and other birth injuries (23%), and complications of prematurity (28%) (2, 4). Many of these deaths can be prevented through implementation of simple, cost-effective interventions that do not require highly technical equipment or highly trained personnel (13). The health of the mother during pregnancy, delivery and the postpartum period is intimately linked with the health of her newborn, which creates a need for integrated maternal and newborn health care strategies (14).

Globally, two-thirds of births and most newborn deaths occur in the home, outside the formal health care system (13). Thus, in order to advance newborn health and survival, interventions must be introduced at the household and community levels, and they must include links with the health care system for treatment of life-threatening conditions.

Newborn health in India and Uttar Pradesh state

Infant and under-five mortality rates in India had declined over the past 2 to 3 decades until the mid-1990s, when rates stagnated. The newborn mortality rate, however, has declined little over recent decades, and remains 43 per 1,000 live births (5). Improvements in perinatal and newborn health are now seen as crucial to advancing child survival in India (15). Each year, an estimated 1.2 million neonates die in India alone, amounting to one-fourth of all global newborn deaths (2-4). Two-thirds of infant deaths in India occur in the first month of life, and three-fourths of newborn deaths occur in the first week of life (5). Moreover, India has the highest number of newborn deaths due to tetanus and the largest number of low birth weight (LBW) babies of any country in the world (4). An estimated 60 to 80% of perinatal and newborn mortality occurs among LBW infants (5, 10, 16). Two-thirds of all births and three-fourths of births in rural areas of India take place at home. Untrained providers attend nearly 60% of all births (17).

Maternal and child health indicators of Uttar Pradesh state are poor when compared with India as a whole. The India National Family Health Survey of 1998-99 found that Uttar Pradesh state had

the second-highest neonatal mortality rate in the country, at 53.6 per 1,000 live births and the second-highest infant mortality rate, 86.7 per 1,000 live births (5). Only 16% of births took places in health facilities and 22% of all births were attended by a health professional. Given that Uttar Pradesh is also the most populous state in India, addressing neonatal mortality in this state is critical to achieving national goals related to neonatal mortality reduction.

Models for community-based interventions to reduce neonatal mortality

The work of the nongovernmental organization, SEARCH has served as a demonstration for the potential to advance newborn health and survival through community-based health care. In Gadchiroli District of Maharashtra state, SEARCH trained female Village Health Workers (VHWs) to provide a package of home-based newborn care, including health education for pregnant women; recognition and management of birth asphyxia; identification of high-risk (premature and LBW) neonates for more intensive surveillance; temperature maintenance; promotion of breastfeeding; treatment of skin infections; identification of sick newborns suspected of having septicemia, meningitis and/or pneumonia using a simple algorithm; and administration of antibiotics (oral cotrimoxazole and intramuscular gentamicin) in the home (10, 18). This community-based intervention reduced sepsis-related newborn mortality by 76%, asphyxia-related mortality by 48%, and overall newborn mortality by 62% in intervention villages, compared to comparison areas. The estimated cost was $5.30 per neonate. This cost estimate, however, is likely to be an under-estimate of the program's full cost.

In an earlier uncontrolled study in India, VHWs identified and managed high-risk neonates in the home, including preterm and LBW infants and those with feeding problems, illness or a history of prolonged and difficult labor. Interventions included: resuscitation of asphyxiated newborns, including cleaning of the mouth and the pharynx and mouth-to-mouth respiration; aseptic cord care; promotion of breastfeeding; minimal handling during delivery to reduce the risk of infection; postpartum home visitation and provision of guidance about routine newborn care; and referral of sick newborns and those with feeding problems to the hospital. Home care of preterm and LBW infants also included keeping the room warm and feeding with a dropper if necessary. Newborn mortality declined by 25% during the intervention year, compared to the year before the implementation of the program (19). Thus, a less intensive package of interventions than those used by SEARCH may save a significant proportion of newborn lives.

CHAPTER 2. THE INTEGRATED NUTRITION AND HEALTH PROGRAM OF CARE-INDIA

Longstanding collaboration with the government of India

CARE has been collaborating with the Government of India (GOI) for more than 50 years in development assistance and relief projects. Support from USAID's Title II Program has served as the foundation of these efforts, which began with food-for-work and school feeding projects and evolved into support for the government of India's nutrition and health programs. In 1984, CARE-India, with USAID's support, began collaborating with the Integrated Child Development Services (ICDS) program of the Department of Women and Child Development of the government of India in eight states to implement a nutrition and health program. In 1996, CARE-India, the GOI and USAID began the Integrated Nutrition and Health Project (INHP), which transformed the Title II program support to the ICDS from provision of supplementary food into a maternal and child survival initiative.

INHP was envisaged as a 10-year project to be implemented in two phases of 5 years each. The purpose of INHP was to work with governmental and non-governmental counterparts to improve the health and nutrition of women and children. Implementation strategies were designed to enable women to attain and maintain optimal health and nutrition for themselves and their children, and to enhance the capacity of communities and counterparts to achieve this goal. Working within the broader mandate and scope of the ICDS program and the Ministry of Health and Family Welfare, CARE-India focused on activities which they felt have the greatest potential to improve the health and nutritional status of pregnant and lactating women, adolescent girls, and children under the age of 2. INHP is significant in size and scope; it reached over 7 million women and children in 100,000 villages during its first phase. By innovating and then promoting replication of strategies that were found successful at small scale, INHP expanded its influence to an even larger population through the ICDS, which currently reaches almost 5 million women and 23 million children.

INHP Phase I spanned from 1996 until 2001, at which point the INHP I evaluation team concluded that the project was successful in facilitating: joint problem solving, convergence of services at the community level, and community spirit and ownership to address health problems. The intervention emphasized the promotion of innovation and experimentation, increasing demand and coverage of prioritized interventions and continuously improving commodity management. The evaluation team also highlighted areas requiring improvement, which include uneven and lower than expected performance in certain outcome indicators. Factors related to low performance in some places were: too many interventions were undertaken, large geographic areas were covered with limited resources, sharing and promotion of best practices was inadequate, staff skills and technical support were uneven, and monitoring and information systems needed improvement.

Building on the successes of the INHP I and solutions to past problems, CARE-India began implementing the INHP II in 2001. The objective of INHP II was to achieve sustainable improvement in the nutrition and health status of vulnerable families in the project area by 2006. The project area included 7 million women and children in approximately 70 districts across 8

states in India. To achieve this objective, CARE and its partners were working toward the following sub-objectives:
Improve the quality and coverage of maternal and child health services by service providers, especially auxiliary nurse midwives (ANM) and anganwadi workers (AWW).
Strengthen key systems, including training, supply chain management and information management.
Sustain community activities for improved maternal and child survival.

INHP II sought to expand the maternal and child survival components to improve their potential for impact. In INHP II, CARE-India continued its role as an innovator and a catalyst with increasing efforts to promote replication of best practices.

INHP II interventions

INHP II focuses on the following 6 technical interventions:
(1) Targeted supplemental feeding of pregnant and lactating women and children under age 6;
(2) Maternal and child immunization;
(3) Antenatal care, including enhanced focus on nutrition, tetanus toxoid immunization, iron-folate supplementation, and birth planning;
(4) Infant feeding;
(5) Vitamin A supplementation for children under the age of 3; and
(6) Newborn care at the community level.

The newborn care intervention was a new component of INHP. It was a focused package of newborn care practices to be implemented at the community level to improve the health and survival of newborns. It included strategies intended to improve care-seeking for newborn illnesses.

Key outcome indicators for INHP II are coverage rates for supplementary feeding, antenatal care, immunization, infant feeding, vitamin A supplementation, newborn care and neonatal mortality.

Elements of CARE-India's newborn health care program

The elements of CARE-India's newborn package were selected through wide consultation with CARE-India's INHP team members, BASICS II, MEDS Project, CARE/USA, Johns Hopkins University, and a range of other stakeholders, including the government of India's Ministry of Health and Family Welfare (MOH), Indian academicians, NGO leaders and bilateral organizations through an expert consultative meeting in the fall of 2001. The Newborn Health Care Program aimed to increase the practice of specific behaviors during the antenatal, delivery, and postnatal periods that have proven association with better rates of maternal and newborn survival. Enhanced community capacity to sustain gains in maternal and newborn health was also a major goal.

The newborn care package included technical interventions for both maternal and newborn care. The maternal care interventions were as follows:
(1) Promotion of early registration of pregnancy, antenatal care (ANC) visits and at least 3 visits;

(2) Iron-folic acid supplementation;
(3) Tetanus toxoid vaccination;
(4) Maternal nutrition and rest;
(5) Mebendazole during the second trimester of pregnancy;
(6) Chloroquine prophylaxis during the second and third trimesters of pregnancy;
(7) Birth planning for a clean and safe delivery. This included identification of a "trained" birth attendant [i.e., trained traditional birth attendant (TBA) or ANM]; a clean place for delivery; savings for emergency transportation; identification of emergency obstetric care facility; and identification of someone to accompany the mother, baby or both during an emergency;
(8) Preparation for clean delivery (clean hands, clean surface, minimize vaginal examinations), including preparation (or purchase) and use of a clean delivery kit;
(9) Recognition of danger signs during pregnancy, childbirth and the postpartum period and appropriate care-seeking.

The newborn care interventions were as follows:
(1) Immediate and exclusive breastfeeding;
(2) Prevention of hypothermia through immediate drying, wrapping and delayed bathing;
(3) Aseptic cord care;
(4) Identification of small newborns and provision of extra attention, such as checking for hypothermia, providing skin-to-skin contact with the mother and giving more frequent breastfeeding;
(5) Identification of newborn danger signs, particularly inability to feed.

The attached Appendix 1 on INHP II Nutrition and Health Behaviors Matrix provides more detailed information on key contacts, the target groups and the behaviors and services that were promoted.

Objectives of the evaluation research

The purpose of this program evaluation is to demonstrate the level of impact that the basic INHP II package can achieve, in terms of use of improved maternal and newborn care practices and reduction of neonatal mortality in a programmatic setting. INHP II included neonatal mortality as one of its impact indicators, but due to several evaluation-related constraints, it was not possible for INHP to evaluate this indicator for all of its project sites. Therefore, while the project was being implemented at scale in 8 states, its impact on neonatal mortality was evaluated using a quasi-experimental design in 2 districts of Uttar Pradesh state only.

This report presents findings for the program evaluation of CARE-India's newborn health intervention, one of the six technical interventions of the INHP II project. Findings are based on a household survey that was conducted in 2003, three adequacy surveys that were administered during the program implementation and the endline survey that was conducted in January – March 2006. The objectives of this analysis are to:
Compare the intervention district (Barabanki) and the comparison district (Unnao) with regard to health indicators and socio-demographic characteristics.
Describe the baseline coverage of key process indicators (coverage, knowledge, practices), and track changes in indicators over the course of the intervention.
Describe changes in neonatal mortality from baseline to endline.

Figure 1. Uttar Pradesh, India

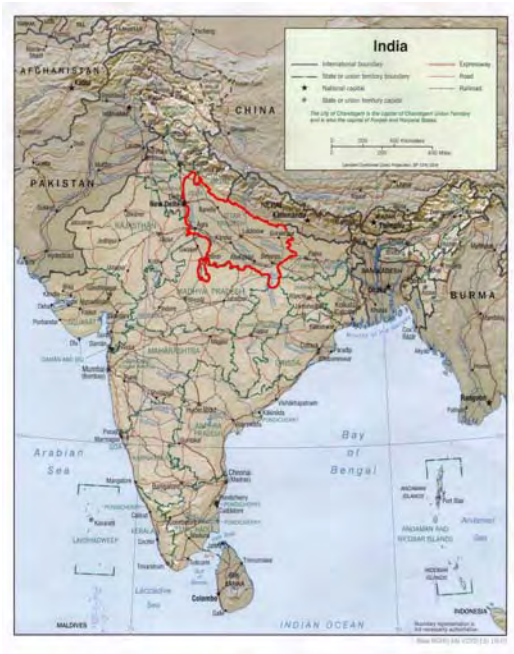


Figure 2. Barabanki (Intervention) and Unnao (Comparison) Districts

Before selecting the study districts, available data from several districts were compiled and reviewed. Based on data available from the Reproductive and Child Health (RCH) rapid survey and the comparability of both districts, the CARE/INHP district of Barabanki was selected as the intervention district and the district of Unnao as the comparison. The following table provides data on the two districts from India's 2001 census.

Table 1. Census data, Barabanki and Unnao

District	Total population	Males	Females	Intercensal growth 1981-1991	Intercensal growth 1991-2001
Barabanki	2,673,394	1,417,213	1,256,181	26.59%	26.40%
Unnao	2,700,426	1,422,965	1,277,461	20.73%	22.72%

The comparison district of Unnao continued to receive nutrition and health services provided by ICDS and Ministry of Health of government of India including antenatal care, tetanus toxoid immunization, and iron-folate supplementation. However, there were no inputs from CARE-India in the district of Unnao. Therefore, Unnao did not have any of the CARE innovations including no change agents (volunteer community health workers) to educate women about birth preparedness and newborn care. Behavior change communications related to birth planning and newborn care were provided in the intervention district (Barabanki) only. Home visitation by ANMs and change agents was promoted in the intervention area, particularly during the first week of life, to identify and refer newborns with health problems.

Formative research to identify routine newborn care practices and possible improvements in these practices was conducted by CARE-India as part of the design of INHP II. The formative research revealed that in INHP areas:
Low literacy rates restricted awareness among women about health issues, including basic maternal and child health and the availability of services. (For example, tetanus toxoid immunization coverage was less than 50%).
Decision-making rested largely with men and women had little influence about seeking maternal and newborn care outside the family.
Newborn neglect was under-recognized, and under-reporting of births and deaths was common.
A variety of potentially harmful traditional care practices persisted with regard to pregnancy, childbirth and the newborn period.

Collaborating partners

Johns Hopkins Bloomberg School of Public Health (JHSPH) in partnership with King George Medical University, Lucknow conducted the evaluation of the CARE-India newborn program. JHSPH's and KGMU's role was limited to assisting CARE with the design and evaluation of the Newborn Health Care Program.

CHAPTER 3. METHODOLOGY AND DATA COLLECTION

Rationale for the study design

The objective of this study was to evaluate the impact of a package of community-based maternal and newborn care services on maternal and newborn care practices and neonatal mortality. The CARE program intended to reduce neonatal mortality by at least 20% in a rural district of India over a 2-year period. Existing community groups, health workers and change agents (volunteer health workers) were trained to provide counseling to pregnant women and their families through home visits so that they would seek necessary preventive and curative care from government and NGO facilities. In order to allow for two full years of program implementation, the study continued for 2 ½ years; the additional 6 months allowed for refinement and maturation of the intervention. In order to assess the effectiveness of the package of services, a quasi-experimental design with intervention and comparison areas was employed. In addition to baseline and Endline surveys, we assessed the adequacy of the intervention's implementation every 6 months. These "adequacy surveys" were conducted so that the intervention strategies could be adjusted as appropriate. Three such adequacy surveys were conducted over the 2-year study, beginning 6 months after the launch of the intervention.

Study design

The district of Barabanki in Uttar Pradesh state, where CARE has been implementing the INHP, was selected as the intervention district. The nearby district of Unnao, which has the Government of India's ICDS program, was selected as the comparison district. The evaluation components included surveys of households and health care providers to establish baseline levels for process and outcome indicators, including neonatal mortality, during the 2 years preceding the survey. To assess the impact of the intervention, the household survey was repeated after 30 months of program implementation.

As the implementation of the interventions continued, the adequacy of the implementation of the interventions was assessed every 6 months by measuring selected process indicators in both intervention and comparison communities. The adequacy surveys were conducted in each study cluster three times during the 30 months of intervention: between 7-8 months, 13-14 months and 19-20 months. Adequacy indicators assessed changes at the community-based provider level and at the community/household level, by collecting data from samples of women that gave birth during the 6 months preceding the survey and from community-based health workers.

Sampling design

Sample Size for Baseline and Endline Surveys

The program aimed to decrease neonatal mortality in the intervention area by at least 20%. Sample size was calculated to detect expected differences in neonatal mortality rates between the intervention and comparison areas with 80% power and at the 95% confidence level. To account for clustering, the estimated sample size was multiplied by an assumed design effect of 1.2. This required a population that would provide information on at least 8,332 live births in each study arm, or a total of 16,664 live births. Since the study took place over 2 years, the number of births needed in the cohort per year is half the total number. The estimated birth rate in the area was 35

live births per 1,000 people. Each household had an average of 5 members, so a population of 1,000 would include about 200 households. Taking these factors into consideration, the number of households required to record 16,664 births was equal to:
(16,664x200x0.5)/35= 47,611

Therefore, approximately 24,000 households were needed in each of the 2 districts to record the outcomes of 16,664 live births over 2 years. Assuming a non-response rate of 10%, a minimum of 26,400 households were needed in each area.

Sample Size for Adequacy Surveys

Adequacy surveys measured coverage of the intervention, and selected process indicators of knowledge and practices. The sample size for the adequacy surveys was estimated on the basis of the following assumptions and considerations. To obtain the most conservative (largest) sample size, estimates were based on an assumption of 50% prevalence of a given care practice among households with a women who had given birth in the 6 months prior to the survey (i.e., recently delivered women, RDW). To measure each indicator at sector level with ± 10% precision, it was necessary to interview at least 100 RDW per sector.[1] This would result in at least 900 mothers from the intervention arm and 800 mothers from the comparison arm, 1700 women altogether. To detect an arm-level difference of 10%, we would need at least 538 mothers from each arm of the study. Therefore, this sample of 1700 mothers would allow us to detect a + 10% difference between study arms with 90% power. Assuming a 15% non-response rate, 115 RDW from each sector were sampled to participate in the study. The sample was randomly selected from each anganwadi center catchment area. The number of women selected from each anganwadi center was proportional to the number of births in the area.

For the service providers' survey, attempts were made to interview all ANMs, AWWs and change agents in the study areas of both districts.

Sample Selection

Rural blocks from the intervention and comparison districts were selected for the evaluation research. The district of Barabanki has 16 blocks, 15 of which are rural. At baseline, the Indian Council of Medical Research was conducting a pilot project in 2 of the 15 blocks, so they were excluded from this study. Nine of the remaining 13 blocks were randomly selected as intervention sites. One sector, an area with 15-25 anganwadi centers (AWC) and an estimated population of 20,000-25,000, was randomly selected from each of the 9 selected blocks. Similarly, in Unnao where there are 16 blocks, 15 of which are rural, 8 blocks were randomly selected as comparison sites and one sector was randomly selected from each block.

Study instruments

The following questionnaires were developed, pre-tested and administered in the field at baseline.

1. House mapping and listing forms: This instrument was used to list all households, record the location of each household and assign the household a unique identification number.

[1] Given that the average population of a sector is about 20,000 and the annual birth rate is about 25 per 1,000, the number of expected births per sector over 6 months period would be about 250. Therefore, it was feasible to sample 100 women from each sector.

Data collected included the structure number, household number, name of the head of the household, and number of women aged 13-49 who had been married.

2. Household questionnaire: This instrument was used to list the usual members of all surveyed households and to collect limited socio-demographic information, including age, sex, marital status, relationship to the head of the household, level of education and occupation from each household member. Each person's duration of stay in the village was recorded. The type of construction material used in the house's roof, wall and floor were also recorded.
3. Pregnancy history form: This form collected information from all eligible women, women between the ages of 13 and 49 years who were usual residents of the household and reported that they were married or had been married. Factors that are likely to influence demographic and reproductive health behavior - such as age, current marital status, education and age at first marriage - were collected. In addition, information about all pregnancies and pregnancy outcomes (live birth, still birth and spontaneous or induced abortion) was collected, including the date of each outcome. The status of each live born baby was noted, and if a baby was reported dead, the age at death was recorded.
4. Recently Delivered Woman (RDW) questionnaire: All women whose pregnancy history included a live birth within the 24 months preceding the baseline survey were asked to complete this questionnaire. It included information on knowledge and practices regarding the antenatal period, delivery, the postpartum period and newborn care. It recorded levels of coverage for antenatal, delivery, postpartum and newborn services during the women's last pregnancy. Antenatal questions asked about the essential care received during pregnancy, birth planning, birth complications and their management. Delivery care questions focused on safe delivery practices, problems experienced and their management. Questions about postpartum care included the appropriate timing and frequency of care. Questions about immediate newborn care included management of the umbilical cord, baby weighing, bathing and wrapping of the newborn, use of pre-lacteal feeds, and breastfeeding. Questions about newborn care during the first month of life asked whether the newborn received a check-up and who conducted it, cord care practices, breastfeeding practices and illnesses experienced by the newborns and treatments for them.
5. Socio-economic survey questionnaire: This questionnaire collected information on the availability of basic amenities and facilities in the households that included a RDW. It recorded ownership of land and livestock, possession of durable goods and the household's main source of income.
6. Verbal autopsy questionnaire: Among RDWs who reported the death of a newborn or a stillbirth within the 24 months preceding the baseline survey, detailed information on the circumstances surrounding the death was collected so that cause of death could be inferred. The verbal autopsy instrument was adapted from a World Health Organization instrument that was developed by a team that included some of the investigators of this study, Abdullah Baqui and Gary Darmstadt. The verbal autopsy started with open-ended questions to elicit the mother's narrative about the newborn's death, followed by a series of structured questions for the mother or another family member who had firsthand experience of the incident. The verbal autopsy data was analyzed and reported separately.
7. Service provider questionnaires: There were three separate instruments, one each for ANMs, AWWs and change agents. The questionnaires were designed so that each

instrument would be appropriate to the workers' responsibilities. Information on background characteristics, knowledge, practices, roles and responsibilities of the workers was gathered.

Data Collection

All survey data collection and initial processing were contracted to a survey research agency called TNS-MODE. Baseline and adequacy survey data collection procedures have been described previously in the baseline and adequacy reports. The same instruments were used in the baseline, adequacy and endline surveys to ensure comparability. A few changes were made over the study period. We carefully reviewed the changes and accounted for any change during analysis, to ensure comparability.

House Listing

Field investigators were recruited and trained by the survey research agency. Several CARE-India and JHSPH investigators participated in the training. The investigators also participated in the assessment of the interviewers finally deployed in data collection. Training consisted of 2 days of classroom training and 2 days of field practice. Investigators formed 20 teams for mapping and listing activities, each team consisting of one lister and one mapper. Five supervisors and 2 coordinators managed the listing and mapping operations under the guidance of field executives and a regional field manager. Listing and mapping of households in one anganwadi center (AWC) catchment area was completed in approximately 2 days. Completed listing-mapping forms were delivered regularly to the JHSPH office in Lucknow. These forms were returned to the survey agency after review.

Coverage of the area was sequentially validated by two supervisors, field executives, and the JHSPH coordinator. The completed listing-mapping forms served as the sampling frame to identify eligible and recently delivered women. The listing and mapping operations were completed within two months.

Main Survey (Household questionnaires, pregnancy histories, RDW questionnaire and socio-economic survey)

The survey team consisted of interviewers, supervisors and field editors. The survey team was trained for 7 days, 5 in the classroom and 2 in the field. The researchers and field managers of the survey agency, evaluation and monitoring experts from CARE-India, and JHSPH investigators and coordinator provided the training. Field training was conducted in the areas that were not selected for the actual study, to avoid testing bias. After completing field practice, the survey team received a final briefing to ensure common understanding of the data collection instruments and related work responsibilities. Following the briefing, the interviewers' knowledge and ability was evaluated. During the baseline data collection, 80 female interviewers, 20 supervisors and 20 field editors were selected to conduct the fieldwork. Twenty teams were formed, each consisting of 4 interviewers, one supervisor and one field editor. During the endline data collection, 120 female interviewers, 30 supervisors and 30 field editors were selected to conduct the fieldwork. Thirty teams were formed, each consisting of 4 interviewers, one supervisor and one field editor like baseline.

Fieldwork began simultaneously in both districts, covering one sector at a time. After office editing, questionnaires were sent weekly to the JHSPH coordinator for review and data quality

assurance sampling. They were then returned to the survey agency for data entry and validation. Fieldwork for baseline was completed within 6 months whereas for endline it was completed within 3 months.

Service Provider Survey

Change agents, AWWS and ANMs were interviewed by field supervisors, either on the day of the main survey or a later date, depending on the service providers' availability.

Verbal Autopsy

A separate team of senior level researchers, including medical doctors, was formed to conduct verbal autopsies. The verbal autopsy team revisited households that reported a neonatal death or stillbirth with a few weeks of the RDW survey. The recall period was the same as the recall period for the main survey, i.e., 24 months. Verbal autopsy findings will be presented separately.

Table 2. Overview of the Study Design and Data Collected

Data Collection Round	Data Collection Instrument	Respondents	Recall Period	Data Collection Period	Sample Size	
					Comparison	Intervention
Baseline	Household Listing	All households in study area		Jan-Jun 2003	26,595	29,560
	Pregnancy History	All ever-married women aged 13-49	Lifetime		22,845	26,420
	Recently Delivered Women survey	Women who had a live birth or still birth	Jan. 2001-May 2003		6,490	9,220
	Service Providers	Auxiliary Nurse Midwives, Anganwadi workers, Change agents			178	283
Adequacy I	Recently Delivered Women survey	Women who had a live birth or still birth	June 2003-March 2004	Jan–April 2004	832	927
	Service Providers	Auxiliary Nurse Midwives, Anganwadi workers, Change agents			182	717
Adequacy II	Recently Delivered Women survey	Women who had a live birth or still birth	March – Sept. 2004	Sept-Oct 2004	807	936
	Service Providers	Auxiliary Nurse Midwives, Anganwadi workers, Change agents			170	819
Adequacy III	Recently Delivered Women survey	Women who had a live birth or still birth	Sept. 2004 – April 2005	March-May 2005	819	932
	Service Providers	Auxiliary Nurse Midwives, Anganwadi workers, Change agents			174	724
Endline	Household Listing	All households in study area		Jan – March 2006	29517	32319
	Pregnancy History	All ever-married women aged 13-49	Lifetime		27112	29263
	Recently Delivered Women survey	Women who had a live birth or still birth	July 2003-Feb. 2006		7525	9792
	Service Providers	Auxiliary Nurse Midwives, Anganwadi workers, Change agents			182	727

Sample coverage, Endline Survey

The total number of AWCs and the target respondents listed in the study population and covered by the surveys are presented in Table 3.

Table 3. Endline Survey Coverage*

	COMPARISON		INTERVENTION		TOTAL	
	Sector Population	Coverage (%)	Sector Population	Coverage (%)	Sector Population	Coverage (%)
Sample						
Households	29,517	28,696 (97.2%)	32,319	30,582 (94.6%)	61836	59,278 (95.9%)
Ever-married women aged 13-49	27,112	25379 (93.6 %)	29,263	26,808 (91.6)	56,375	52,187 (92.6%)
Recently delivered women	7,525	7,504 (99.7%)	9,792	9,744 (99.5%)	17,317	17,248 (99.6%)
* Based on final data including revisits						

Data quality assurance

To ensure data quality, a hierarchy of continuous supervision and scrutiny was created by the survey agency, following the ISO 9000 procedures for data quality. There were 3 tiers of supervision and scrutiny as follows.

First tier: There was a supervisor and an editor with every team of 4 interviewers. They instantly checked 33% of the questionnaires in the field. The Questionnaires in which inconsistencies were found were returned to the interviewers on the same day, whorevisited the households to rectify the inconsistencies. Finally, the data was cross-checked.

Second tier: Each district had a district coordinator to monitor and supervise the progress of fieldwork by spot-checking the data quality. District coordinators checked selected items from 5-10% of the questionnaires.

Third tier: Two senior researchers from the survey agency were involved in overseeing the progress and quality of work in both districts. All discrepancies were addressed individually, and senior researchers took corrective measures after consulting with the JHSPH coordinator. Review and feedback meetings were held regularly with the field teams involving interviewers, supervisors, researchers, field managers and the JHSPH coordinator. The overall field operations and data quality were supervised by the JHSPH coordinator and JHSPH investigators.

Independent Data Quality Assurance by JHSPH Team

Data quality was a paramount requirement of this study. A data quality assurance (DQA) procedure was set up for concurrent validation throughout the data collection period. Commonly, the data quality in large studies is likely to be affected by sampling bias, non-response patterns, inconsistencies across the instruments used, field investigators' lack of knowledge about key

variables and the consequent effect on data, and field investigators' deliberate attempts to misrepresent information.

To address these issues, a sub-sample was selected from the main study, using a stratified sampling approach so that the sub-sample included cases for various categories of respondents, each type of instrument, and each field investigator. This method was implemented to locate and interview respondents for data validation, consistent with the data collection schedule of the main survey team and their data collection protocol. These households were re-interviewed by independent teams that had no access to the previous interview data. The main survey and DQA interviewers were trained together using the same modules. Some key variables from the main and DQA data were compared every week to identify the levels and patterns of disagreements. Furthermore, the distribution of these key variables was generated from the main data set every week. Unusual response patterns in some variables and inconsistent or conflicting responses were analyzed using a pre-designed algorithm for each interviewer in the main survey team. The findings were presented periodically before the main survey team, and appropriate corrective measures were taken. This process continued throughout the survey period. Cases of gross discrepancy were identified as examples of case studies and jointly visited by the leaders of the main survey and DQA teams. Results of such cases were shared with all the interviewers.

Apart from the independent data collection, the DQA teams were also involved in spot-checking and back-checking of the TNS teams. When the TNS teams were in the field, the DQA team would observe their work and note any discrepancies and discuss them in the field on the same day, to avert future errors. The DQA would also come to the field unannounced and back-check some key variables in completed questionnaires, in order to maintain the quality of work.

Key Variables

Key variables included in the DQA process were the number of eligible women and RDW recorded in each household and that number's concordance with the number of pregnancy history and RDW forms attached to the household form. Other key variables that were checked included: family size, number of surviving children under 3 years old, age of any woman near the beginning or end of the reproductive period, deaths at critical ages to distinguish between neonatal, infant, and child mortalities, birth year of the youngest child, registration with ANM for antenatal check-up, place of delivery, person conducting delivery, person who cut the umbilical cord, duration of breastfeeding, visits by various service providers after delivery, family's main source of drinking water, main household source of light, type of fuel for cooking, and area of agricultural land owned.

Data management

For the baseline survey, completed questionnaires were sent to the data processing division at the survey agency's headquarters in Delhi. For the endline survey, the data management was conducted in Lucknow. Data management consisted of office editing, coding, data entry, cross-validation, and consistency checks. To ensure accuracy, the data were entered twice by independent operators, and then matching was done. Software for data entry, data validity and data processing was developed using Visual Fox-PRO, SPSS, C++, Fortran 77 and EXCEL.

Statistical methods

Data from completed interviews were used for computing descriptive statistics at the household level. Indicators of coverage with home visits by community-based workers, practices and care-seeking for newborn conditions and delivery practices were based on information collected from RDWs. The computation of mortality levels utilized the life table approach. A summary measure for standard of living index (SLI) was calculated by the method used in NFHS-II (5). In this method, points are assigned based on the family's house type, toilet facility, source of lighting, main cooking fuel, source of drinking water and possession of certain durable goods, such as car, tractor, bicycle, electric fan, television, sewing machine, etc. Points are added if the families have a separate room for cooking, own their home, own their agricultural land, own irrigated land or own livestock. Index scores are used to classify the family as having low, medium or high standard of living. In this report, denominators in various levels may not be the same throughout the analysis because all the questions were not applicable to all the respondents.

Service Providers' Knowledge

Chapter 4 presents the proportion of correct responses for each of angwanwadi workers and auxiliary nurse midwives. In all of the project surveys, service providers were given a brief quiz to assess their knowledge related to maternal and newborn health. Most of the questions were unprompted (see questionnaires in the appendix for details), and respondents were given one point for each possible correct answer. For example, one question asked, "What advance birth planning must a family do to cope with any emergency during delivery?" Possible correct answers included: identify a clean place for delivery, identify a trained person to conduct the delivery, identify a hospital/clinic, identify a transport and save some money for emergiencies, arrange for new blade, soap and thread, or arrange for a disposable delivery kit (DDK). Therefore, a total of seven points could be received for this question. Percentages were then calculated based on the total number of points possible. Some indicators are also presented based on knowledge of specific topics. These indicators are described in Chapter 4.

Changes in Process Indicators and mortality between Study Arms

This report presents an intent-to-treat analysis. The analysis compares the rates of outcome indicators (e.g., behavior change, receipt of services, neonatal mortality) between the intervention and comparison areas between two time periods, using a difference of differences test. These indicators measure program coverage, quality of program implementation, and program effects on maternal and provider knowledge and behavior, in addition to effects on mortality. The baseline survey measured mortality during the 2 years preceding the survey, and the endline survey measured mortality during the 2 years of the intervention. Though reduction in mortality is the desired outcome, quality process data can help to distinguish elements of the program that were successful or not successful and provide insight for future modifications.

CHAPTER 4. SERVICE PROVIDERS' TRAINING, KNOWLEDGE AND FACILITIES

Training

The project aimed to train all the community-based service providers during the course of the intervention. Figure 3 shows the proportion of auxiliary nurse midwives, anganwadi workers and change agents that reported participating in a CARE training during the intervention. More than 90% of AWWs and CAs participated in the training, while 43% of ANMs received training. By topic areas that are particularly relevant to this project – pregnancy care, delivery care and newborn care - the trends were similar (Figure 4). About 80% of AWWs participated in training for those topics, 80-90% of change agents and 43% of ANMs. Therefore, the high coverage of training for AWWs and change agents can be cited as one of the accomplishments of this project. The failure of more than half of ANMs to participate in the training should be investigated so that future trainings can improve their level of participation.

Figure 3. Coverage of CARE Training at Endline in Intervention District

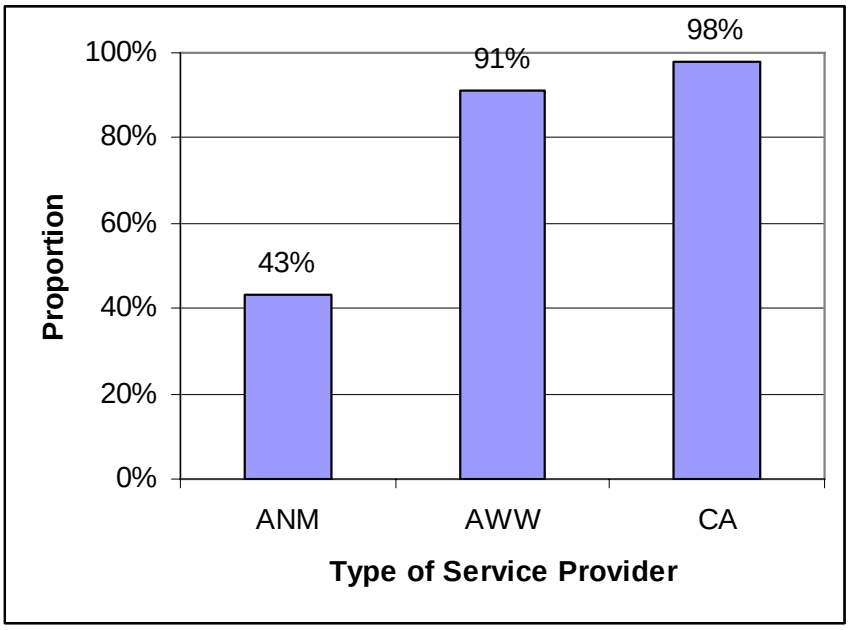
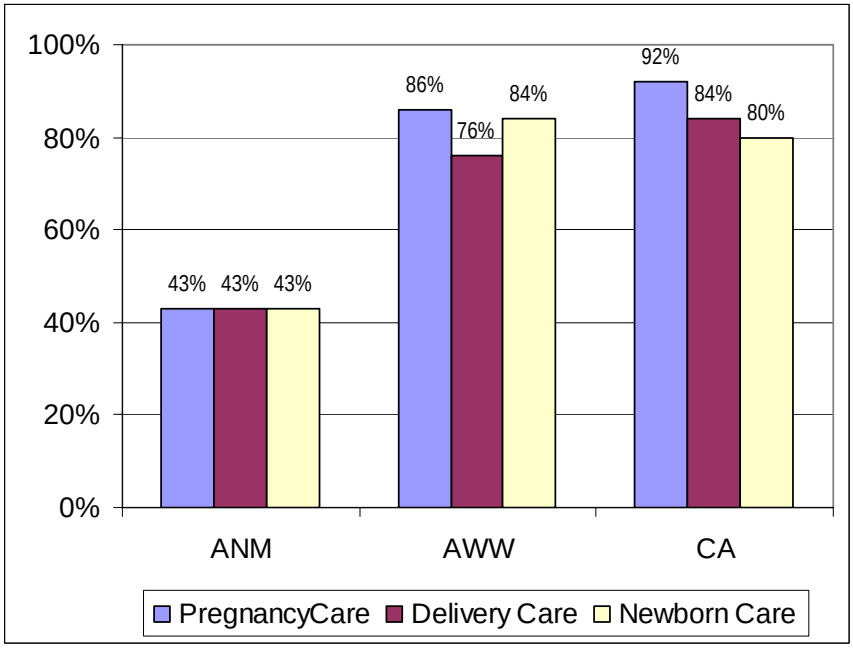


Figure 4. Training Coverage by Topic



Auxiliary Nurse Midwives

Data from the ANMs shows some improvement from baseline but also highlights some enduring problems with the government health system. The auxiliary nurse midwives are the community-based workers of the ministry of health. They are charged with providing contraceptive counseling and services, birth attendance, immunization and some basic curative health services. At endline in both districts, the ANMs' average age was 44 in both areas, and they reported an average of 12 years education. Table 4 shows that ANMs in both districts showed improved knowledge scores from baseline to endline, but ANMs in the intervention area showed a greater degree of improvement. Nonetheless, no ANMs received more than 75% of the possible points. With regard to topic-specific indicators, ANMs in the intervention area improved in all indicators except knowledge of maternal post-partum danger signs, while ANMs in the comparison area improved only in knowledge of the five cleans of delivery and newborn danger signs. However, some knowledge levels, such as pregnancy and delivery dangers signs, are unexpectedly poor given that the ANMs are supposed to be educated as skilled birth attendants. Only 27% of ANMs in the intervention area were able to list five or more delivery complications requiring immediate referral. These findings suggest that some progress was made through this intervention, but there remains an urgent need to update the ANMs' knowledge and skills.

Figure 5. Changes in Proportion of Correct Responses given by ANMs' from Baseline to Endline

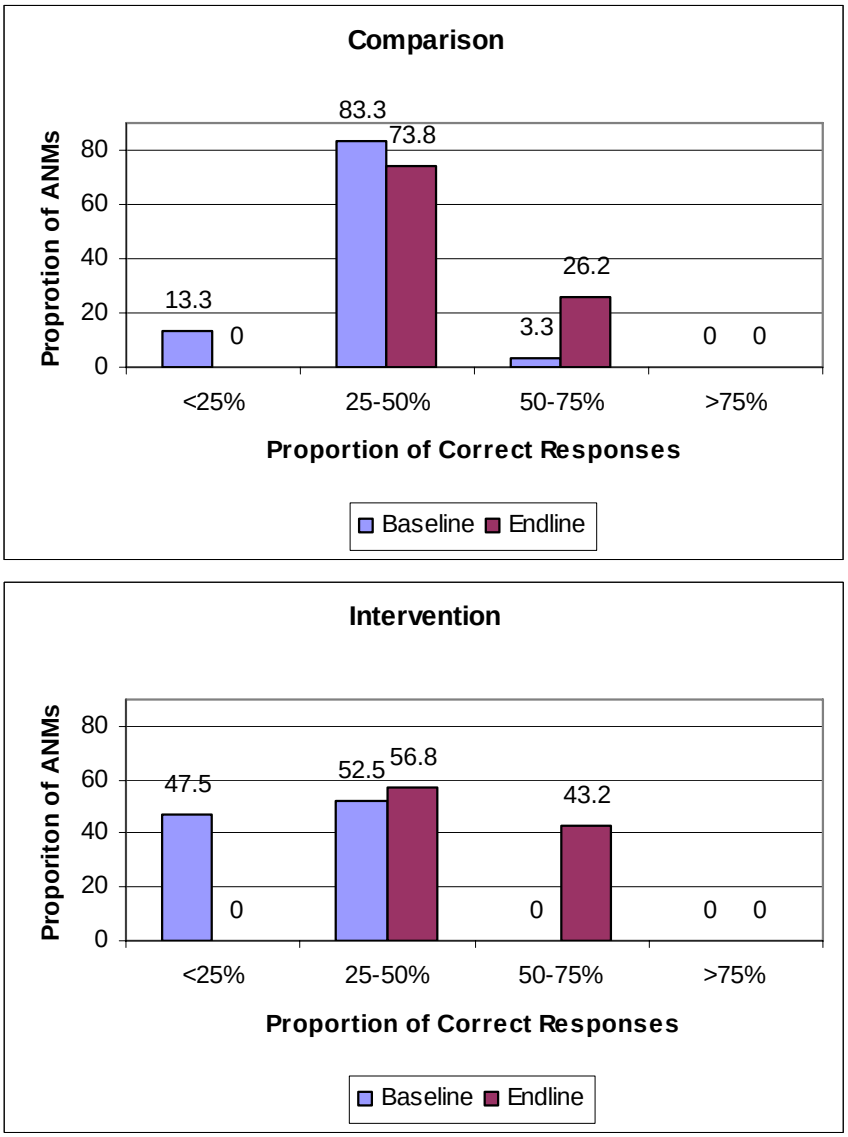


Table 4. Changes in Auxiliary Nurse Midwives' Knowledge

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Received CARE Training						
Proportion of Correct Responses:						
<25%	13.3	0	-13.3	47.5	0	-47.5
25-50%	83.3	73.8	-9.5	52.5	56.8	4.3
50-75%	3.3	26.2	22.9	0	43.2	43.2
>75%	0	0	0	0	0	0
Topic-specific Indicators:						
Pregnancy Danger Signs[1]	30.0	23.8	-6.2	15.0	43.2	28.2
Delivery Danger Signs[2]	36.7	7.1	-29.6	10.0	27.3	17.3
5 Cleans[3]	30.0	78.6	48.6	32.5	86.4	53.9
Maternal Post-partum Danger Signs[4]	10.0	0.0	-10	5.0	2.3	-2.7
Newborn Danger Signs[5]	26.7	54.2	27.5	7.5	50.0	42.5
Exclusive breastfeeding[6]	80.0	80.9	0.9	82.5	95.4	12.9
Total Number	**30**	**42**		**40**	**44**	

1. Able to list 5 or more pregnancy complications (including "bad obstetric history," severe headache, blurry vision, reduce or absent fetal movement, high blood pressure, edema of the face or hands, fever, unconsciousness, convulsions, excessive vaginal bleeding, lower abdominal pain, meconium and severe anemia.)
2. Able to list 5 or more delivery complications (including excessive vaginal bleeding, pre-term labor, high fever, breech presentation, "baby in bad position", prolonged labor , meconium, retained placenta, torn uterus, prolapsed cord, cord around the neck, convulsions and premature rupture of the membrane.)
3. Able to list the 5 cleans of delivery: clean surface, clean hands, clean blade, clean thread, clean cord.
4. Able to list 5 or more postpartum complications (including excessive vaginal bleeding, foul-smelling discharge, high fever, inverted nipples, tetanus, retained placenta, severe abdominal pain, convulsions, engorged breasts and jaundice.)
5. Able to list 5 or more newborn complications (including poor feeding, infant diarrhea, redness/discharge from around the cord, red/discharging eyes, persistent vomiting, newborn is cold to the touch, pneumonia, jaundice, convulsions, skin lesion/pustules, baby won't cry, fever, unconsciousness, difficult/fast breathing, chest in-drawing, failure to pass urine, and failure to pass stool.)
6. Knows that exclusive breastfeeding should continue for six months.

Anganwadi Workers

Anganwadi workers are the community-based workers of the Integrated Child Development Services. Anganwadi workers' demographic characteristics in the two study districts were comparable at the end of the project. Anganwadi workers had a mean age of 36 in both districts, and an average of 12 years of education. They reported an average of 8 years of

service in the comparison (range: 1-23) and an average of 9 years of service in the comparison area (range: 2-28).

Indicators related to anganwadi workers' knowledge and to the activities, supplies and equipment at the anganwadi centers showed improvement from baseline to endline in the intervention area. Figure 6 shows that the anganwadi workers' knowledge scores increased from baseline to endline. At baseline, 28% of the AWWs received a score of 50% or higher, compared with 38% at endline. Table 5 shows that anganwadi workers in the comparison area made little improvement in overall knowledge. Comparing the topic-specific indicators, some gains were measured in both districts but that the gains in the intervention district were generally more pronounced. For example, knowledge of the "5 cleans" of childbirth improved from 3% to 24% in the comparison area, but in the intervention area this indicator improved from 18% to 75%. Similarly, the proportion of AWWs able to list 3 or more maternal post-partum danger signs increased from 0% to 26% in the comparison area and from 0% to 58% in the intervention area. However, the proportion of AWWs that were able to list three or more newborn complications rose from 7% at baseline to 81% at endline in the comparison area, while gaining from 6% to 82% in the intervention area. In other words, knowledge of newborn complications seemed to increase in a comparable fashion in both areas. This suggests that some capacity building took place in the comparison area during the program's implementation. To provide some context for the health services in the communities, a few indicators of supplies and equipment at anganwadi centers are shown in Table 6. Some of the project's best practices were to promote the formation of mahila mandal groups, to recruit and train change agents, to produce social maps with health indicators, to teach women to conduct individual monitoring and to hold nutritional health days monthly. These best practices were adopted by almost all anganwadi centers in the intervention area. Another project goal was to distribute iron-folate supplements and disposable delivery kits through anganwadi centers. In the intervention area, 72% of anganwadi centers were stocked with iron-folate supplements and 40% with disposable delivery kits.

Figure 6. Changes in the Proportion of Correct Responses given by Anganwadi Workers from Baseline to Endline

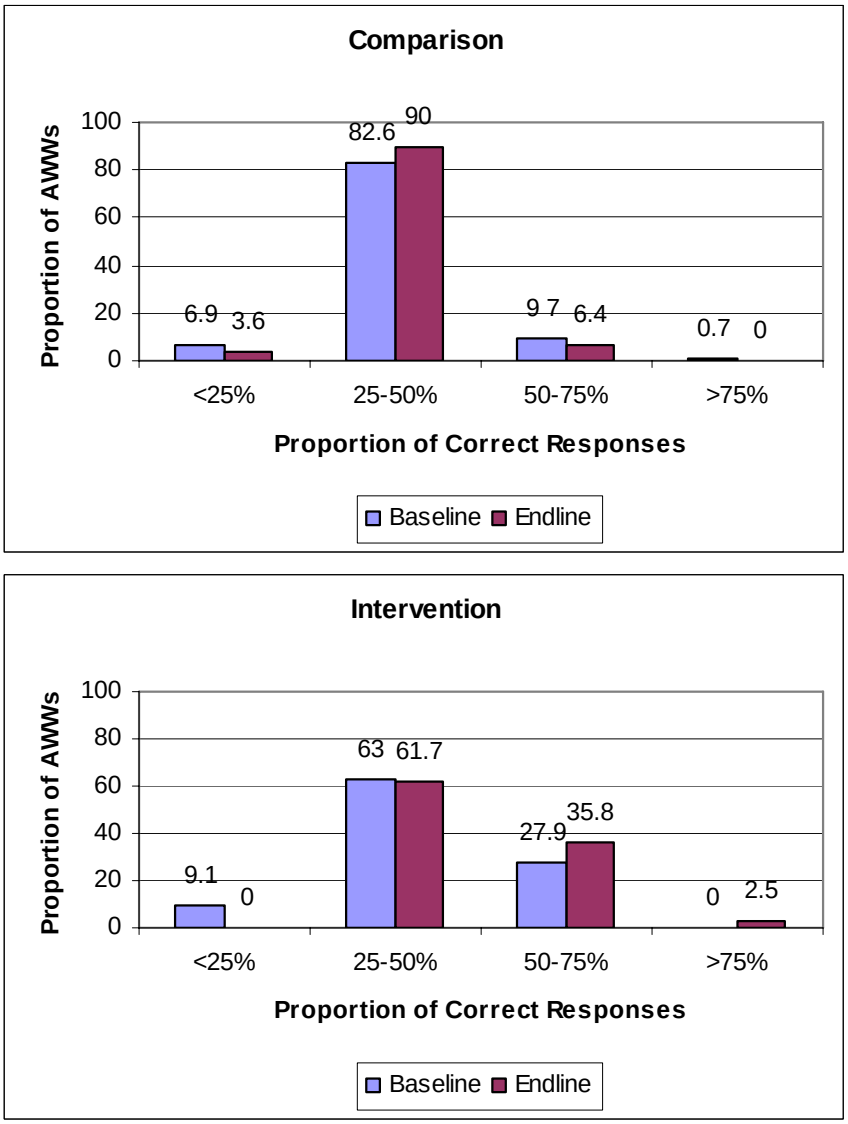


Table 5. Anganwadi Workers' Knowledge

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Proportion of Correct Responses:						
<25%	6.9	3.6	-3.3	9.1	0.0	9.1
25-50%	82.6	90.0	7.4	63.0	61.7	-1.3
50-75%	9.7	6.4	-3.3	27.9	35.8	7.9
>75%	0.7	0	-0.7	0	2.5	2.5
Topic-specific Indicators:						
Pregnancy Danger Signs[1]	6.9	19.3	12.4	21.2	46.9	25.7
Delivery Danger Signs[2]	3.5	56.4	52.9	6.7	73.5	66.8
5 Cleans[3]	2.8	24.3	21.5	17.6	75.3	57.7
Maternal Post-partum Danger Signs[4]	0	26.4	26.4	0	58.0	58.0
Newborn Danger Signs[5]	6.9	80.7	73.8	6.1	82.1	76
Exclusive breastfeeding[6]	87.5	91.4	3.9	84.8	98.8	14.0
Total Number	**144**	**140**		**165**	**162**	

1. Able to list 5 or more pregnancy complications. (At baseline, symptoms included "bad obstetric history," severe headache, blurry vision, reduce or absent fetal movement, high blood pressure, edema of the face or hands, unconsciousness, convulsions, excessive vaginal bleeding, lower abdominal pain, meconium, severe anemia and short stature. At endline, symptoms included all of the previous except short stature, plus fever and jaundice.)
2. Able to list 3 or more delivery complications. (At baseline, correct responses included excessive vaginal bleeding, preterm labor, prolonged labor, and convulsions. At endline, correct responses included all of these plus high fever, "baby in abnormal position", retained placenta and premature rupture of the membrane.)
3. Able to list the 5 cleans of delivery: clean surface, clean hands, clean blade, clean thread, clean cord.
4. Able to list 3 or more postpartum complications. (At baseline, correct responses included excessive vaginal bleeding, foul-smelling discharge and high fever. At endline, correct responses included all of these, plus severe abdominal pain, convulsions, and jaundice.)
5. Able to list 3 or more newborn complications At baseline, correct responses included poor feeding (or unable to suckle), drowsiness or unconsciousness, newborn is cold to the touch, fast breathing and chest in-drawing. At endline, correct responses included all of these plus diarrhea, high fever, redness/discharge from around the cord, red/discharging eyes, persistent vomiting, jaundice, baby won't cry, excessive crying, difficult/fast breathing, failure to pass urine, and failure to pass stool.
6. Knows that exclusive breastfeeding should continue for six months.

Table 6. Activities, Supplies and Equipment at Anganwadi Centers

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Activities						
AWC area with Mahila Mandal	79.9	78.6	-1.3	89.1	95.1	6
Change agents with assigned households	0	2.1	2.1	7.3	93.2	85.9
Social map/community based monitoring system	2.8	18.6	15.8	15.8	91.4	75.6
Supplies and Equipment						
IFA Small or Large Tablets	20.8	30.7	9.9	47.9	71.6	23.7
Disposable Delivery Kits	4.9	10.7	5.8	13.3	39.5	26.2
ORS packets	13.9	43.2	29.3	23.6	19.3	-4.3
Total Number	**144**	**140**		**165**	**162**	

Change Agents

The change agents are a group of volunteers recruited and trained for this project. A small number of them were recruited and trained in the demonstration sites prior to the launch of this phase of the intervention. Most of them had little experience in health promotion before joining the project. Table7 presents an overview of their characteristics. Their median age was 39, and they had a median of 2 years of education. In fact 67% had no formal education. They were recruited at the start of the project, and thus reported a mean of 28 months of service as change agents. One of the program's goals was to increase the INHP coverage of households that had previously been left out. As part of this aim, change agents were largely recruited from the scheduled castes (43%) and other backward classes (43%). Change agents reported being responsible for 34 households on average, and 41% had more than 35 households in their area of responsibility.

An effort was made to contact change agents who had dropped out after the start of the intervention. To assess the change agents experience in the project, they were asked about the supportiveness of the community, the anganwadi workers and the auxiliary nurse midwives. Nearly all (94-97%) of change agents reported that these groups were supportive or very supportive. Table 8 shows changes in CAs knowledge scores for topic-specific indicators over the course of the intervention.

Table 7. Characteristics of Change Agents at Endline

Age, proportional distribution of	
<20	2.3
20-29	16.8
30-39	33.2
40-49	26.7
>50	20.9
Mean Age	39
Years of education, proportional distribution of	
None	66.8
1-8	23.3
>8	9.9
Mean years of education	2.4
Mean months of service as change agent	30.7
Number of households in coverage area, proportional distribution	
≤15	9.1
16-25	24.1
26-35	25.1
>35	41.7
Mean number of households	**33.7**
Sex	
Female	90.7
Male	9.3
Marital Status (% Distribution)	
Never married	3.7
Married	83.4
Divorced or separated	0.4
Widowed	12.4
Occupation (%)*	
Household work	81.4
Agriculture	65.2
Service/job	11.1
Artisan or skilled worker	11.7
Shop or business	8.1
Traditional birth attendant	10.7
Other	22.7
Caste (% Distribution)	
Scheduled castes or tribes	43.5
Other backward class	42.7
Others	13.8
Total Number	**506**

* More than one response possible.

Table 8. Change Agents' Knowledge Scores during the Intervention

	Adequacy I	Adequacy II	Adequacy III	Endline
Topic-specific Indicators:				
Iron-folate supplements[1]	66.9	84.2	71.3	81.6
Complications of childbirth[2]	32.3	52.0	39.4	50.7
Thermal care practices[3]	8.6	7.7	7.9	12.9
Newborn infection prevention[4]	3.1	6.8	2.1	10.9
Early breastfeeding[5]	75.2	81.0	84.3	83.9
Total Number	**520**	**621**	**530**	**506**

1. Able to identify that iron tablets are taken to prevent anemia and that 90+ should be taken during pregnancy.
2. Able to list at least two of the following childbirth complications: excessive bleeding, convulsions and prolonged or obstructed labor.
3. Able to state that the newborn should be wiped with a dry cloth, kept in skin-to-skin contact with the mother, wrapped warmly at all times and bathed only three or more days after birth.
4. Able to list at least three of the following steps to reduce newborns' risk of infection: minimum handling, handwashing before handling the child, breastfeeding immediately after delivery nad avoiding prelacteal feeds and supplements.
5. Able to state that mother should begin breastfeeding within one hour of delivery and to list at least one of the three following benefits of early breastfeeding: to protect child from infection, to help mother minimize feeding difficulties, and to minimize postpartum bleeding.

CHAPTER 5. HOUSEHOLD CHARACTERISTICS

Table 9 presents the characteristics of all households included in the baseline and endline surveys by study districts. It demonstrates that the study districts were comparable at both the beginning and the end of the projects on several indicators of household characteristics and composition. The majority of houses, about 51% in the comparison district and 61% in the intervention district, were semi-pucca (made from a combination of more permanent and less permanent materials), and a small proportion had pucca (made from permanent materials). In both districts the mean household size was about 5.5, the majority of households where headed by males, the mean age of the head of household was low- to mid-40s, and there was an average of about 1 eligible woman per household. Table10 shows the age distribution and sex ratio of the study population, which is also comparable across study groups at baseline and endline. Educational attainment of the study population is presented in Table 11. Distribution is fairly comparable, but the intervention district has slightly higher illiteracy rates both at baseline and endline.

Table 12 presents socioeconomic characteristics of the recently delivered women (RDW). These samples were also similar between study districts both at baseline and at endline. At endline 65% of RDW in the comparison district and 59% of RDW in the intervention district were between the ages of 20 to 29. The majority of RDW in both districts were illiterate, though this percentage was slightly higher in the intervention district. Most women were Hindu, were in either scheduled or other backwards castes, and had a low household standard of living. Future analyses will examine how program implementation, process indicators and neonatal mortality varied according to these characteristics.

Table 9. Percentage distribution of selected household characteristics

	COMPARISON		INTERVENTION	
	Baseline	Endline	Baseline	Endline
House type*				
Kachha	40.7	37.4	38.4	33.1
Semi-Pucca	49.5	50.9	56.9	60.6
Pucca	9.7	11.7	4.7	6.2
Number of members in HH				
1	4.0	4.8	3.6	4.3
2	8.9	9.7	8.8	9.5
3	10.4	11.1	10.6	10.6
4	14.9	15.2	14.0	14.0
5	17.4	18.3	15.8	16.2
6	15.8	15.7	15.4	15.9
7	11.9	11.0	11.5	11.2
8	7.0	6.2	7.7	7.4
9+	9.7	7.9	12.7	11.0
Mean HH size	5.40	5.16	5.63	5.43
Sex of head of household				
Male	88.8	87.1	94.1	93.0
Female	11.2	12.9	5.9	7.0
Age distribution of head of household				
<30	11.3	10.4	15.8	12.9
30-44	37.2	37.4	40.2	39.4
45-59	26.2	26.7	23.5	24.3
60+	25.3	25.4	20.5	23.4
Median age of head of HH	45	45	40	42
Eligible women in HH				
0	17.2	18.5	14.7	18.7
1	70.4	70.6	70.1	69.5
2	10.0	9.0	11.8	9.6
3+	2.4	1.8	3.4	2.2
Mean no. eligible women	0.98	1.16	1.08	1.18
Number of HH	26,595	28,696	29,560	30,582

*Kachha: less permanent dwelling with straw, mud/clay or tin roof and straw or mud/clay walls and mud/clay floor; Pucca: more permanent dwelling with cement/RCC roof and brick or cement/RCC walls and Cement/RCC, Tiles or Granite floor; Semi-pucca: mix of more permanent and less permanent with another combination of type of material used.

Table 10. Age distribution of the study population

	COMPARISON		INTERVENTION	
	Baseline	**Endline**	**Baseline**	**Endline**
Age				
<1	2.3	2.1	2.9	2.4
1-4	9.9	9.3	11.6	10.5
5-9	13.7	13.1	15.2	14.8
10-14	13.2	13.7	12.4.	13.3
15-19	10.5	11.0	9.7	10.3
20-24	7.9	7.8	8.1	7.6
25-29	7.3	6.8	7.6	7.1
30-34	6.5	6.5	6.7	6.6
35-39	5.9	6.2	5.8	6.2
40-44	4.6	4.9	4.4	4.5
45-49	4.0	4.4	3.7	3.7
50-54	2.8	2.6	2.4	2.4
55-59	2.5	2.5	2.1	2.2
60-64	3.3	3.2	2.8	3.2
65-69	2.1	2.3	1.7	2.1
70-74	1.9	1.8	1.6	1.6
75-79	0.7	0.8	0.5	0.6
80+	1.0	0.9	1.0	0.9
Sex				
Male	51.9	51.4	52.3	52.3
Female	48.1	48.6	47.7	47.7
Sex ratio	928	946	913	914
Number of Person	143,539	147,978	166,517	166,275

Table 11. Educational status of the study population

	COMPARISON		INTERVENTION	
	Baseline	**Endline**	**Baseline**	**Endline**
Education Level				
Illiterate	37.5	34.5	51.0	46.8
Primary School < Middle School	35.1	35.4	30.7	32.8
Middle School	15.5	16.2	10.4	11.3
High School +	11.9	14.0	7.9	9.1
Number of Person	**121,714**	**126,916**	**136,485**	**138,947**

Note: Educational status is computed for the population of age > 5 years

Table 12. Characteristics of Recently Delivered Women

	COMPARISON		INTERVENTION	
	Baseline	Endline	Baseline	Endline
Mean Age at Most Recent Birth	**24.8**	**25.4**	**24.9**	**25.6**
Age at Most Recent Birth				
12-15	1.5	0.2	3.7	1.0
16-19	18.7	13.7	18.9	16.0
20-29	59.4	65.1	53.7	59.0
30-34	13.4	13.8	14.8	14.6
35-39	5.5	5.5	6.6	6.7
40-49	1.5	1.6	2.2	2.7
Education Level				
Illiterate	62.9	59.4	76.7	74.8
Primary School < Middle School	15.9	14.9	13.1	12.6
Middle School	12.7	15.0	6.5	7.8
High School +	8.4	10.7	3.7	4.8
Parity				
1	18.2	18.3	16.4	17.3
2-3	37.0	36.7	34.5	35.5
4-5	25.1	26.0	26.5	25.7
6+	19.7	18.9	22.5	21.5
Religion				
Hindu	94.3	94.3	81.2	80.5
Muslim	5.6	5.5	18.7	19.0
Other	0.1	0.3	0.2	0.5
Caste				
Scheduled Castes	-	42.8	-	40.2
Scheduled Tribes	-	0.4	-	0.5
Other backward castes	-	42.5	-	48.1
Others	-	14.4	-	11.2
Household Standard of Living				
Low	53.1	57.5	46.5	51.6
Middle	32.0	26.6	39.8	34.0
High	14.9	15.8	13.7	14.4
Number of Women	**6,329**	**7,504**	**9,069**	**9,744**

- Not available in baseline data

CHAPTER 6. ANTENATAL CARE INDICATORS

This chapter presents indicators related to the coverage and quality of care during the antenatal period. One goal of the INHP was to increase the proportion of women that were visited at home during pregnancy by an auxiliary nurse midwife, anganwadi worker or change agent. Through these visits, women were encouraged to seek antenatal check-ups. Behavior change communication in the intervention district promoted the use of tetanus toxoid immunization and iron-folate supplementation during pregnancy. Service providers were taught to introduce the concepts of birth planning and clean delivery to women and their families. Some aspects of birth planning include counseling women to choose a birth attendant in advance, save money for the delivery, obtain a disposable delivery kit and plan for transport and a person to take them to an emergency obstetric care facility. Another element of prenatal counseling is to teach women to recognize signs of serious illness ("danger signs") in themselves or their newborns, in hopes that this will encourage them to seek timely care.

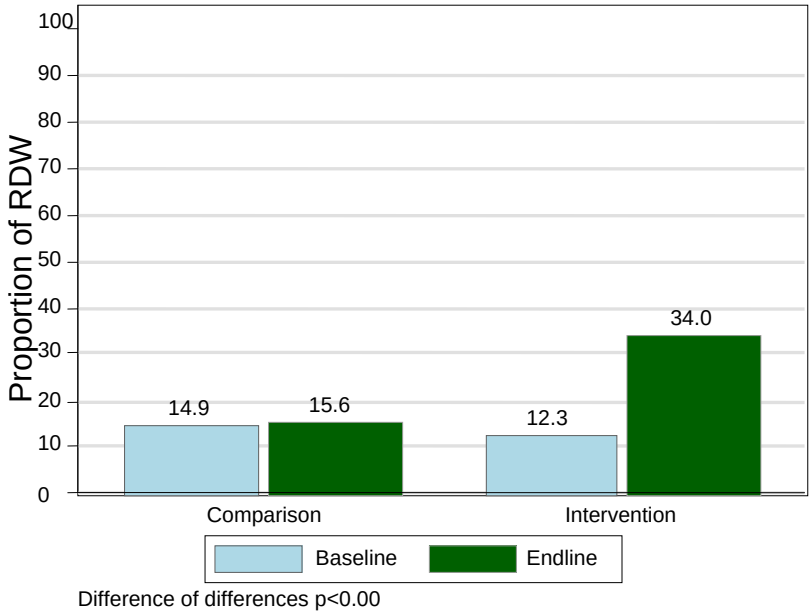
Coverage of home visits by service providers

The proportion of pregnant women who were visited during pregnancy at home increased substantially in the intervention area from baseline to endline (Figures 7-9; Table 13). In general, no change was seen in the indicators of coverage in the comparison area. The proportion of women that were visited by any of the three types of workers increased from 16% at baseline to 59% at endline in the intervention area (Figure 9). The anganwadi workers showed the greatest improvement in coverage, from 5% of women at baseline to 48% at endline survey (Figure 8). The auxiliary nurse midwives showed a smaller degree of improvement, from 12% at baseline to 36% at endline in the intervention area (Figure 7). The recruitment and training of change agents was scaled up during the intervention, and this group reached 29% coverage of antenatal home visits by the endline survey. Attendance of recently delivered women at a Nutrition Health Day event rose from 2% at baseline to 31% at endline in the intervention area (Figure 10).

Figures 11 and 12 (trend line) present coverage by four time periods: January – June 2004 (the period corresponding to the first adequacy survey), July to December 2004 (the period corresponding to the second adequacy survey), January – June 2005 (the period corresponding to the third adequacy survey) and July to December 2005 (the period from the third adequacy survey to the endline survey). Figure 11 compares the reported coverage of antenatal home visits by anganwadi workers using two data sources, the adequacy surveys and the endline survey. It demonstrates that women who gave birth during each of the reference periods retrospectively reported higher coverage of visits during the endline survey than they had during the adequacy surveys. For example, during the adequacy 1 survey, 21% of women reported being visited by an AWW during pregnancy, while at the endline survey 41% of women who gave birth during the adequacy 1 recall period reported being visited by an AWW. This discrepancy is more marked earlier in the project. No discrepancy of this sort was observed in the comparison district (data not shown.) Figure 12 presents the same information using data for change agents' visitation during the antenatal period. It also suggests a differential in reporting that was greater during the earliest months of the project. This finding is unexpected and cannot be attributed to different samples between the adequacy and end of report surveys. In fact, all women who participated in

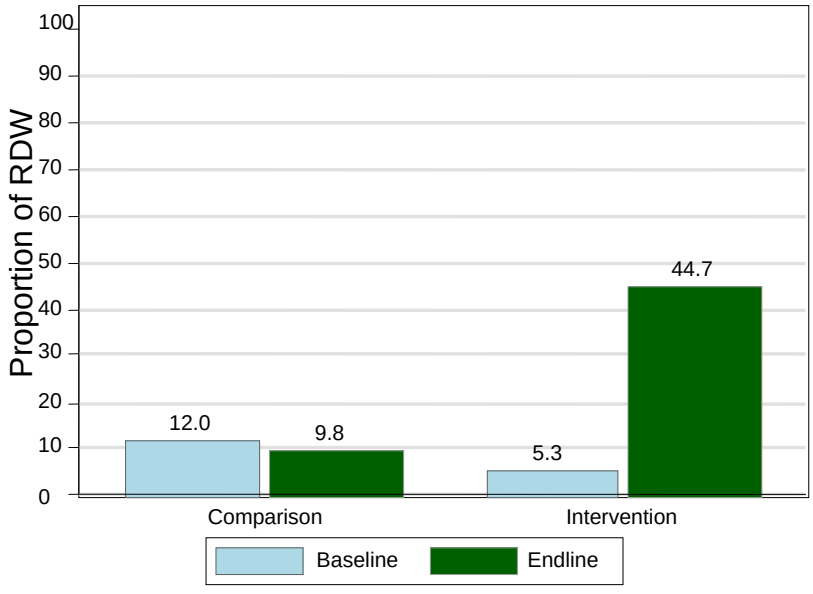
the adequacy surveys also were asked to participate in the endline survey. Therefore, this finding is unexpected and suggests a reporting bias. One explanation for this discrepant finding may be that the mothers report at endline was based on current knowledge and not based on actual experience.

Figure 7. Antenatal Visits by Auxiliary Nurse Midwives



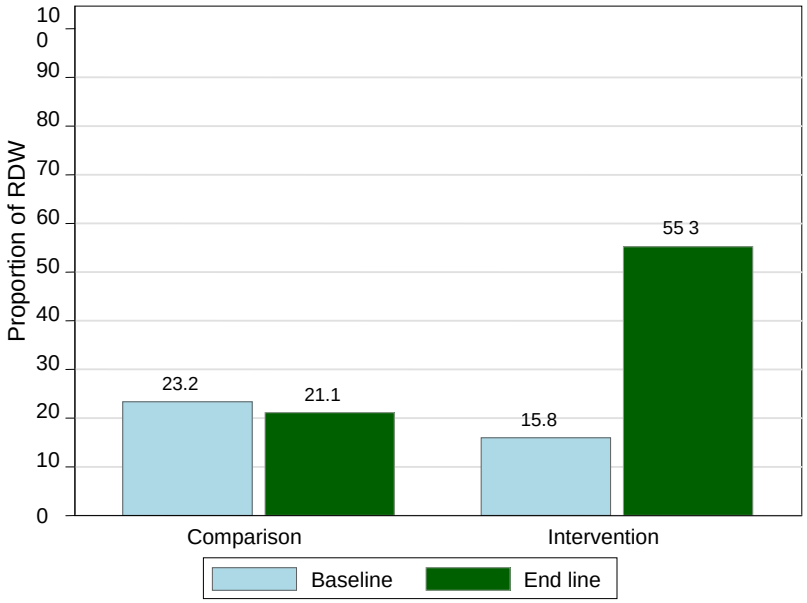
Difference of differences p<0.00

Figure 8. Antenatal home visits by Anganwadi Workers



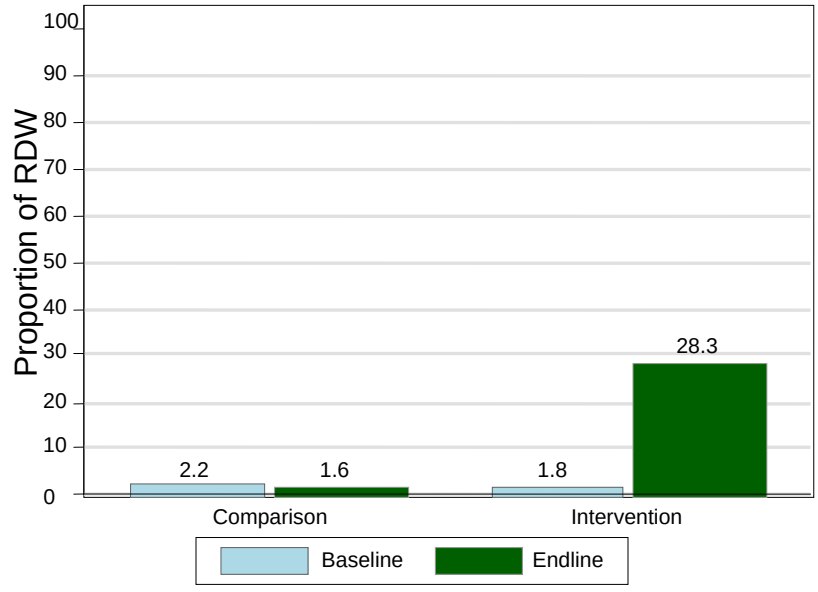
Difference of differences p<0.00

Figure 9. Antenatal home visits by ANMs, AWWs or Change Agents



Difference of differences p<0.00

Figure 10. Nutrition Health Day Attendance



Difference of differences p<0.00

Figure 11. Trends in coverage of antenatal home visits by Anganwadi Workers, Intervention District Only

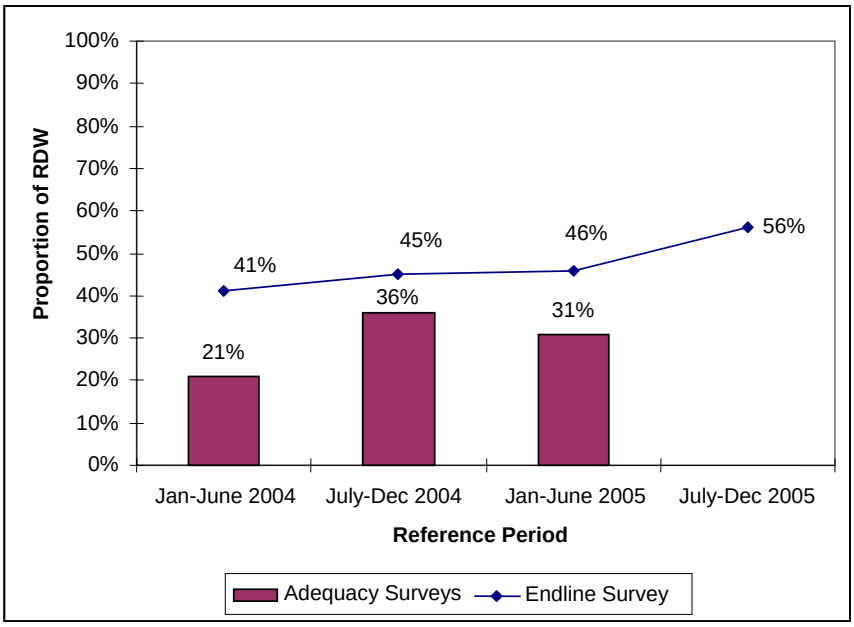
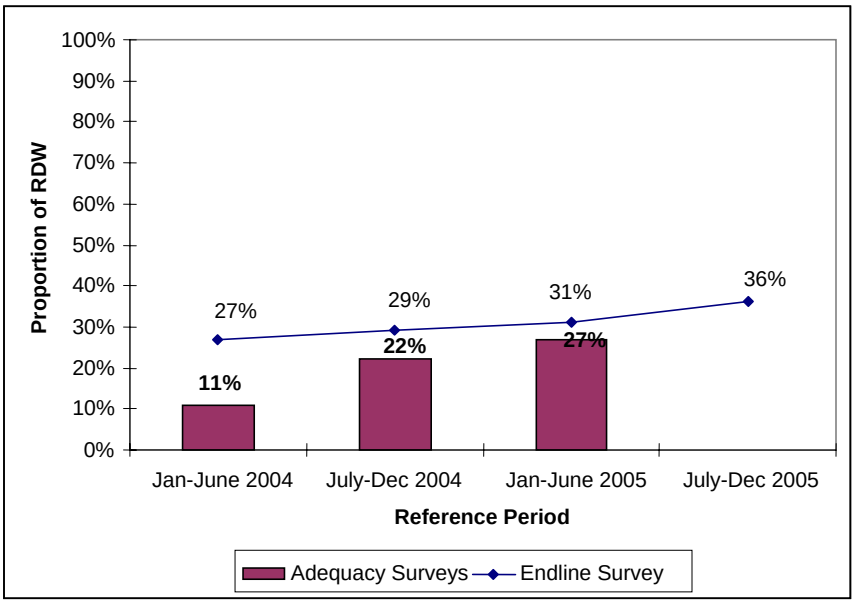


Figure 12. Trends in Coverage of Antenatal Home Visits by Change Agents, Intervention District Only



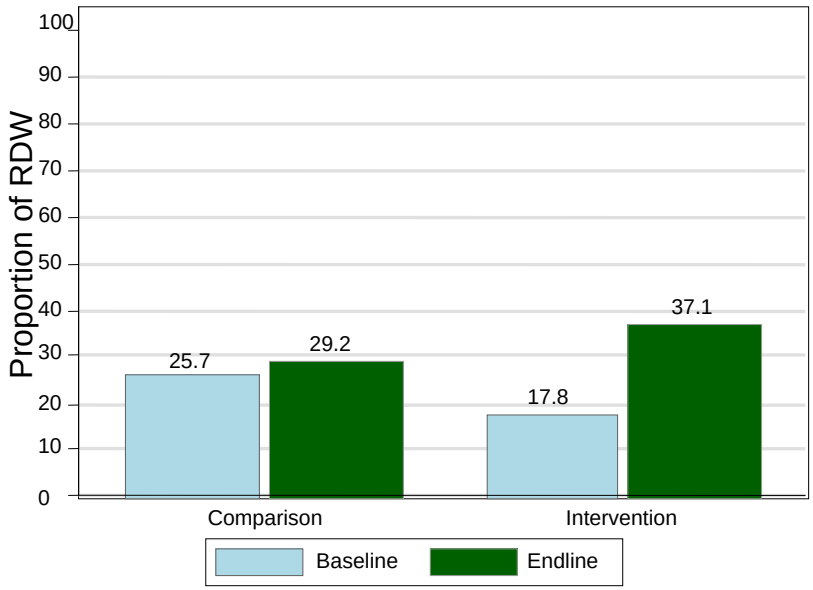
Antenatal check-ups

Antenatal Check-ups

Improving antenatal care is an important intervention for reducing neonatal mortality. A contact with a health worker was recorded as an antenatal check-up if the woman received, at a

minimum, an abdominal examination or a blood pressure check. Nearly 40% of women in the intervention area received one or more ANC visits at endline, more than double the proportion that received one or more ANC visits at baseline (18%) (Figure 13). In the comparison area, the proportion of women who received one or more ANC visits increased slightly from 26% to 30% (Figure 13). The linear probability model suggests that the improvement from baseline to endline in the intervention district is significantly greater than in the comparison district ($p<0.0$). However, interpreting these data in light of the adequacy survey data suggests that the endline coverage in the intervention area is improbably high (Figure 14). Only 13% of women in the intervention area received the three ANC visits recommended by the World Health Organization (Table 13). As a result, indicators moved in a positive direction but remain low by international standards, or in comparison with southern India.

Figure 13. Received one or more antenatal check-ups



Difference of differences p<0.00

Figure 14. Trends in Coverage of Antenatal Check-ups

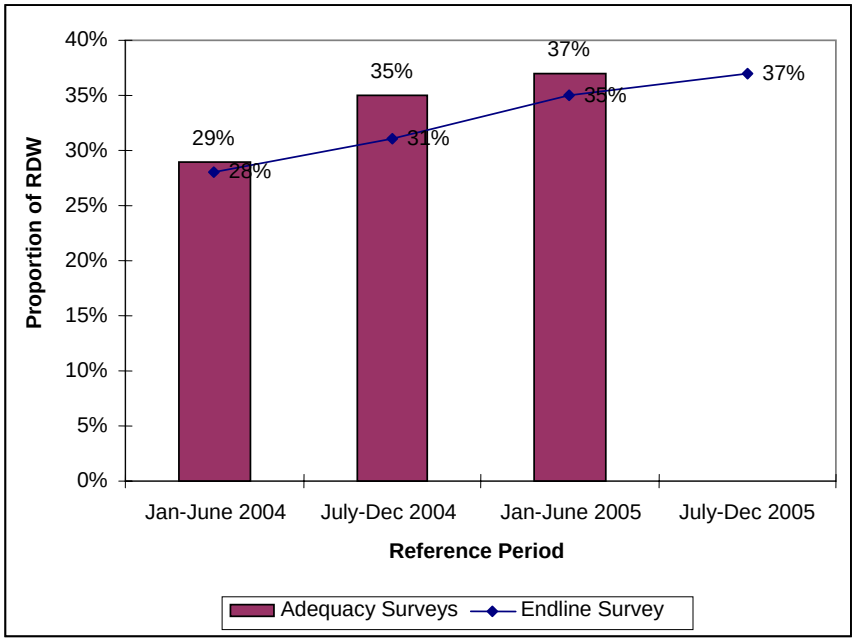


Table 13. Number and timing of antenatal check-ups

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Number of ANC*						
0	74.3	70.1	-4.2	82.2	63.0	-19.2
1	9.8	10.8	1	8.3	10.8	2.5
2	8.6	9.1	0.5	5.8	13.6	7.8
3+	7.2	9.1	1.9	3.8	12.6	8.8
Timing of first ANC*						
1st trimester	9.2	10.4	1.2	6.5	15.8	9.3
2nd trimester	11.9	13.7	1.8	8.1	17.0	8.9
3rd trimester	4.6	4.8	0.2	3.2	4.1	0.9
Total Number	**6,329**	**7,504**		**9,069**	**9,744**	

*Difference of differences are significant at p<0.00

Table 14. Antenatal check-ups by maternal characteristics*

	Comparison		Intervention	
	Baseline	Endline	Baseline	Endline
Maternal Age				
<20	27.7	31.2	19.3	42.2
20-34	26.3	29.9	18.1	37.5
35-49	14.3	22.1	12.5	31.0
Birth Order				
1	40.6	44.9	28.3	48.4
2-3	28.3	30.6	20.6	37.9
4-5	20.6	22.5	13.3	33.4
6+	13.5	14.8	11.2	28.7
Mother's Education				
Illiterate	16.9	18.9	12.7	31.5
Primary School	27.9	31.9	25.3	46.3
Middle School	41.9	39.3	41.1	53.9
High School and Above	63.0	61.6	57.7	70.9
Religion				
Hindu	25.6	29.3	18.9	38.3
Muslim	27.1	27.2	13.0	32.2
Others	33.3	31.6	18.7	40.0
Standard of Living Index				
Low	17.9	20.8	11.9	30.9
Middle	26.3	30.8	17.9	37.7
High	52.1	56.6	38.0	57.8
Total Number	**6,329**	**7,504**	**9,069**	**9,744**

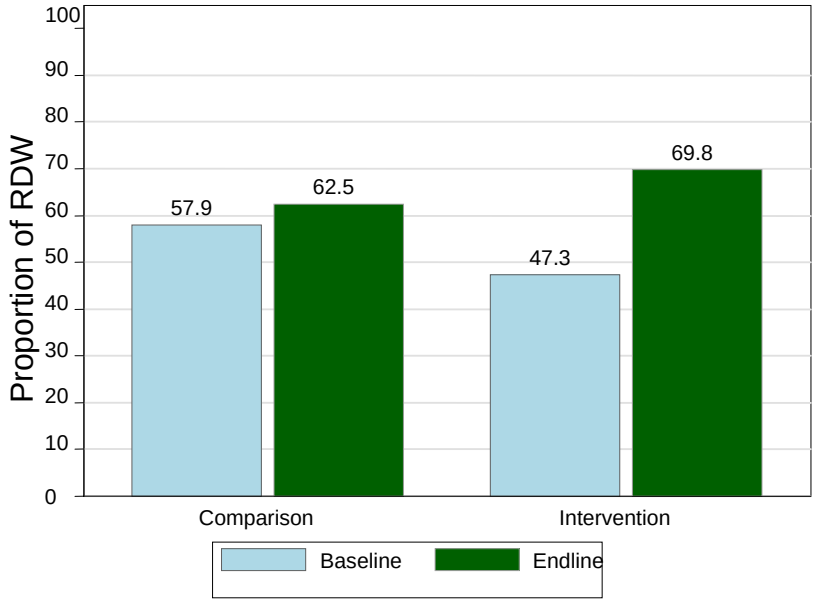
*Received one or more ANC from any source.

Quality of antenatal check-ups and counseling

Tetanus Toxoid Immunization

Tetanus toxoid immunization is a critical intervention to prevent neonatal tetanus. At baseline, about half of all women in the intervention area (47%) and just over half in the comparison area (58%) had been immunized during their most recent pregnancy. This proportion increased to 69% in the intervention area while remaining nearly the same in the comparison area, at 62% (Figure 15). The increase in the intervention area was statistically significant by a linear probability test.

Figure 15. Received two or more Tetanus Toxoid Immunizations



*Difference of differences are significant at p<0.00

Iron-Folate Supplementation

Iron-folate supplementation during pregnancy is a standard intervention for both maternal and neonatal health. Two aspects of iron-folate supplementation (IFA) have been tracked as program indicators: whether women received an adequate supply of iron-folate tablets (100 tablets or more) and whether they consumed an adequate amount of tablets for a non-anemic woman (at least 100 tablets). The first reflects the adequacy of the health intervention, while the second may affect the quality of counseling and is necessary to impact health status. Adequacy reports showed improvements in the proportion of RDW in the intervention area that received an adequate amount of IFA supplements, but less than half of those women reported consuming an adequate amount of iron supplements. Findings from the endline survey present a similar but somewhat more encouraging picture: 32% of RDW in the intervention area received an adequate supply of IFA, and 22% consumed an adequate amount (Figure 16). In the comparison area, 23% of RDW received adequate IFA and 8% consumed it; the latter figure represented no significant change from baseline. Thus, both these indicators showed significant gain from baseline, but only about one in five women took sufficient IFA.

Figure 16. Iron-folic Acid Supplementation

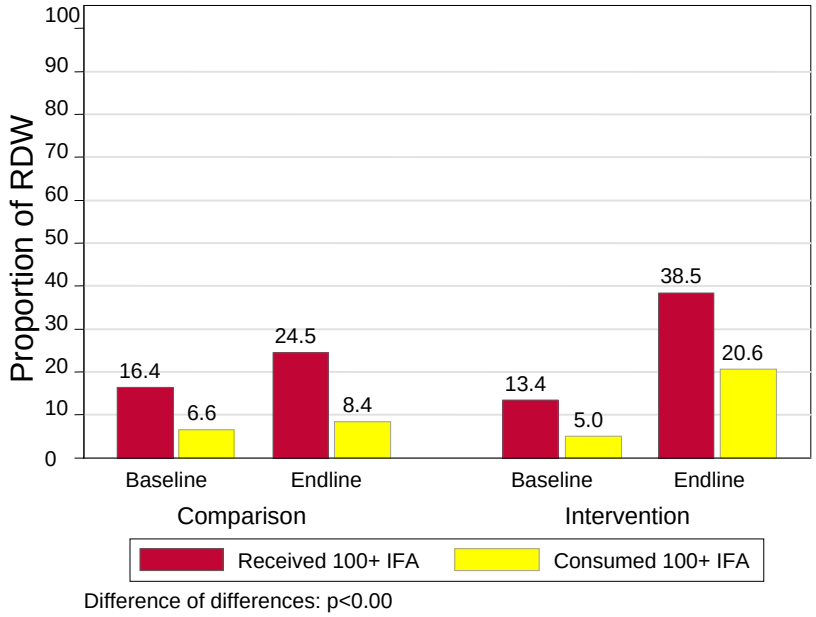


Table 15. Services received during antenatal check-ups

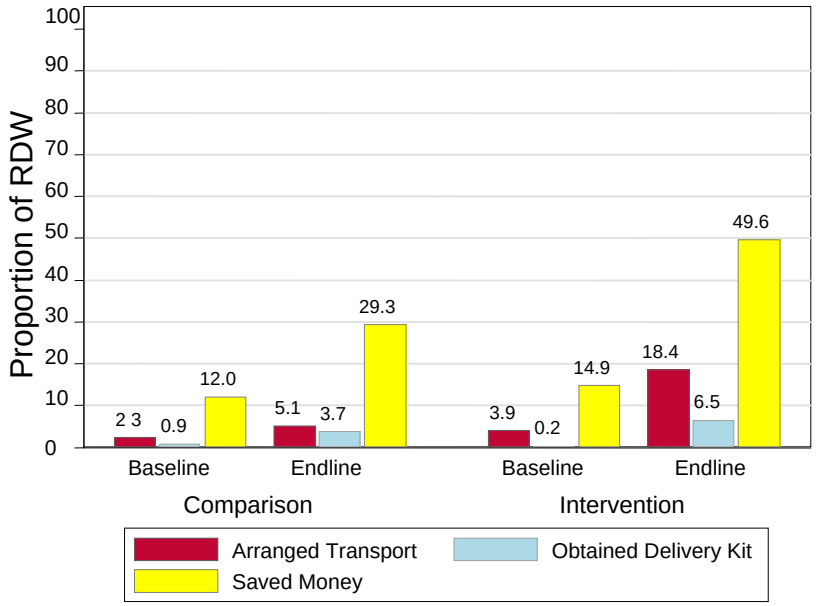
	Comparison			Intervention		
	Baseline	Endline	Change	Baseline	Endline	Change
Weight measured	22.5	24.8	2.3	37.1	52.7	15.6
Blood pressure checked	30.1	32.5	2.4	31.1	30.7	-0.4
Urine test	31.4	35.5	4.1	36.5	35.7	-0.8
Abdomen exam	85.8	91.0	5.2	87.4	89.7	2.3
Ultrasound	16.1	20.7	4.6	19.5	17.2	-2.3
Blood Test	30.1	30.1	0	32.9	27.5	-5.4
Total Number that received ANC	1,627	2,186		1,618	3,608	

Birth Planning

The concept of birth planning is promoted as a strategy to prevent both maternal and newborn mortality, by encouraging families to prepare for a clean home delivery and to take action if an obstetric emergency occurs. Some components of birth planning include choosing a birth attendant, identifying a health facility in case of emergency, planning for emergency transport, saving money and obtaining a disposable delivery kit. Small gains have been observed in the proportion of women that took specific birth planning steps in both areas. In the intervention area, the largest gain has been in the proportion of women that reported saving money, from 15% at baseline to 50% at endline (Figure 17). A substantial increase in the proportion of RDW who saved money for an emergency, from 12% at baseline to 30% at endline, was also seen in the comparison area. Plans for transport to a health facility in case of emergency also increased in the intervention area, from 4% at baseline to 18% at the endline. A

seven percentage point increase was measured in the intervention area in the proportion of woman that obtained a clean delivery kit for use during the birth.

Figure 17. Birth Planning Steps



Components of Antenatal Counseling

The quality of antenatal counseling was assessed by asking women both unprompted and prompted questions regarding the information that was conveyed to them during pregnancy. The data presented in Tables 16-18 are based on the unprompted responses. In general, most women in both the comparison and intervention areas had information about the importance of TT immunization and IFA supplementation at baseline, and small, equal increases in awareness were seen in both the intervention and comparison areas. The data indicate that messages about recognition of pregnancy or delivery complications or newborn danger signs were largely not received by RDW in the intervention or comparison areas. There was some improvement, however, in the proportions of women who reported that the ANMs (Table 16) and AWWs (Table 17) provided information about birth planning, the five cleans and essential newborn care practices, including immediate and exclusive breastfeeding, immediate drying and wrapping and delayed bathing. In general, about 15-30% of women in the intervention area indicated that the ANMs and AWWs had provided this information, whereas few women (about 1-5%) in the comparison area had been given these messages during pregnancy. A similar pattern was seen for counseling by change agents (Table 18), although the proportion of women who received messages about birth planning and essential newborn care practices from a change agent was lower (10-20%) than those from ANMs and AWWs. Tables 16-18 also include a mean total score, which indicates the number of messages each woman remembered receiving. For example, a woman who only recalled being told about TT immunizations and IFA tablets would have a total score of 2. For ANMs, the mean number of messages recalled was 1.6 at baseline and 2.9 at endline in the intervention area. For AWWs and change agents, the average total number of messages recalled was 1 at baseline and 3 at endline. As with the percentage coverage

of specific messages, it suggests a minor change in quality of counseling. However, Table 19 shows the proportion of all women who reported receiving specific types of counseling during pregnancy in response to prompted questions. In both the comparison and intervention groups, recognition of all messages increased from baseline to endline, but the intervention group had more dramatic increases for all messages. The difference in quality of counseling between comparison and intervention areas was more pronounced when the women were promted with the messages.

Improvements in the quality of antenatal counseling would be expected to lead to an increase in maternal knowledge. Maternal knowledge was assessed by asking women to list the danger signs for women during pregnancy, childbirth, post-partum and for newborns. Table 20 shows that there was no improvements of knowledge of danger signs in either group which is consistent with the low rate of counseling on the study subjects. As has already been described, women rarely recalled being counseled about maternal and newborn dangers signs. Although some women could recall being counseled about danger signs when prompted, they could not recall these signs sponteneously. The overall knowledge scores for both groups increased slightly and by the same magnitude, indicating no improved knowledge in the intervention group over the comparison group.

Table 16. Quality of Counseling during antenatal home visits by ANMs*

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Topics discussed during antenatal home visits						
TT Immunizations	80.5	90.7	10.2	84.6	79.8	-4.8
IFA Tablets	66.5	80.9	14.4	68.9	79.8	10.9
Birth Planning	2.2	6.8	65.8	2.6	12.9	10.3
Pregnancy Complications	6.6	3.2	-3.4	5.1	2.3	-2.8
Delivery Complications	1.4	2.1	0.7	1.0	1.2	0.2
Newborn Complications/Danger Signs	0	1.6	1.6	0.3	3.0	2.7
Five Cleans	0.7	1.2	0.5	1.4	19.3	17.9
Immediate Breastfeeding	0.6	2.4	1.8	0.7	22.4	21.7
Exclusive Breastfeeding	0.8	6.4	5.6	0.4	30.3	29.9
Delayed bathing of newborn	0.1	0.6	0.5	0.2	19.7	19.5
Drying and wrapping the newborn	0.3	3.1	2.8	0.1	16.8	16.7
Mean Total Score Out of 11 (Median Total Score)	**1.6 (2)**	**1.9 (2)**	**0.3 (0)**	**1.6 (2)**	**2.9 (2)**	**1.3 (0)**
Total Number of Women that Received Visits	**941**	**1,170**		**1,120**	**3,309**	

* Based on unprompted responses.

Table 17. Quality of Counseling during antenatal home visits by AWWs*

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Topics discussed during antenatal home visits						
TT Immunizations	41.8	65.5	23.2	54.4	70.3	15.9
IFA Tablets	36.1	57.4	21.3	43.7	77.6	33.9
Birth Planning	2.1	6.8	4.7	2.1	15.3	13.2
Pregnancy Complications	5.1	3.3	-1.8	5.0	2.6	-2.4
Delivery Complications	0.7	1.6	0.9	1.0	1.7	0.7
Newborn Complications/Danger Signs	0.0	2.0	2.0	0.2	3.5	3.3
Five Cleans	1.1	1.1	0	1.7	21.6	19.9
Immediate Breastfeeding	1.1	2.7	1.6	2.5	29.4	28.9
Exclusive Breastfeeding	1.2	5.6	4.4	2.3	34.8	32.5
Delayed bathing of newborn	0.0	0.4	0.4	0.4	24.7	24.3
Drying and wrapping the newborn	0.4	2.2	1.8	0.6	19.4	18.8
Mean Total Score Out of 11 (Median Total Score)	**0.9 (1)**	**1.1 (1)**	**0.2 (0)**	**1.5 (2)**	**3 (3)**	**1.5 (1)**
Total Number of Women that Received Visits	**758**	**734**		**478**	**4,352**	

* Based on unprompted responses.

Table 18. Quality of Counseling during antenatal home visits by Change Agents*

	Baseline	**Endline**	**Change**
Topics discussed during antenatal home visits			
TT Immunizations	48.3	62.7	14.4
IFA Tablets	34.5	63.7	29.2
Birth Planning	13.8	15.9	2.1
Pregnancy Complications	3.4	2.5	-0.9
Delivery Complications	0.0	1.4	1.4
Newborn Complications/Danger Signs	0.0	4.5	4.5
Five Cleans	17.2	22.4	5.2
Immediate Breastfeeding	6.9	26.6	19.7
Exclusive Breastfeeding	13.8	35.6	21.8
Delayed bathing of newborn	6.9	27.6	20.7
Drying and wrapping the newborn	6.9	23.8	16.9
Mean Total Score Out of 11 (Median Total Score)	**1.5 (1)**	**2.9 (3)**	**1.4 (2)**
Total Number of Women that Received Visits	**29**	**2833**	

* Based on unprompted responses.

Table 19. Advice received during pregnancy from any source*

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
TT immunization	41.7	68.6	26.9	15.6	76.2	60.6
IFA tablets	38.4	58.0	19.6	14.2	71.8	57.6
Birth Planning						
Emergency transport	3.8	11.5	7.7	2.5	46.4	43.9
Saving money	5.1	24.0	18.9	3.4	57.3	53.9
Suitable location for delivery	9.2	20.3	11.1	4.5	45.9	41.4
Birth attendant	6.7	18.2	11.5	3.2	39.1	35.9
Emergency obstetric care	9.4	12.3	2.9	3.7	33.5	29.8
Danger Signs	9.4	24.7	15.3	5.1	60.8	55.7
Aspects of Clean Delivery						
Clean Surface	9.0	28.6	19.6	4.8	65.5	60.7
Clean Hands	9.1	34.7	25.6	5.1	70.4	65.3
New Blade	5.1	70.4	65.3	6.0	73.6	67.6
Boiled Thread	9.0	40.8	31.8	5.0	69.8	64.8
Clean towel to dry baby	7.9	19.5	11.6	4.6	55.0	50.4
Breastfeeding	9.4	24.7	15.3	5.1	60.8	55.7
Total Number	**6,329**	**7,504**		**9,069**	**9,744**	

* Based on prompted responses.

Table 20. Changes in Maternal Knowledge

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Percent Recalled:						
Pregnancy Danger Signs[1]	12.9	15.7	2.9	15.7	20.0	4.3
Delivery Danger Signs[2]	20.0	27.5	7.5	22.5	30.0	7.5
Postpartum Danger Signs[3]	13.3	21.7	8.3	15.0	23.3	8.3
Newborn Danger Signs[4]	15.0	33.3	18.3	13.3	28.3	15.0
Total Danger Sign Knowledge	15.2	23.9	8.7	16.1	25.2	9.1

1. Possible responses: severe headache, high fever, edema of the face, edema of the hands, unconsciousness, convulsions, vaginal bleeding.
2. Possible responses: excessive vaginal bleeding, high fever, prolonged labor and convulsions.
3. Possible responses: excessive vaginal bleeding, foul-smelling discharge, high fever, convulsions, swollen feet or hands and severe headache.
4. Possible responses: poor feeding/unable to suckle, poor activity/can't be awakened, not crying, cold to the touch, breathing difficulties and chest retraction.

CHAPTER 7. DELIVERY AND NEWBORN CARE

This chapter presents indicators related to quality of care and care-seeking during childbirth and describes newborn care practices. The baseline verbal autopsy found that 26% of neonatal deaths occurred on the day of birth and that 73% occured during the first week (CIT). In addition, the number of stillbirths almost equals the number of neonatal deaths, and evidence suggests that a large proportion of these deaths may be related to intrapartum events. Therefore, interventions during childbirth and the first few days after birth are particularly critical to reducing neonatal deaths in this population.

Skilled birth attendance and institutional delivery care

Most women in this setting give birth at home assisted by family members or others who have received no formal health care training. Increasing institutional deliveries or birth attendance by doctors, nurses and auxiliary was not a primary goal of this program, but patterns in birth attendance are presented because they are related to birth outcomes. These data suggest a modest increasing toward more institutional births, from 11% to 15% in the comparison area and 12% to 17% in the intervention area (Table 21). The proportion of births attended by a trained traditional birth attendant (TBA) increased slightly in the intervention area from 1% at baseline to 6% at endline, perhaps because some TBAs were trained through the CARE intervention. The cesarean section rate remained very low, 2-3% in both communities, suggesting poor access to emergency obstetric care. The prevalence of self-reported delivery complications reduced dramatically from baseline to endline in both districts. The level of reported complications was 65% in both districts at baseline and about 35% at endline, suggesting that differences in survey methodology led to divergent reporting. Figure 18 shows that among women with reported complications, the proportion that received skilled birth attendance at home or in a facility remained unchanged. However, given the inconsistency of the levels of reported complications, this finding should be interpreted with caution.

Table 21. Institutional deliveries and birth attendance

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Institutional deliveries	11.3	15.2	3.9	12.4	16.3	3.9
Home delivery by						
Trained health professional *	6.8	6.8	0	4.3	6.1	1.8
Trained TBA	3.7	4.6	0.9	1.0	5.4	4.4
Others	78.2	73.4	-4.8	82.2	72.2	-10.0
Cesarean section rate	2.1	2.7	0.6	1.4	2.5	0.8
Total	**6,329**	**7,504**		**9,069**	**9,744**	

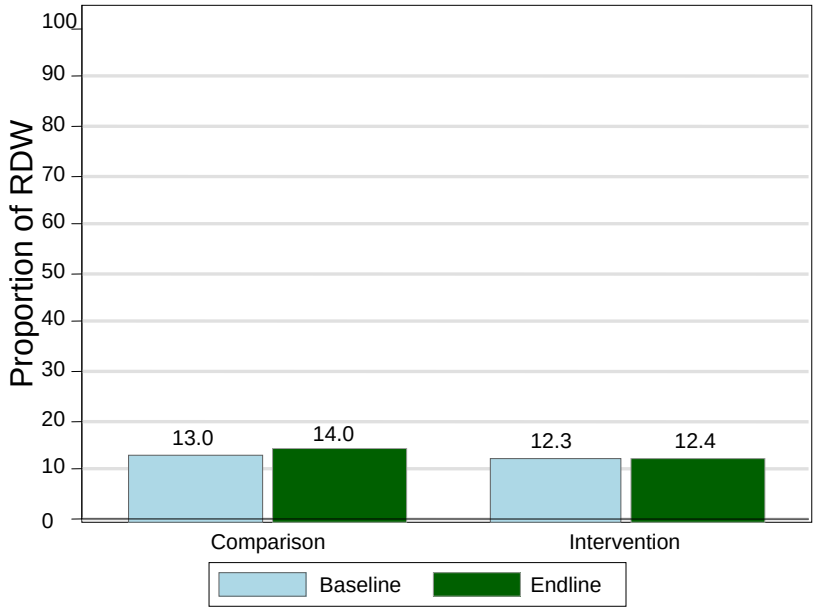
* MBBS Doctor, Nurse, Lady Health Visitor or Auxiliary Nurse Midwife.

Table 22. Skilled birth attendance by Maternal Characteristics*

	Comparison		Intervention	
	Baseline	**Endline**	**Baseline**	**Endline**
Maternal Age				
<20	21.7	24.6	20.1	29.1
20-34	18.0	22.6	15.8	22.8
35-49	9.3	15.4	15.0	15.5
Birth Order				
1	33.0	40.5	31.3	39.2
2-3	19.9	20.7	16.3	21.1
4-5	12.2	14.9	12.9	16.9
6+	8.5	11.2	11.3	14.9
Mother's Education				
Illiterate	10.3	12.8	11.7	17.4
Primary School	20.4	21.5	23.5	28.9
Middle School	30.0	30.4	37.0	37.7
High School and Above	54.5	54.6	60.9	54.5
Religion				
Hindu	18.0	22.3	17.7	23.6
Muslim	20.1	17.3	12.3	17.4
Others	22.2	15.8	18.7	26.7
Standard of Living Index				
Low	11.3	13.4	11.0	15.8
Middle	18.4	23.7	15.3	24.0
High	41.9	50.2	40.4	42.3
Total Number	6,329	7,504	9,069	9,744

* Institutional delivery or MBBS doctor, nurse, lady health visitor or auxiliary nurse midwife at home delivery.

Figure 18. Proportion of RDW with self-reported delivery complications that gave birth with a trained birth attendant



Immediate Newborn Care Practices

Behavior change communications in the intervention area focused on promoting specific newborn care practices that have been shown to reduce risk of infection and hypothermia. Four key newborn care practices promoted through the intervention included: (a) cutting the umbilical cord with a blade that is new or boiled and tying it with boiled thread; (b) delaying the newborn's first bath for 3 or more days after delivery; (c) drying and wrapping the newborn immediately after delivery; (d) initiation of breastfeeding immediately (i.e., within 1 hour) after delivery.

At the end of the project, the proportion of home deliveries in the intervention area for which the combined practice of sterile cord cutting and tying was followed increased to 68% from 32% at baseline (Figure 19). A smaller, 5 percentage point gain (from 36% to 42%) was measured in the comparison area. The practice of delaying the newborn's first bath also showed noticeable increase in the intervention area. The proportion of newborns bathed more than 6 hours after birth increased from 24% at the start of the project to 60% at the end of the project, and the proportion bathed 3 or more days after birth also increased from 4% to 43% (Figure 20). No changes of practical significance were measured in the comparison area. The proportion of newborns that were dried and wrapped before the placenta was delivered more than doubled in the intervention area from 18% at baseline to 45% at endline (Figure 21). However, when these indicators are plotted with the interim adequacy survey findings, they become more difficult to interpret. For example, the indicator related to drying and wrapping the newborn showed no improvement, or a slight decline, over the course of the adequacy surveys (Figure 22). The endline coverage of 45%, which includes the women who were surveyed during the adequacy surveys, is difficult to reconcile with these data. Perhaps there was some difficulty with the survey methodology for measuring this behavior. However it is unclear why such difficulty would be encountered only at endline, or only during the surveys prior to the endline and only in

the intervention district. An alternative explanation may be that perhaps there was diffusion of knowledge within the study area over the period of the intervention and the RDW answered the question in a way that more closely reflected their current knowledge than their actual practice at the time they gave birth, which was one month to two years before the endline survey.

At baseline, most women in both study districts delayed the start of breastfeeding for several days after birth. In the intervention area, service providers have been encouraging women to start breastfeeding within one hour of birth, or as soon as possible. Initiation of breastfeeding within 1 hour of delivery increased in the intervention area from 6% at baseline to 34% at endline (Figure 23). Initiation of breastfeeding during the first day of life rose from 20% to 64% in the intervention area. The comparison area saw no change in these indicators. Similarly, colostrum feeding was reported to increase from 20% to 88% in the intervention area, while little change (14% to 20%) was seen in the comparison area (Figure 24). The endline data for this indicator are more consistent with data from the adequacy surveys throughout the intervention (Figure 25). However, at enline 44% of women reported starting breastfeeding within one hour, compared to 18%, 18%, and 22% for the previous three reference periods. Some caution should be taken with this indicator since this is an unlikely jump and could indicate increased knowledge rather than actual practices. Nevertheless, both adequacy survey data and endline data suggest that breastfeeding practices have improved markedly in the intervention area during the course of the program.

Figure 19. Sterile cutting and tying practices at home deliveries

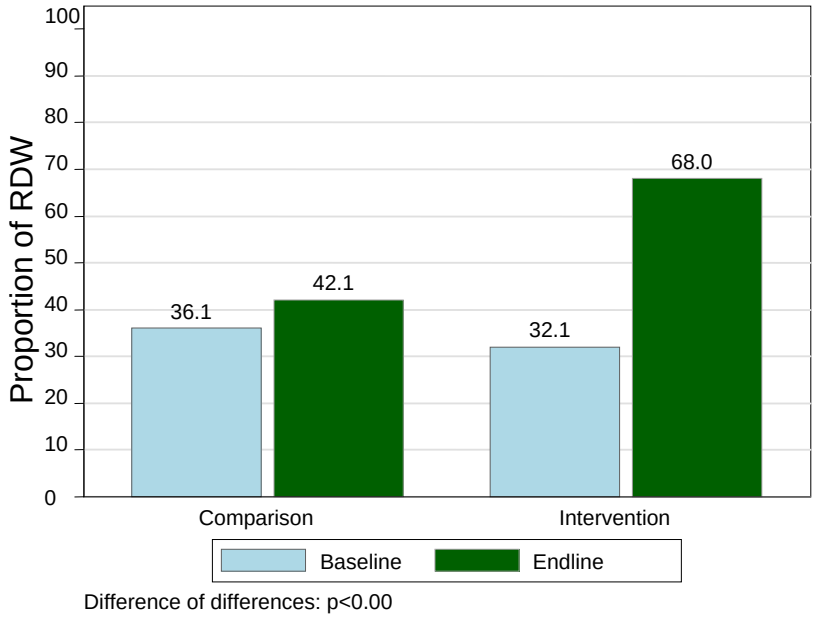


Figure 20. Timing of the newborn's first bath

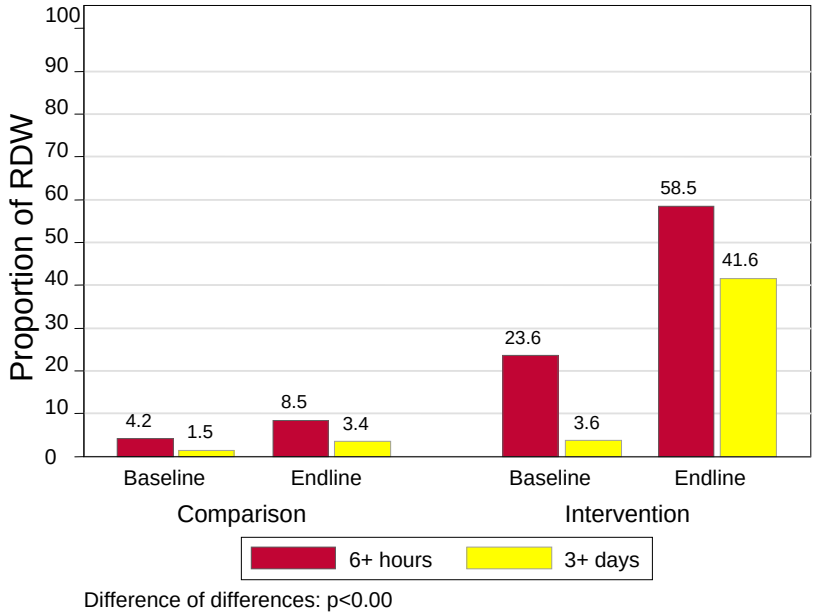


Figure 21. Newborn dried and wrapped immediately

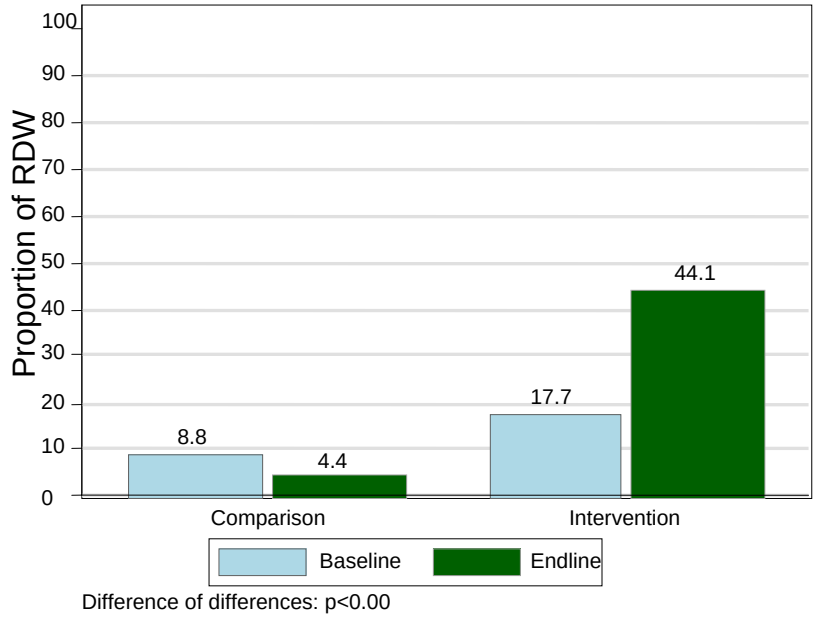


Figure 22. Trends in prompt drying and wrapping

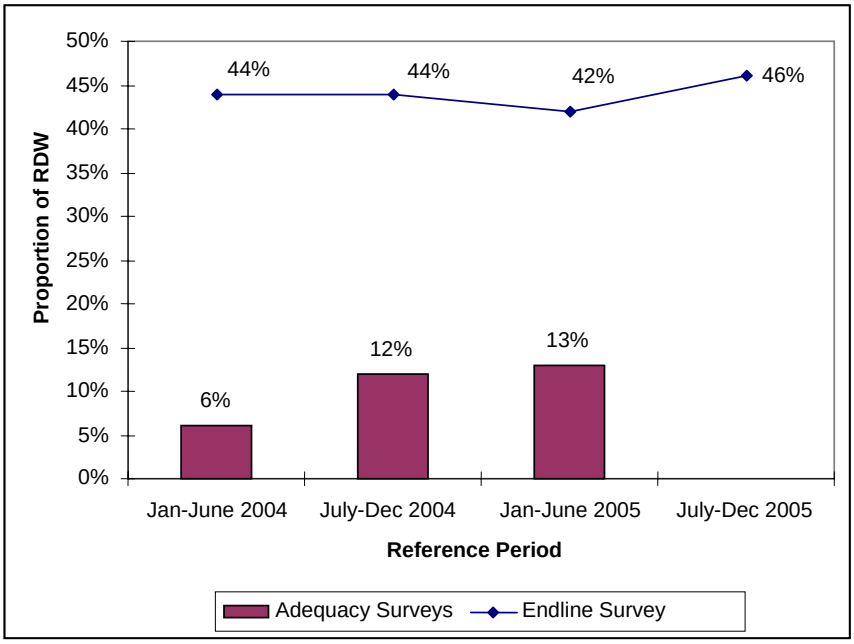
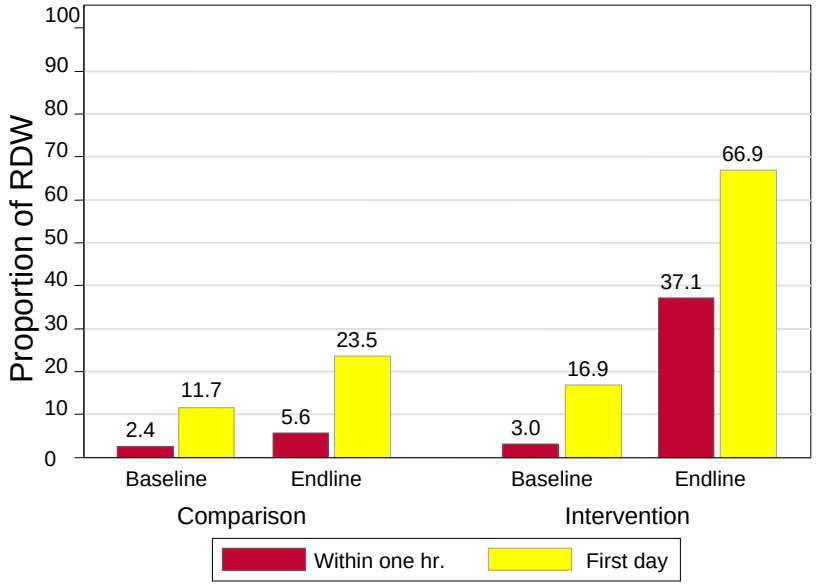


Figure 23. Timing of Breastfeeding Initiation



Difference of differences: p<0.00

Figure 24. Colostrum Feeding

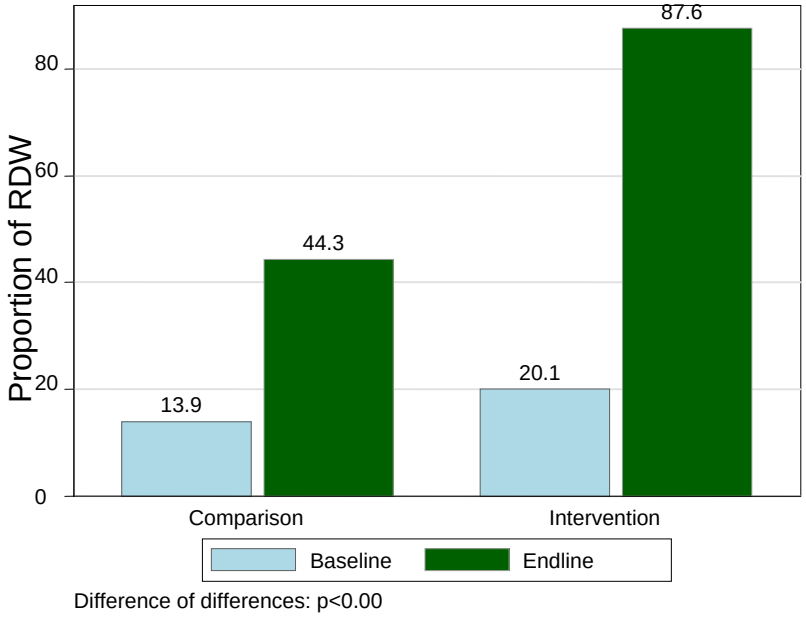


Figure 25. Trend line: breastfeeding initiation within one hour

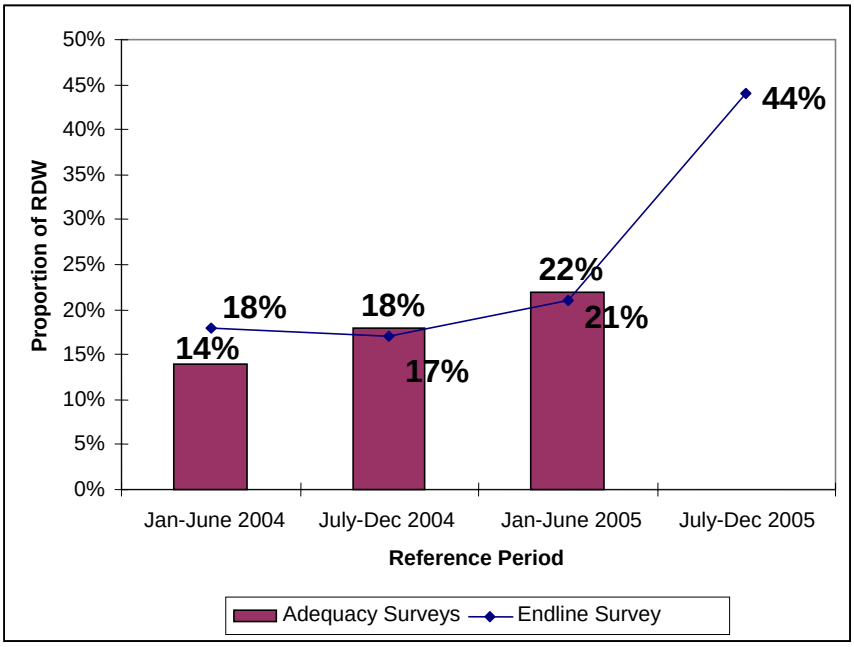


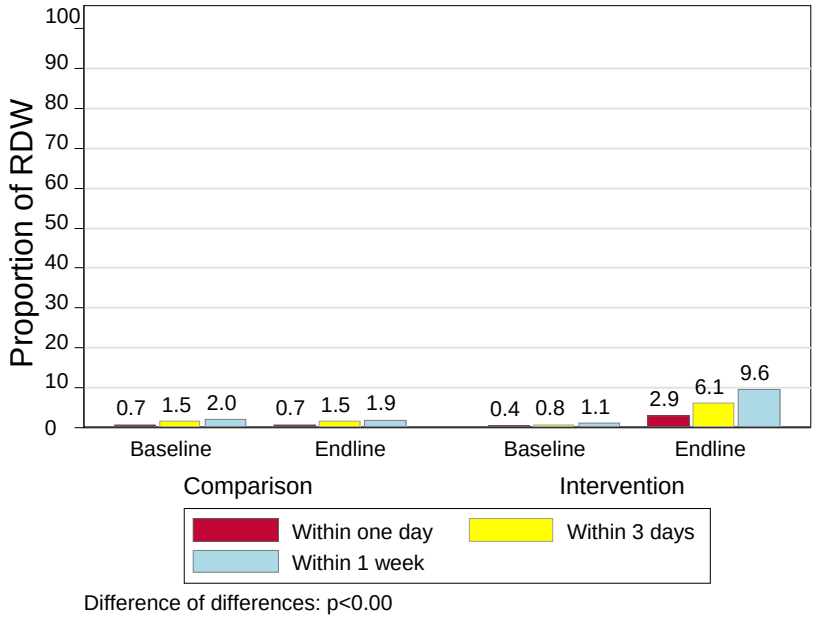
Table 23. Breastfeeding Initiation of First Day of Life, by Maternal Characteristics

	Comparison		Intervention	
	Baseline	Endline	Baseline	Endline
Maternal Age				
<20	10.7	21.3	16.2	16.2
20-29	12.4	24.4	17.3	17.3
30-39	6.3	18.7	15.0	15.0
>39				
Birth Order				
1	14.0	22.8	18.9	67.6
2-3	14.1	28.7	18.5	63.9
4-5	10.7	23.8	16.1	64.7
6+	6.0	23.1	13.7	67.1
Mother's Education				
Illiterate	7.0	17.6	13.3	64.8
Primary School	13.9	23.6	21.2	72.0
Middle School	17.4	29.2	34.3	72.8
High School and Above	33.1	44.1	44.4	75.6
Religion				
Hindu	11.8	16.1	16.1	66.9
Muslim	9.5	20.0	20.0	66.4
Others	11.1	18.7	18.7	77.8
Standard of Living Index				
Low	7.8	18.9	13.6	65.2
Middle	12.0	24.6	16.8	66.7
High	24.8	38.6	28.1	73.3
Total Number	6,203	7,312	8,890	9,467

Postpartum Home Visits by Service Providers

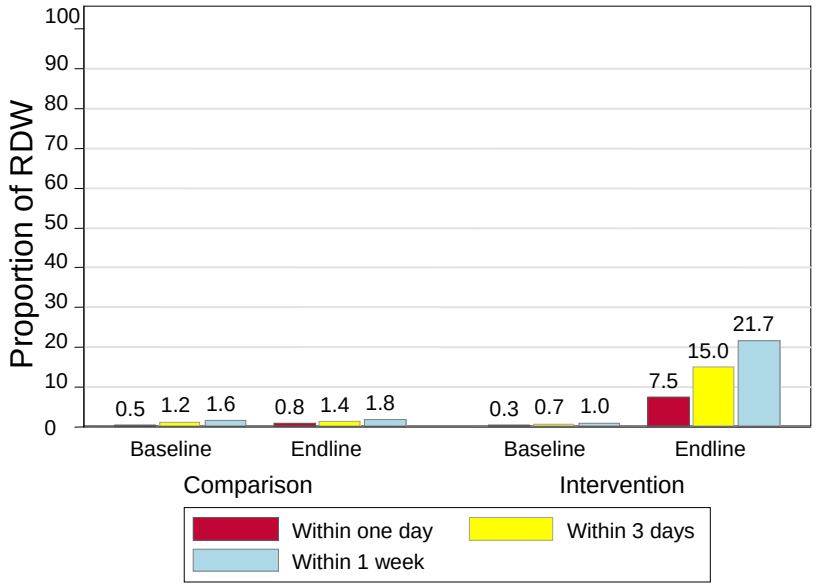
Postpartum home visitation was an important part of the intervention strategy, to promote healthy newborn care practices and care-seeking for illness. Postpartum home visits by ANMs (Figure 26) or AWWs (Figure 27) were rare at baseline (< 2%) and remained that way in the comparison area at endline. In the intervention area, the greatest success in postpartum home visitation within 1 week of birth was achieved by the AWWs, which reached 23% of households at endline (Figure 27), followed by the Change Agents (17%, Figure 28) and the ANMs (9%, Figure 26). Values for postpartum home visitation within 3 days were lower, 16% for AWWs, 13% for change agents and 6% for ANMs. Postpartum visits by ANWs, AWWs, or CAs within one week remained low in the comparison area (3.3%, Figure 29), but increased significantly in the intervention area from 1.9% to 28.9%. Visits within one day and within 3 days also increased markedly, suggesting an overall improvement in postpartum visits by any health worker in the intervention area.

Figure 26. Timing of Postpartum Visits by ANMs



Difference of differences: p<0.00

Figure 27. Timing of Postpartum Visits by AWWs



Difference of differences: p<0.00

Figure 28. Timing of Postpartum Visits by Change Agents

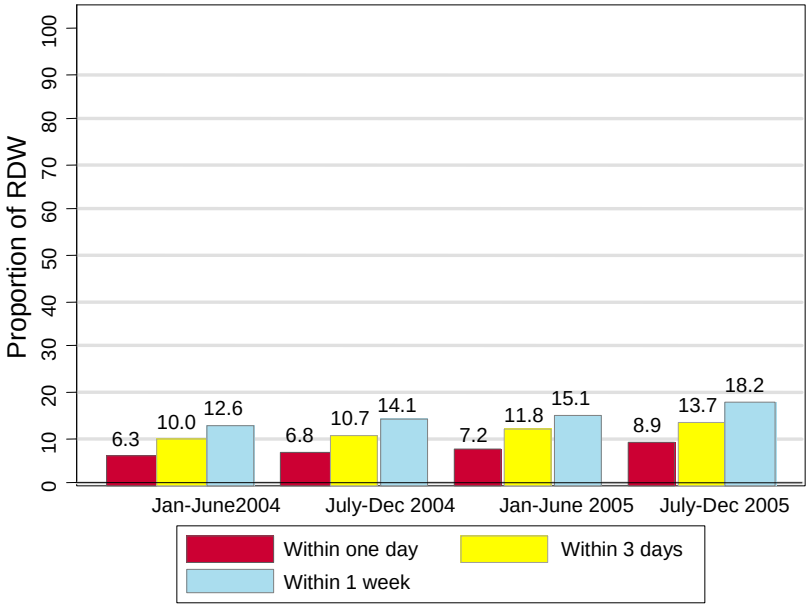


Figure 29. Postpartum home visits by ANMs, AWWs or Change Agents

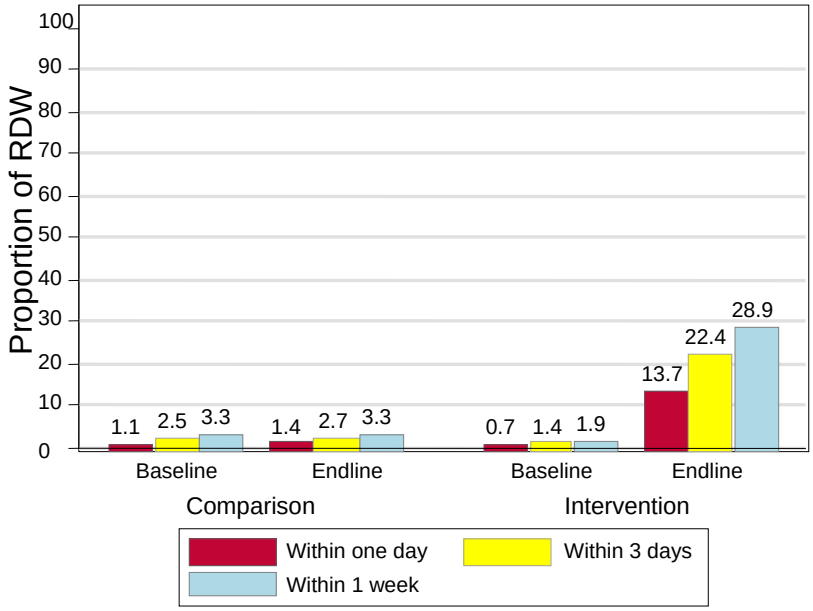
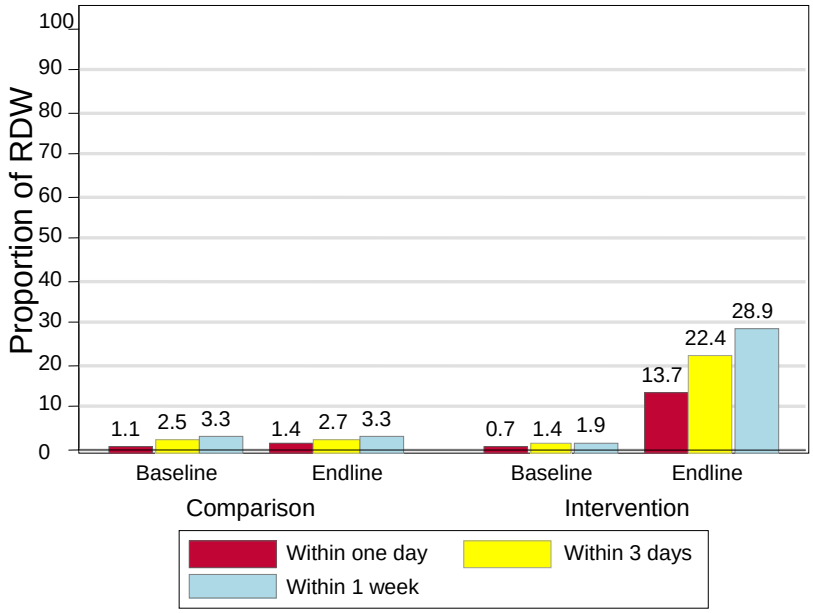


Figure 30. Postpartum home visits by ANMs, AWWs or Change Agents

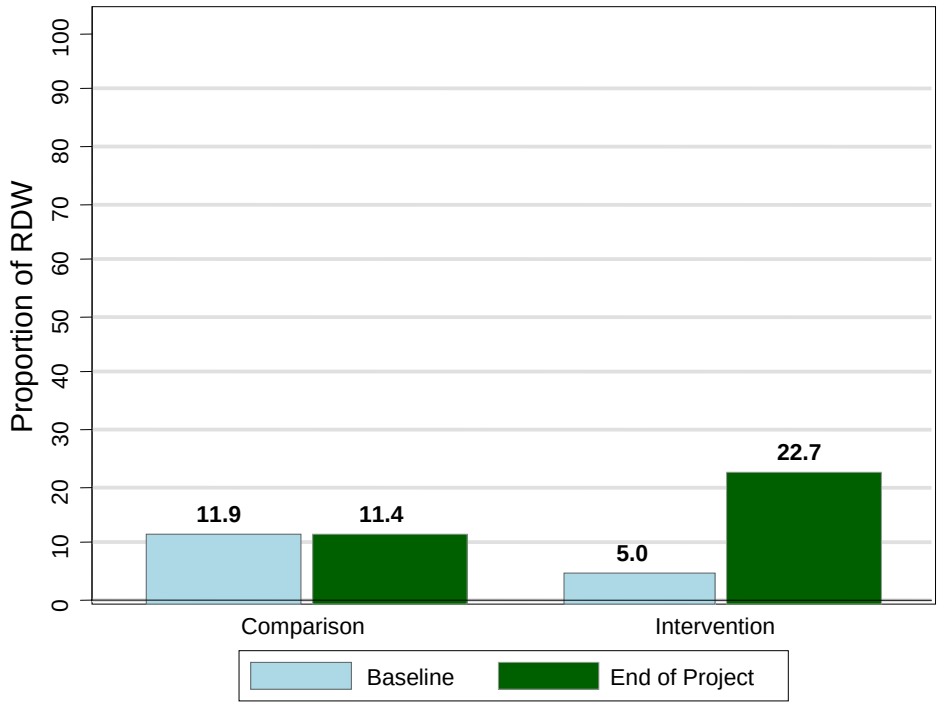


Care-seeking for Newborns

Patterns of care-seeking for newborns increased during the program, but nonetheless only a minority of newborns received care from trained providers. Among all newborns, the proportion that received a check-up from a trained provider within one month of birth increased from 5% at baseline to 23% at endline (Figure 31). Levels of reported newborn complications[2] declined in the intervention area from baseline (57%) to endline (42%). A similar, but smaller decline in level of reported illness were also seen in the comparison area, from 51% to 42%. Little is known about the reliability of retrospectively reported neonatal illness, so this change should be interpreted with caution. It may or may not reflect a real change in the prevalence of serious complications. Reported care-seeking showed some shifts in both areas (Figure 32, Table 23). In the intervention area, an increased proportion of women reported taking sick newborns for care from a trained provider (allopathic, qualified doctors, lady health visitors or ANMs) at endline (31%) compared with baseline (20%). However, only 1 in 3 newborns received this type of care, and 27% received no care from outside the home. There was a slight decline in the rate of care-seeking from a trained provider in the comparison area.

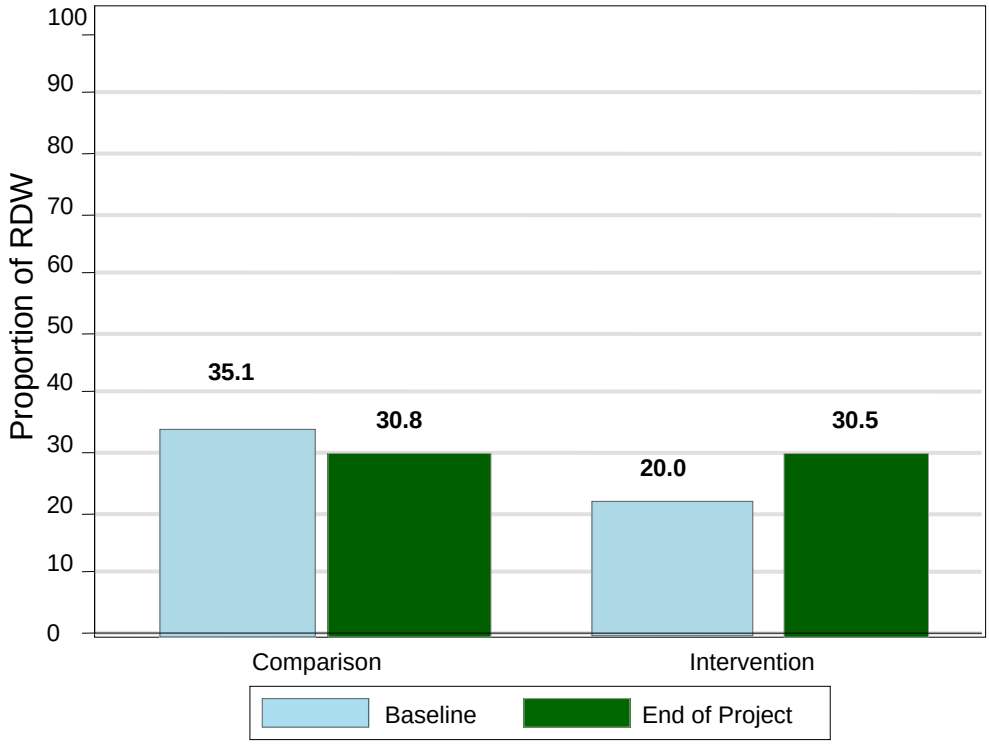
[2] Complications included fever, breastfeeding problems, breathing trouble, fast breathing, chest in-drawing, drowsiness, jaundice, diarrhea, persistent vomiting, felt cold, red or discharging eye, skin pustules, umbilical redness or discharge, unconsciousness, and convulsions.

Figure 31. Newborns that received a check-up from a trained provider within one month



Difference of differences: p<0.00

Figure 32. Newborns with complications that received care from a trained provider



Difference of differences: p<0.00

Table 24. Care-seeking for Sick Newborns

	Comparison			Intervention		
	Baseline	**Endline**	**Change**	**Baseline**	**Endline**	**Change**
Sought Care From:*						
Qualified doctor, nurse, LHV or ANM	35.1	30.8	-4.3	20.0	30.5	10.5
Homeopathic or Ayurvedic doctor	1.3	20.4	19.1	1.6	16.4	14.8
Untrained doctor	17.3	19.4	2.1	38.1	20.5	-17.6
Others	21.0	14.5	-6.5	19.0	11.3	-7.7
No care sought outside of the home	27.1	24.8	-2.2	22.6	27.3	4.7
Total Numbers of Newborns with Complications	3,142	2,858		5,087	3,747	

* Multiple responses possible.

CHAPTER 8. EQUITY OF PROGRAM COVERAGE

This chapter presents data on the equity of program coverage by geographical sectors and socio-cultural indicators. The program attempted to cover all geographic sectors in the intervention district and to improve equity of coverage regardless of socio-cultural factors by targeting coverage to mothers of lower economic status and caste. Indicators are presented to show distribution of program activities and practices at baseline and at the end of the project.

Comparison of Geographical Equity

Figures 31-38 show program coverage by geographical sector in the intervention district only. Though there is some variation among sectors, no sector stands out as having much higher or lower coverage for all of the indicators. The proportion of recently delivered women receiving visits by auxiliary nurse midwives increased significantly from baseline to endline and showed some variation across sectors with a high of 42% in Puredalai and a low of 27% in Banikodar (Figure 31). Aganwadi worker coverage increased even more dramatically from baseline to endline (Figure 32), and change agents achieved about 30% in all sectors (Figure 33). AWW coverage was highest in Banki (56%) and lowest in Dariyabad (33%), while CA coverage was highest in Harak (33%) and lowest in Banikodar (25%). Antenal care coverage increased in all sectors but was highest in Banki (51%, Figure 34) at endline while Dariyabad had the lowest coverage (31%). Most sectors saw slight improvements in skilled attendance at birth from baseline to endline, and there was less variation in coverage at endline (16%-28%, Figure 35). Clean cutting and tying practices and breastfeeding on the first day increased significantly in all sectors with relatively even distribution (Figures 36-37). The proportion of RDW receiving postpartum visits in the first three days went from around 1% in most sectors to between 20 and 25% in all sectors (Figure 38). Therefore, though geographic variations were present, program coverage was relatively equal across sectors and improved within each sector over the course of the intervention.

Figure 33. Auxiliary Nurse Midwife Visit Coverage by Sector, Intervention District Only

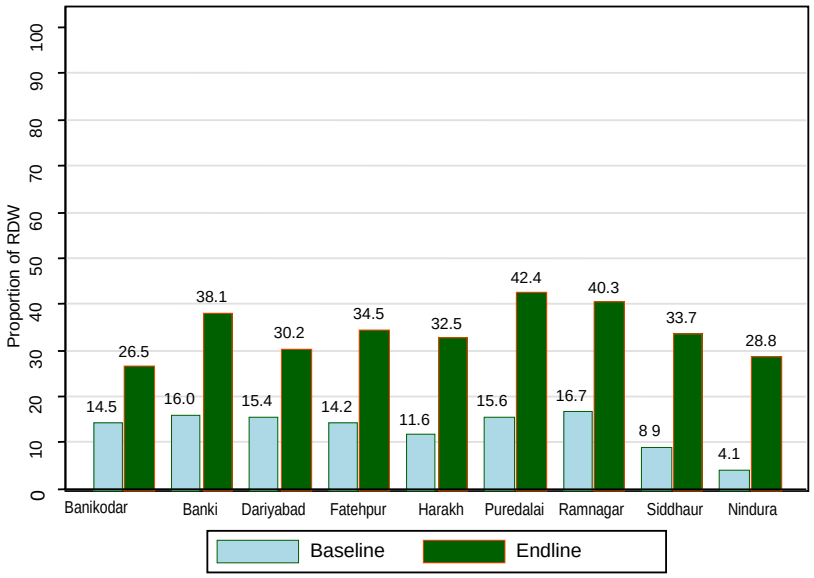


Figure 34. Anganwadi Worker Visit Coverage by Sector, Intervention District Only

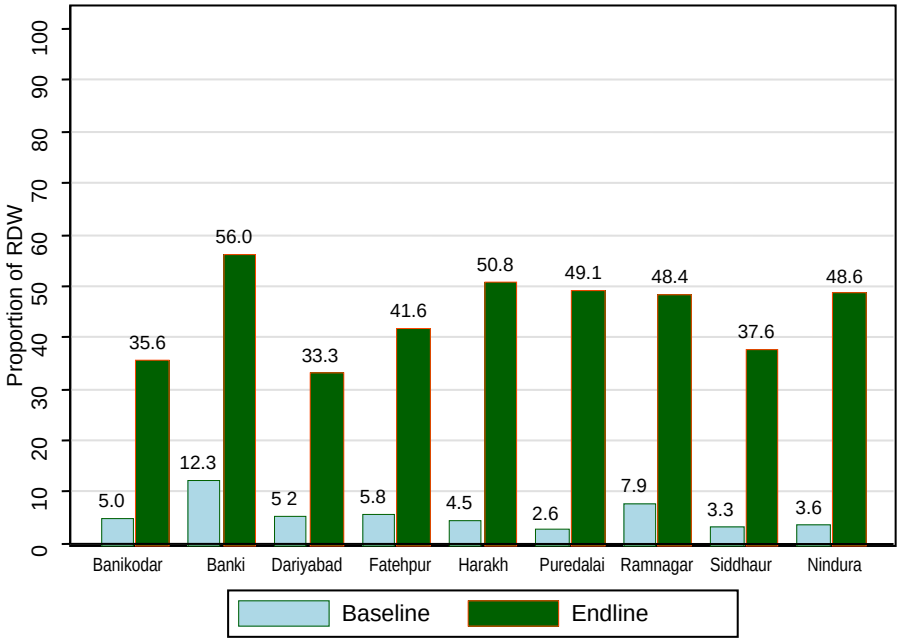


Figure 35. Change Agent Visit Coverage by Sector, Intervention District Only

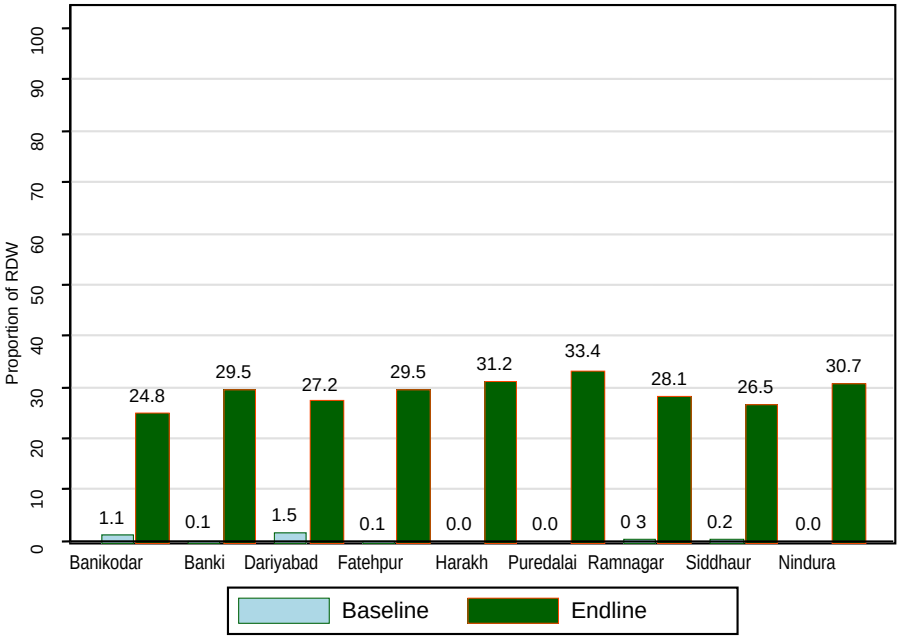


Figure 36. Antenatal Care Coverage by Sector, Intervention District Only

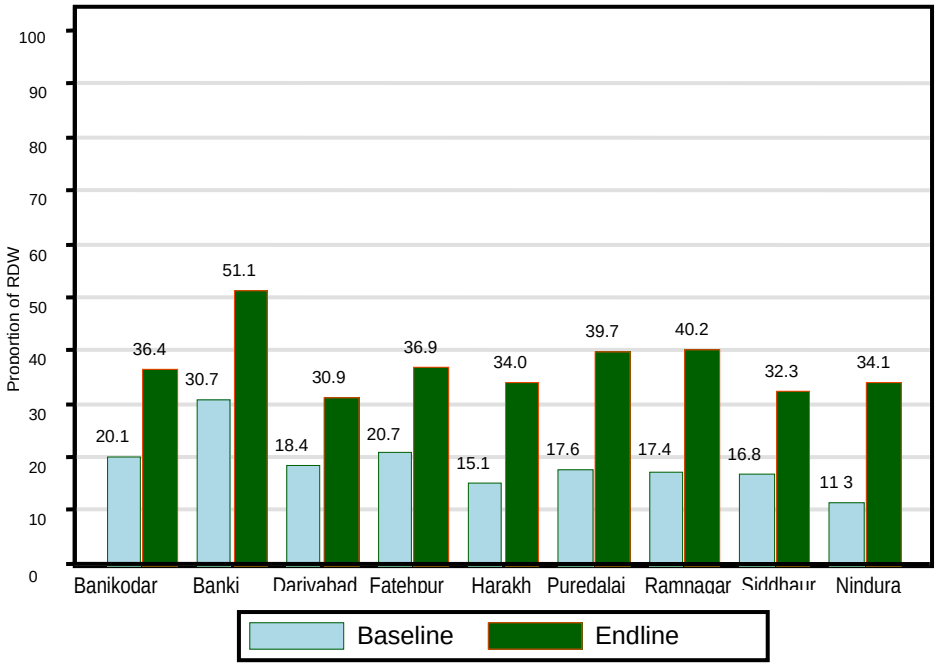


Figure 37. Skilled Birth Attendance at Home or Facility by Sector, Intervention District Only

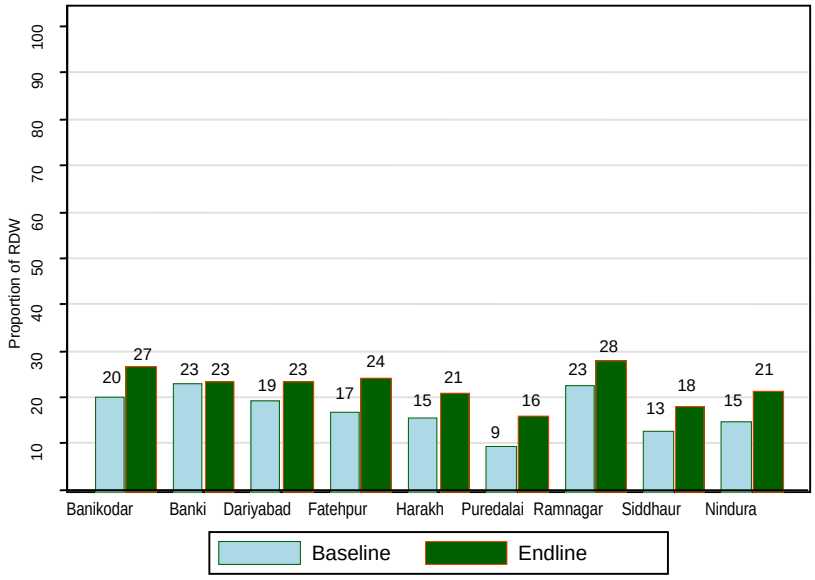


Figure 38. Clean cutting and tying practices by Sector, Intervention District Only

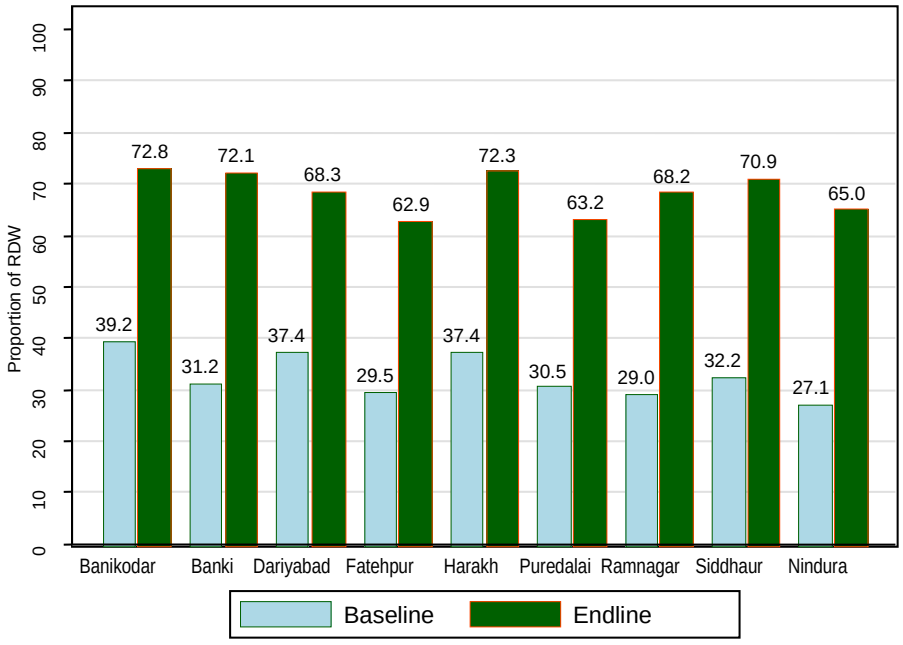


Figure 39. Breastfeeding Initiation on Day of Birth by Sector, Intervention District Only

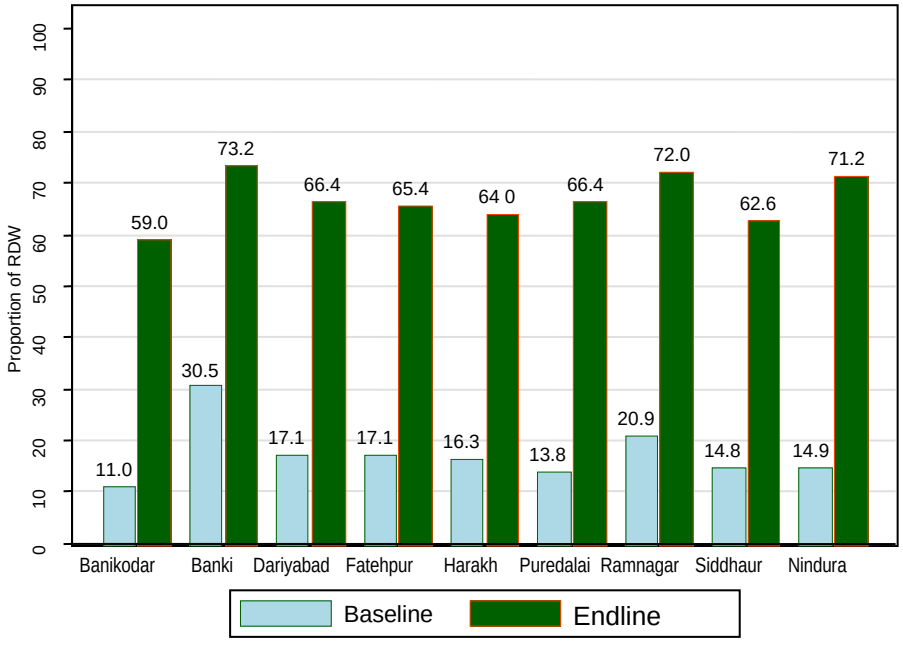
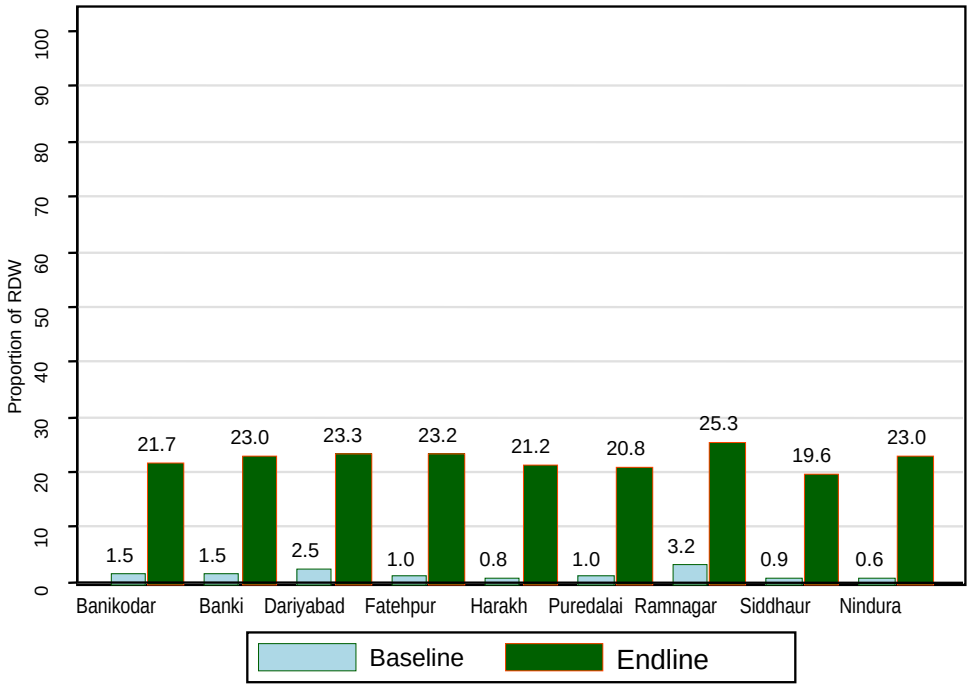


Figure 40. Received postpartum visit within three days by Sector, Intervention District Only



Comparison of Socio-cultural Equity

Program coverage was examined using two socio-cultural indicators: standard of living index (SLI) and caste group (scheduled castes/tribes, other backward classes, and other classes). The SLI is a summary measure that was calculated by the same method used in NFHS-II, in which points are assigned based on the family's house type, toilet facitliy, source of lighting, main cooking fuel, source of drinking wate and possession of certain durable goods such as car, tractor, bicycle, electric fan, television, sewing machine, etc. This measure, along with caste classifications which are designated by the Government of India, provide economic and socio-cultural markers of the study population. Program indicators are presented here for baseline and endline to show equity of coverage by socio-economic groups.

Program Coverage by Standard of Living Index (SLI) in the Intervention District

Indicators of program coverage in the intervention district are presented by SLI categories: low, medium, or high. Coverage by SLI appears more equitable compared to geographical distribution. The proportion of RDW receiving visits from ANMs increased in all categories by about 20%, with an endline range of 32-40% (Figure 39). AWW visit coverage increased even more dramatically by about 40% in each SLI category, with a rage of 44-48% at end of program (Figure 40). Visits by CAs were also equitable at about 30% of RDW in all groups at endline (Figure 41). Figure 42 shows that antenatal care coverage had a significant

difference between SLI categories at both baseline and endline (Low: 31%, High: 58%), but coverage in all groups increased. Skilled attendance at birth showed little to no improvement from baseline and also had unequal distribution by SLI group (Low: 16%, High: 42%, Figure 43). Clean cutting and tying practices and initiation of breastfeeding on the first day showed marked increases and were equitable across groups, ranging only a few percentage points (Figures 44-45). Postpartm visitation within three days increase by about 20% and was almost exactly equal in all groups at endline (Figure 46). Home visitation and preventive behaviors improved over the course of the intervention and appear equitable among SLI groups, while care-seeking for antenatal check-ups and skilled attendance remained unequal by group.

Figure 41. Auxiliary Nurse Midwife Visit Coverage by SLI

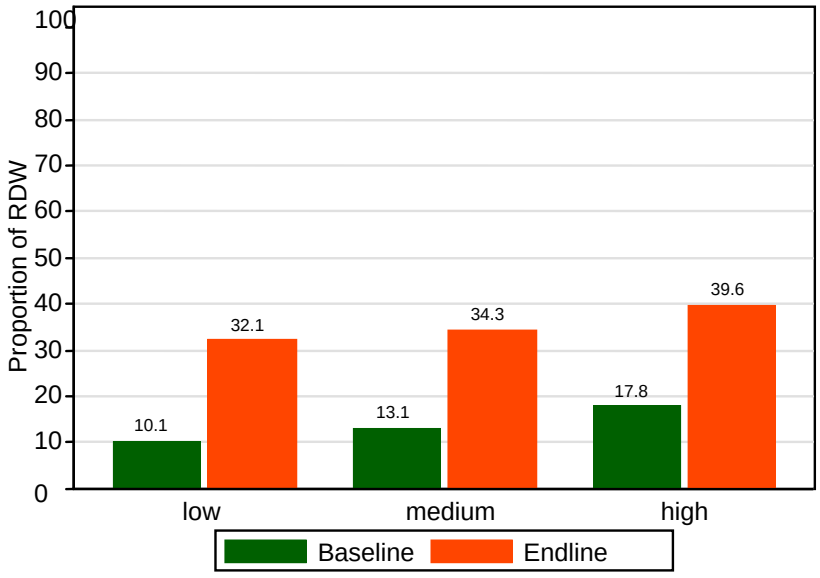


Figure 42. Anganwadi Worker Visit Coverage by SLI

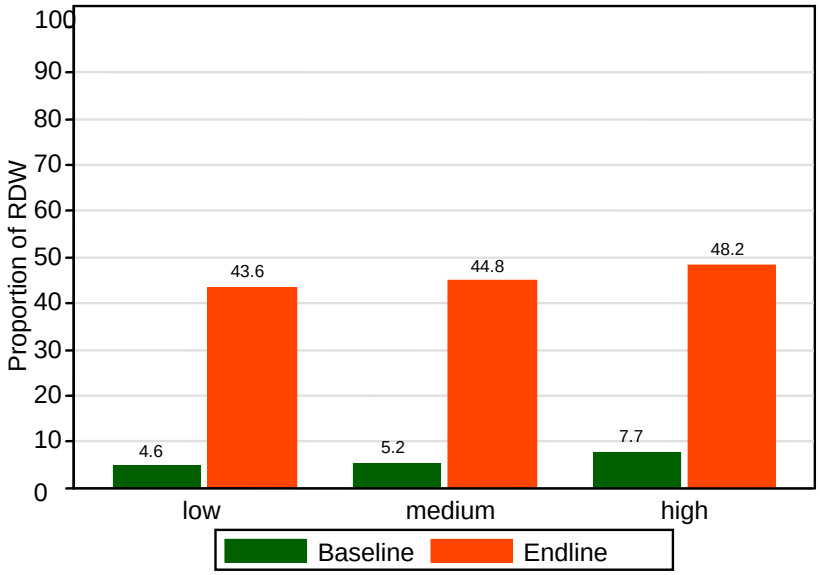


Figure 43. Change Agent Visit Coverage by SLI

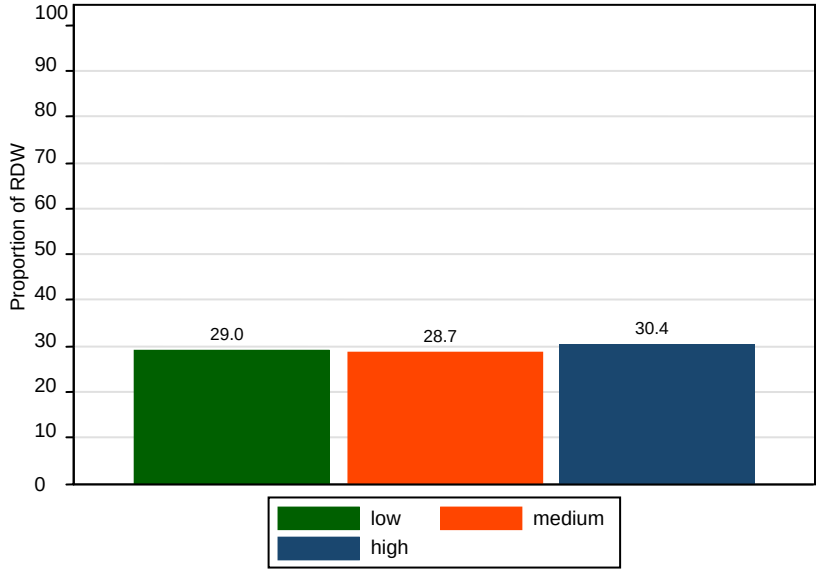


Figure 44. Coverage of one of more Antenatal Check-ups

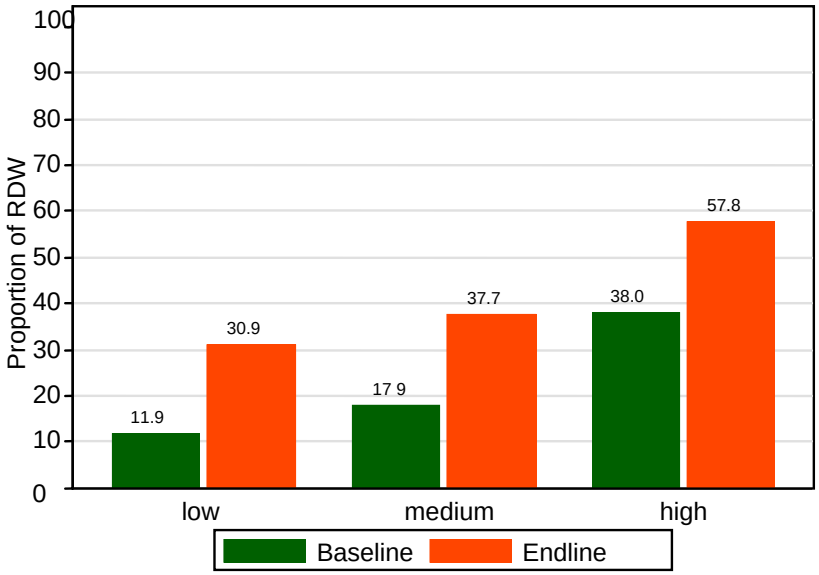


Figure 45. Trained Birth Attendance (Home or Facility) by SLI

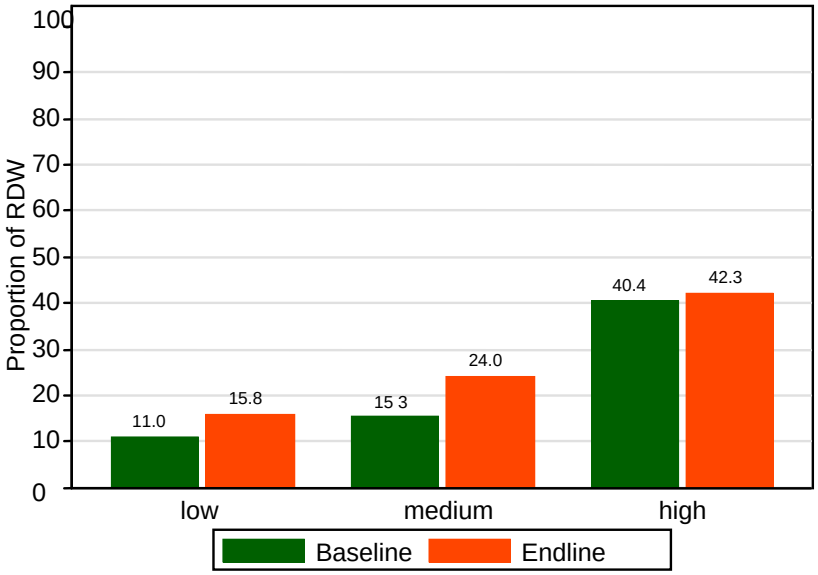


Figure 46. Clean cutting and tying practices by SLI

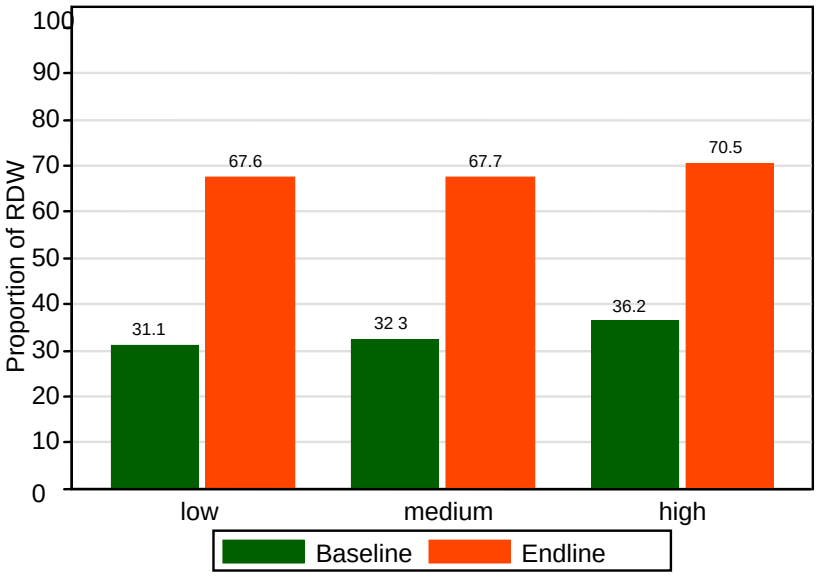


Figure 47. Breastfeeding Initiation on Day of Birth by SLI

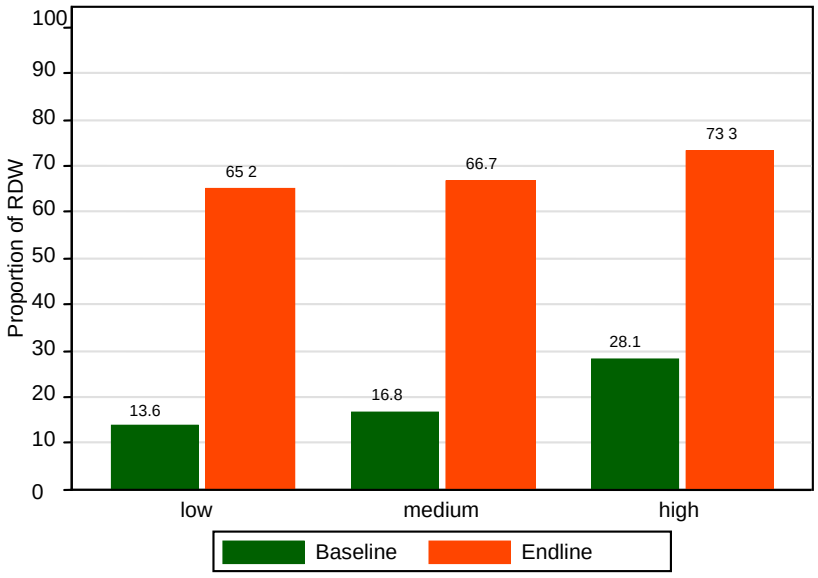
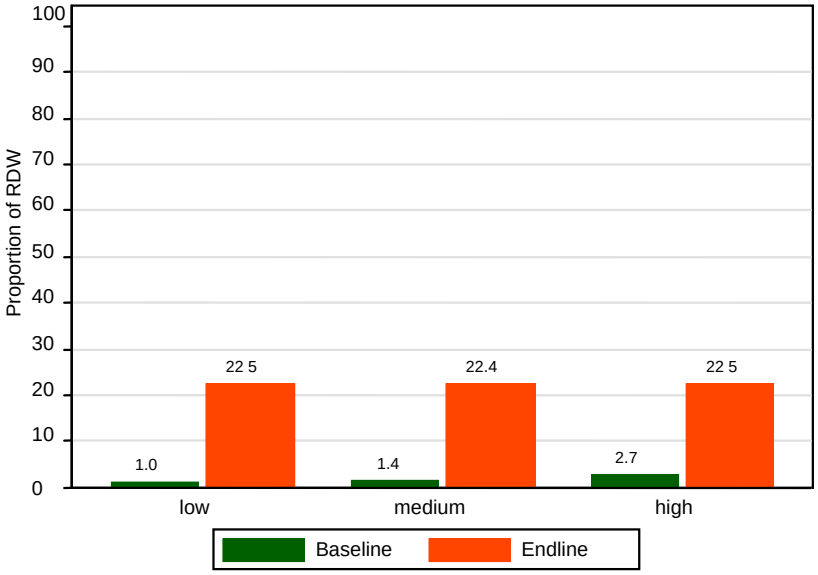


Figure 48. Postpartum visit within three days by SLI


100
90
80
70
60
50
40
30
20
10
0
Proportion of RDW
22 5
22.4
22 5
1.0
1.4
2.7
low
medium
high
Baseline
Endline

Comparison of Coverage by Scheduled Castes and Backward Classes vs. Other Groups

In this section, recently delivered women are categorized by caste into three categories: scheduled castes/tribes, other backward classes, and other classes. Because there was no baseline data collected on caste, this section compares coverage in the intervention and comparison districts at endline. Coverage of antenatal home visits visits by ANMs was equitable in the intervention district (33-36%, Figure 47) and slightly higher than the comparison group, while coverage by AWWs was also equitable (40-45%, Figure 48) but significantly higher than the comparison district. The proportion of RDW visited by CAs in the intervention group ranged from 26-30% by caste (Figure 49). Again, antenatal check-ups and skilled birth attendance showed the most inequality among groups (Figures 50-51). Neither of these indicators was considerably better in the intervention group versus the comparison group, and in fact the comparison group had a higher proportion of skilled birth attendance for the "other classes" category. Practices of clean cutting and tying and initiation of breastfeeding the first three days were quite equal across castes (68-69%, 66-70%, respectively, Figures 52-53). And finally, coverage of postpartum home visits was about 20% higher than the comparison district and ranged from 18-24% in the different castes (Figure 54). Anganwadi worker and change agent coverage for antenatal and postpartum visits showed slightly better coverage for lower castes at endline. This could be due to the fact that anganwadi workers and change agents are more likely to be from lower castes and, therefore, are more comfortable visiting women of lower castes. While program coverage seems to have improved for lower socio-economic groups, access to care remains unequal, which could be reflective of many barriers such as knowledge, cost, distance, or cultural factors.

Figure 49. Auxiliary Nurse Midwife Antenatal Visits by Caste

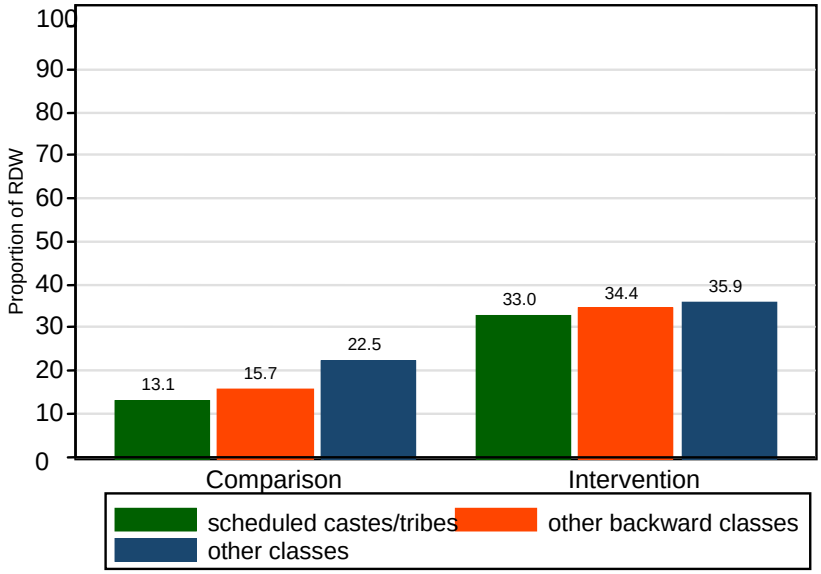


Figure 50. Anganwadi Worker Antenatal Visits by Caste

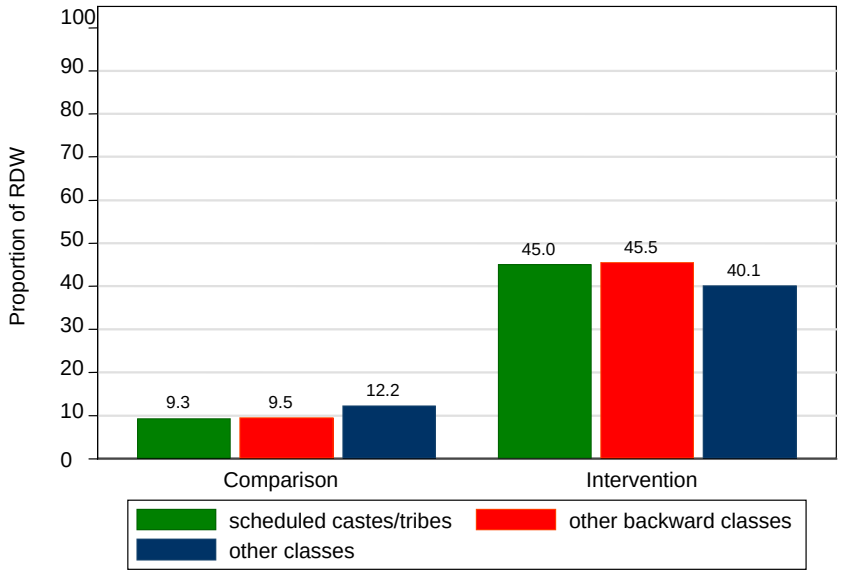


Figure 51. Change Agent Antenatal Visit Coverage by Caste

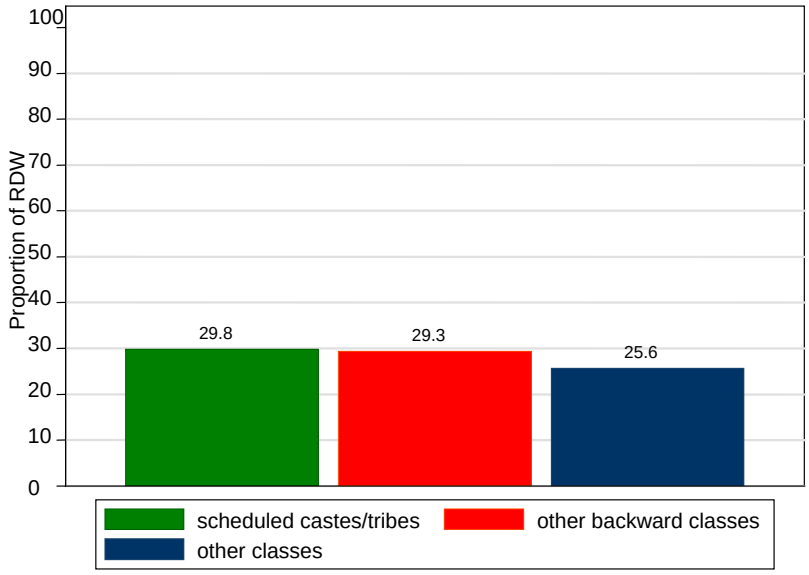


Figure 52. Antenatal Check-up by Caste

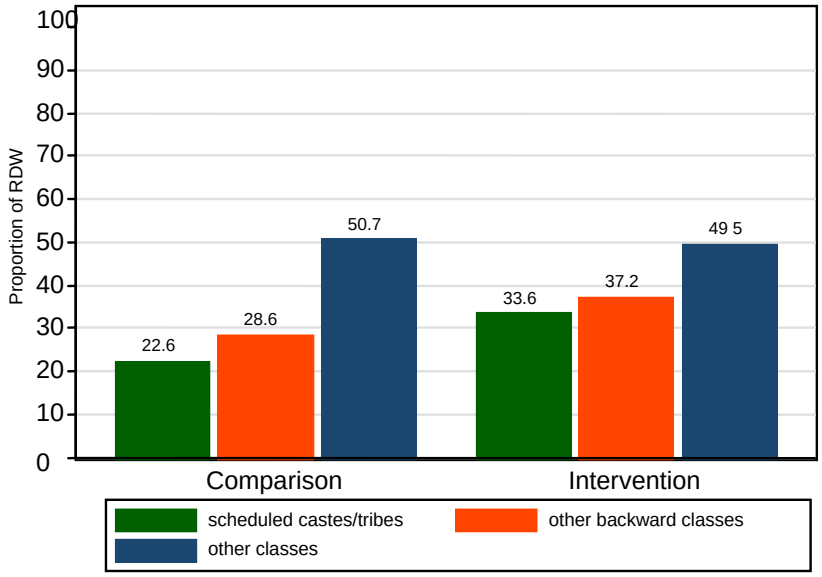


Figure 53. Trained Birth Attendance at Home or Facility by Caste

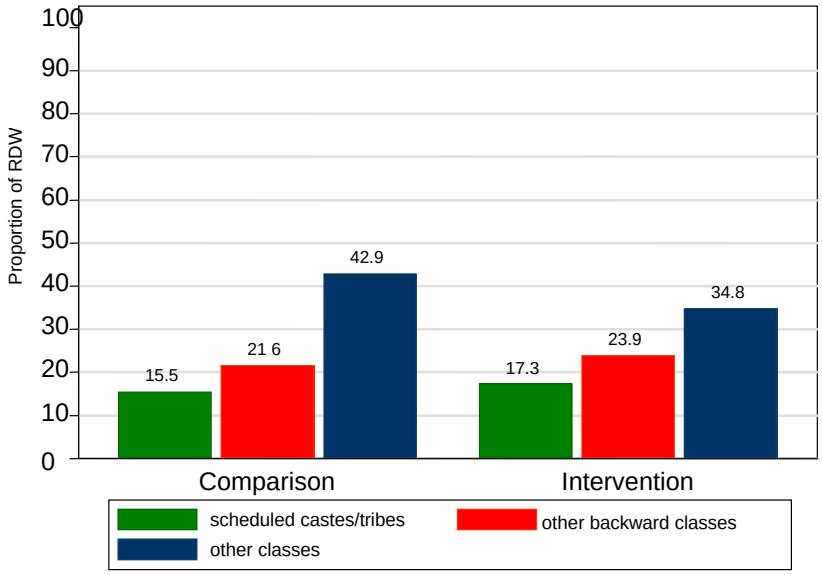


Figure 54. Clean cutting and tying practices by Caste

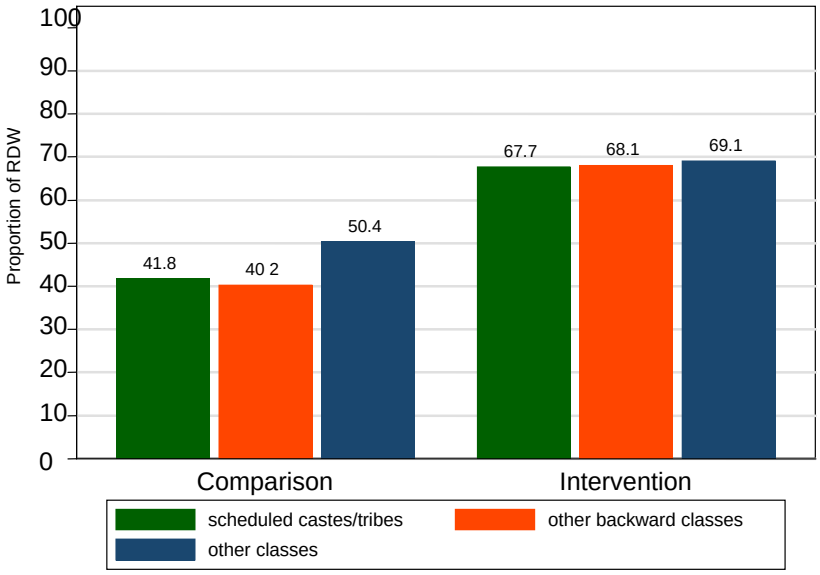


Figure 55. Breastfeeding Initiation on Day of Birth by Caste

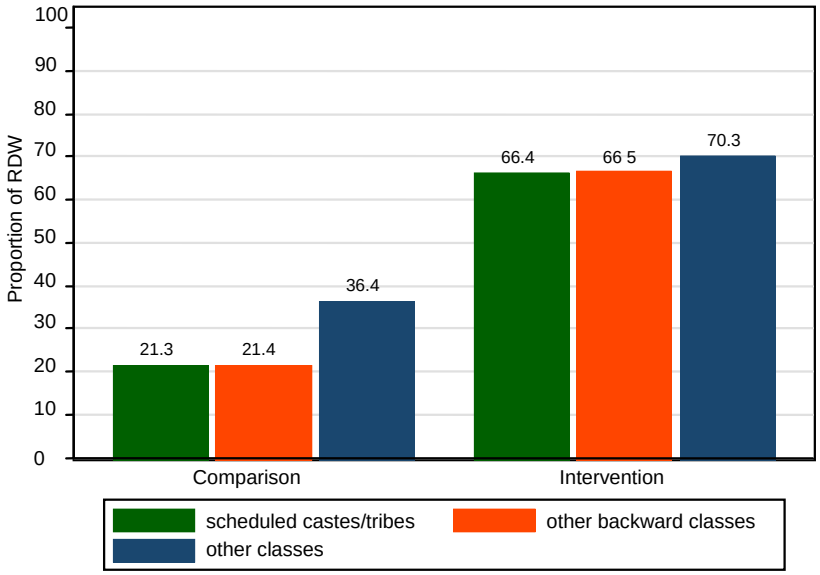
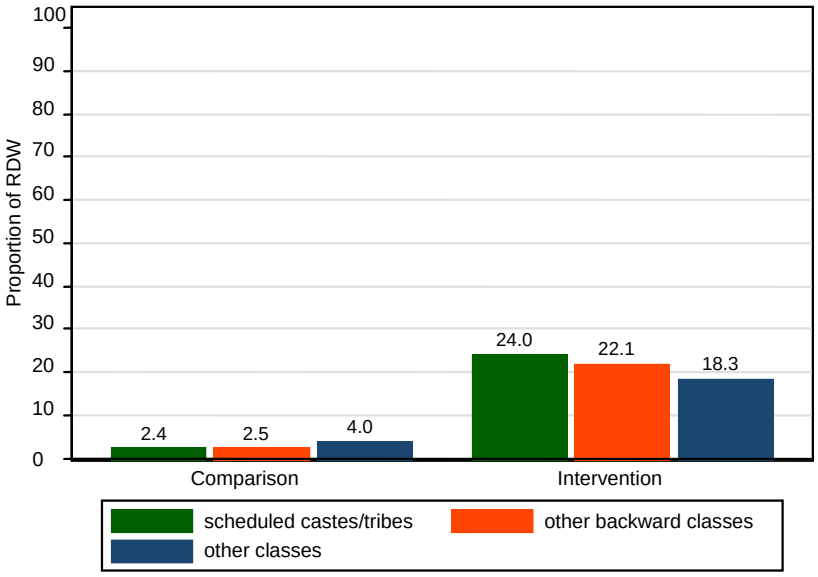


Figure 56. Received postpartum visit within three days by Caste



CHAPTER 9. TRENDS IN NEONATAL MORTALITY

Table 24 shows the mortality rates of the comparison and intervention areas at baseline and at the end of the project. Neonatal mortality rates were relatively constant in both the comparison and intervention areas. The neonatal mortality rate in the comparison area was 47.3 per 1,000 live births (confidence interval 42.3-52.7) at baseline and 49.8 per 1,000 live births at endline. The neonatal mortality rate in the intervention area was 50.5 per 1,000 live births (confidence interval 44.6-55.5) at baseline and 47.8 per 1,000 live births (confidence interval 43.2-52.6) at the endline. No considerable differences were seen in early neonatal mortality, with baseline and endline rates at 21.3 per 1000 live births and 18.1 per 1000 live births, respectively, in the comparison area and 23.4 per 1000 live births and 22.6 per 1000 live births, respectively, in the intervention area. Stillbirth rates also remained relatively stable.

Figure 55 shows the probability of neonatal death by study arm. Overall there is no difference in the risk of dying between the comparison and intervention arms. Figure 56 shows the probability of death in the intervention arm by baseline and endline. Again, an inconsequential difference is observed in the risk of dying between baseline and endline.

Table 25. Mortality Rates

	Comparison				Intervention			
	Baseline		Endline		Baseline		Endline	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Stillbirths	207	30.1	232	35.3	316	33.0	281	32.9
Timing of Neonatal Deaths								
1st day	78	11.7	109	17.2	123	13.3	103	12.5
1-6 days	142	21.3	115	18.1	217	23.4	187	22.6
7-27 days	95	14.3	92	14.5	128	13.8	105	12.7
Total Neonatal Deaths	315	47.3	316	49.8	468	50.5	395	47.8
Total Live Births	6,654		6,342		9,268		8,267	
Total births	6,861		6,574		9,584		8,548	

Figure 57. Kaplan-Meier Estimates of Probability of Neonatal Death, Intervention district vs. Control district at Endline

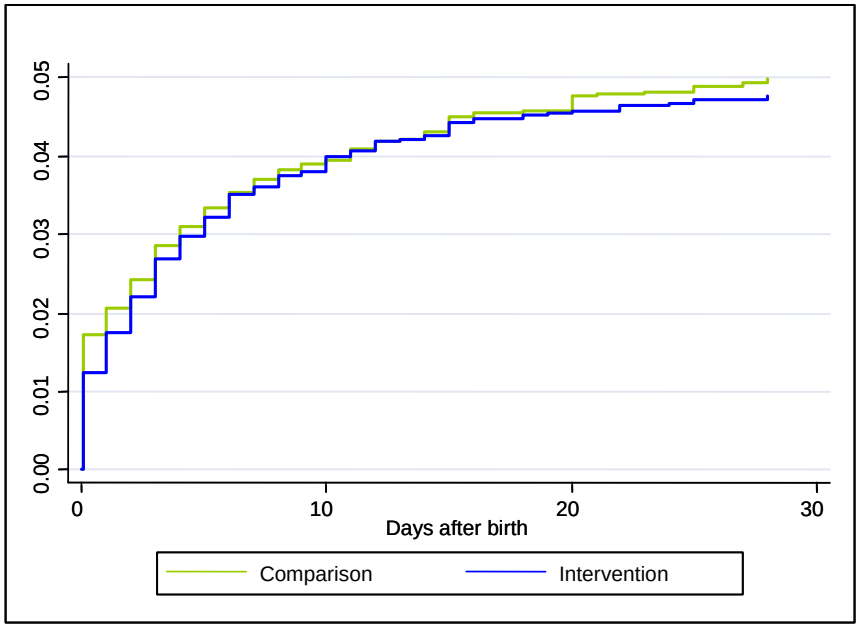
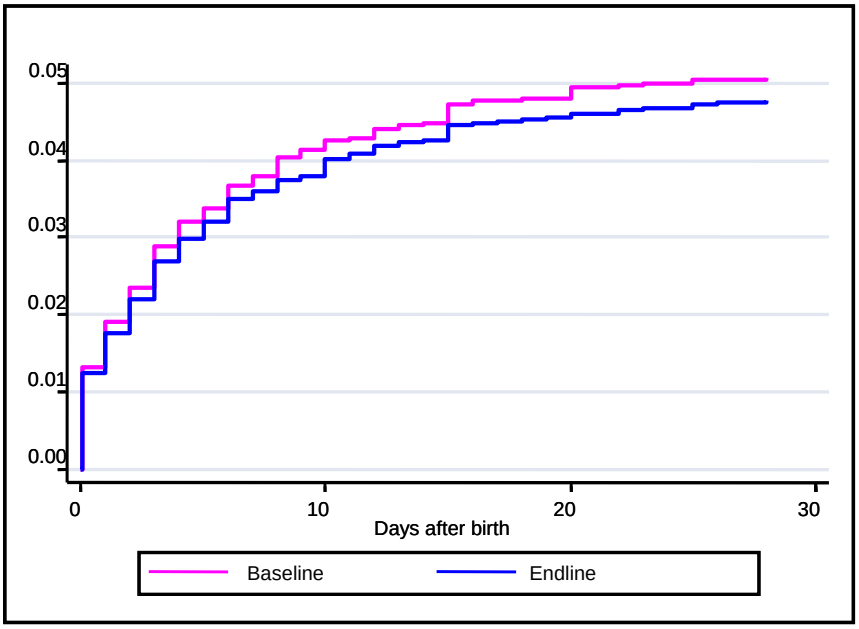


Figure 58. Kaplan-Meier Estimates of Probability of Neonatal Death, in Intervention district, Baseline vs. Endline



CHAPTER 10. CONCLUSIONS AND RECOMMENDATIONS

The Integrated Nutrition and Health Program II (INHP II) has been a continuation of CARE-India's longstanding collaboration with the Government of India. This cycle of the program included a new emphasis on promoting the health and survival of newborns, a group with specific health needs that have received less emphasis in traditional child survival programs. Several community-based efficacy trials have been conducted to examine various strategies for improving newborn survival with significant success. This is the first large-scale effectiveness trial of a package of neonatal health interventions implemented through the existing government and non-governmental health systems. The program inputs that were provided were achieved at scale, with a limited cost and time frame. Thus, this evaluation research yields useful insights for future INHP programs, Indian health system policies and the global network of program planners and researchers in maternal and newborn health. It has also led to important lessons learned for this type of evaluation research. Finally, this program was evaluated in one of the more economically and socially disadvantaged areas of India, rural Uttar Pradesh. Therefore, this research can help health planners to understand what can be achieved realistically in a limited resource setting within India using the existing government health services.

Program accomplishments and lessons learned

At the beginning of the project, community-based health service providers had little knowledge of newborn health, because this topic had seldom been emphasized in previous trainings. Knowledge of some basic aspects of maternal health care –such as the "five cleans" of delivery – was also limited at the outset. One of the major challenges of this program was to train a large number of community-based health workers in maternal and newborn health in a short period of time. The difficulty of accomplishing this task should not be understated. Within the newborn evaluation research area, workers were scattered over hundreds of villages. Most of the anganwadi workers have limited access to telephones and transportation outside their villages, and as honorary workers they receive modest compensation for their work. The auxiliary nurse midwives have multiple competing priorities in their job responsibilities. In addition to training the ANMs and AWWs, CARE recruited and trained a new cadre of community health volunteers known as change agents. The logistics involved in bringing these groups together for training was quite challenging. The completion of three rounds of two-day trainings of the large group of workers is a remarkable accomplishment of this program.

In addition to completing the trainings, this evaluation suggests that the trainings elevated workers' knowledge of maternal and newborn health. Knowledge scores rose significantly in the intervention area while remaining similar in the comparison area. Nonetheless, some deficiencies remained in some workers' knowledge. For example, none of the ANMs or CAs and only 2.5% of the AWW received more than 75% of the possible points on the knowledge score. Knowledge of maternal and newborn danger signs, in particular, was somewhat lower than expected for cadres of workers who were meant to effectively recognize and refer serious complications. These findings suggest that the information imparted during the trainings was not retained adequately by the community-based service providers. One explanation is that this information was not conveyed adequately in training. Another explanation is that the field-based support for

these groups was insufficient to sustain their gains in knowledge. The challenge of maintaining the knowledge of community-based workers is large scale government programs is common. ***The next phase of the program should include clear guidelines to maintain the knowledge and skills of the community-based workers through the use of job aids and refresher trainings***. These strategies should be field-tested and evaluated on a pilot level before being scaled up to the entire program.

The baseline survey found that the ICDS and community-based component of the Ministry of Health programs, which are implemented mainly through the anganwadi workers and auxiliary nurse midwives, failed to reach most women and newborns, particularly economically vulnerable women, younger mothers and those at greatest risk for neonatal mortality. ***Coverage improved remarkably by the endline. One of critical lessons learned from this project is that it is possible to improve coverage of proven interventions at scale using sustainable strategies.*** The increases in coverage were achieved mostly by improved management and training, without increasing the number of paid community-based workers. Of the three types of workers, the anganwadi workers were most successful in redirecting their work to improve program coverage. However, the anganwadi workers and auxiliary nurse midwives were far more successful at reaching women during pregnancy than they were at contacting women during delivery or during the early postpartum period. This is clearly a factor of the differences in the windows of opportunity, and it may also reflect cultural norms about receiving outside visitors during childbirth and postpartum. Although essential newborn care practices can and should be taught during pregnancy, other community-based trials suggest that it is essential to have contact with mothers and newborns in the days immediately after birth. This contact can facilitate the recognition and management of newborn complications. It can also enhance the adoption of supportive newborn care practices for small or weak newborns, such as kangaroo mother care. Skilled birth attendance and access to emergency obstetric care have long been the hallmarks of the safe motherhood movement and are critical to reducing maternal and newborn mortality. Therefore, ***the next phase of the program should find strategies to improve coverage with skilled attendants at delivery and in the early postpartum period and to increase the communities' capacity for prompt referral of women with obstetric and postpartum complications and sick newborns.***

The recruiting and training of change agents was a new innovation of this program. As mentioned previously, the accomplishment of this large-scale training was an important program achievement. Deploying the change agents was one strategy to improve program coverage overall, and particularly to reach out to women from economically or socialized marginalized groups. In terms of the first goal, change agents reached about 30% of pregnant women and about 20% of newborns less than three days old. Training of change agents alone, therefore, was insufficient to achieve high levels of ICDS program coverage at national scale. However, taken together with increased coverage of the ANMs and AWWs, providers reached 3.5 times greater a proportion of women with antenatal home visits, and the coverage of postpartum visits within a week of delivery rose from less than 1% to 29%. Examining the relative contribution of change agents to this increase in coverage, 3% of women were visited only by change agents during the antenatal period, and 15% were visited only by change agents during the first week postpartum. In other words, change agents made a relatively small contribution to total program coverage during the antenatal period and a much larger contribution during the neonatal period, in terms of

their direct provision of home visits. However, they may have improved coverage indirectly by assisting the ANMs and AWWs in identifying women in need of services or by encouraging pregnant women to seek care. In terms of the second goal of improving program equity, change agents were no more likely to contact women of lower castes or lower standard of living households than they were to contact women from other groups. The question arises of whether the cost of recruiting, training and maintaining support for the change agents merits the return on the investment. These data should be used in conjunction with CARE's internal data on the program inputs in order to assess this question more fully.

The impetus behind the training and increased coverage were to improve the quality of counseling received by mothers and their families. Assessing the quality of counseling through a survey is challenging, because women were asked to recall conversations that took place one month to two years before the survey was conducted. The survey used both prompted and unprompted questions to elicit women's recall of topics that were discussed in visits by auxiliary nurse midwives, anganwadi workers and change agents during pregnancy. Examining the unprompted responses, it seems that the improvements in quality of counseling were about 20-30 percentage points at most for any given topic, and the mean number of topics discussed improved only slightly. However, looking at the prompted responses, women recalled far more of the topics being discussed, indicating greater improvements in quality. Therefore, the quality of counseling may have improved modestly during the course of the intervention, but the inconsistency in women's responses call for some caution in interpreting this statement.

The rationale behind this intervention is that health education will lead to improved knowledge which will then improve maternal and newborn care practices. The practices might be considered in two categories, preventive care practices and care-seeking. Many critical behaviors related to newborn health improved during the course of the intervention. Almost all of the preventive care practices, such as sterile cord care and early breastfeeding initiation, have improved significantly in the intervention area from baseline to endline, while little change was observed in the comparison area. These changes are useful and have important implications for newborn health. The baseline survey identified many practices that put newborns at increased risk of mortality. Some ethnographic studies suggest that these practices are firmly entrenched in local understanding of risks and benefits to the newborn and mother. This study shows these newborn care practices can be changed through community-based health education campaigns. This is a significant finding of this study. Some variations in findings exist when the endline survey is contrasted with the adequacy survey findings, as will be discussed further. Although the endline survey may overstate the behavior change somewhat, the evaluation research largely suggests that many of the essential newborn care practices have been adopted by a large proportion of households in the study area. However, women's knowledge of maternal and newborn danger signs showed almost no improvement. This finding suggests a deficiency in the program, as prompt recognition of danger signs is one prerequisite to timely and appropriate care-seeking.

The data related to care-seeking for maternal and newborn care practices is more difficult to interpret. Although antenatal care coverage improved, quality of care was poor and changed little from baseline to endline. As a result, it is unclear whether a greater proportion of women with pregnancy complications received adequate treatment. Improvements in skilled birth

attendance were of little practical significance, and no evidence suggests that a greater proportion of women with delivery complications sought care over the course of the intervention. In terms of neonatal care-seeking, data suggest that the proportion of newborns with serious complications that were taken for care from a trained provider increased by about 20 percentage points. This improvement is promising, but less than half of newborns (45%) with serious complications received care from a trained provider. In addition, these reports are based on complications reported by mothers, which may or may not correspond to medical diagnoses. Care-seeking is affected by many factors outside of the scope of this intervention, such as availability and access to health care. However, the limited improvements in care-seeking may help interpret the mortality data, as will be discussed further.

Antenatal intervention coverage was higher than postpartum coverage, but still 45% of women were not reached by the intervention. This level of coverage represents a significant improvement but the quality of ANC did not improve. ***It is a highly encouraging finding of this study that it is possible to expand government health and ICDS program coverage without increasing the number of workers. The increased coverage suggests that the improvements in management and convergence between the two government ministries took root at the village level.*** Nonetheless, coverage, particularly during the postpartum period, may have been too low to achieve the desired impact on neonatal mortality.

Interpreting different findings within the study methods

The interpretation of the improved program coverage and behavior change is complicated by discrepant findings between the periodic adequacy surveys and the endline survey. For some key program indicators, the periodic adequacy surveys yielded very different findings than the endline survey. It is implausible that this would be a result of sampling differences. It is also implausible that the differences reflect a change in the manner of administering the survey, since the same survey agency administered both surveys using the same instruments, the same group of researchers oversaw training for the data collection and the data quality assurance found the data to be of outstanding quality. Therefore, one aspect of interpreting the endline findings is to understand how this could have occurred.

One possible explanation would be that since the endline survey involved long recall, mothers' recollection of their past behaviors was not always consistent. That is, women reported different behaviors at different times because their recollections were not always the same. However, this would not explain why the changes were measured in the intervention area but not in the comparison area.

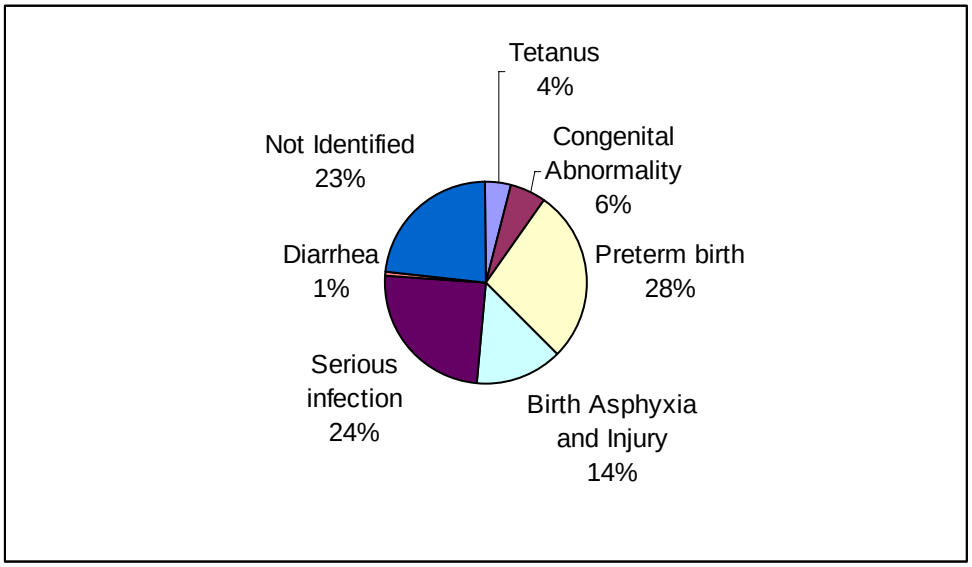
Another explanation is that respondents reported ideal behaviors rather than actual behaviors. Some respondents who gave birth earlier in the intervention may not have known about the desired behaviors at the time of pregnancy or delivery, such as the essential newborn care practices promoted through the intervention. They also may not have known about these behaviors at the time of the adequacy surveys, or they knew about these behaviors but reported their actual behaviors. Later in the intervention they may have been exposed to the intervention, and then during the endline survey incorrectly reported that they had adopted these behaviors. As a result, at the end of the project they reported these desired behaviors as if they had practiced

them at the time of birth. This explanation seems plausible. ***Therefore, some data suggest that the endline survey may overstate the extent of the increases in program coverage and the improvement in key practices. Nonetheless, the findings suggest that, at minimum, knowledge of the essential newborn care has improved substantially in the study area.***

Lack of impact on neonatal mortality

The key outcome indicator of this study was the neonatal mortality rate (NMR). The study was designed to detect a 20% or greater decrease in NMR. These data suggest no statistically significant change in neonatal mortality following two years of intervention. To understand how so many aspects of the progam could have improved without showing a corresponding decrease in neonatal mortality, it is useful to review the common causes of neonatal death in this community and discuss the extent to which the intervention addressed these causes. Figure 57 presents the causes of neonatal deaths in both districts as ascertained by the baseline verbal autopsy study. Preterm birth was the leading cause of death, attributed to 28% of deaths. One proven strategy to reduce preterm birth that was a component of this program was extra care for newborns, such as extra feeding, extra attention to hygiene and added warmth through skin-to-skin contact and other measures (13). It is unclear where preterm or low birth weight newborns received extra care at the household level. It is difficult to distinguish preterm and low birth weight babies in this analysis, given that newborns are seldom weighed after birth and gestational age is usually not calculated. The second leading cause of death was serious infections, such as sepsis and pneumonia. Many of the preventive care strategies included in the intervention have been shown to be effective at reducing neonatal infections, such as clean cord care and immediate breastfeeding (13). However, the two strategies that could be expected to have the greatest impact on deaths due to infections – case management of pneumonia and emergency neonatal care – were not included in the intervention package. While recognition of maternal and newborn danger signs was part of the intervention, providers' knowledge and RDWs' recall of these signs was low, suggesting care-seeking and referral for serious complications was low. Family care (clean home delivery, hygienic cord care, thermal care and breastfeeding promotion), which was included in the intervention, could be expected to reduce infection deaths by 20-50% if coverage approached 80% or higher (16). Birth asphyxia is the third most common cause of death, and none of the intervention components explicitly targeted birth asphyxia. Deaths due to congenital abnormality could be reduced 1-10% through periconceptual folic acid supplementation; but only about 20% of women in the intervention district took an adequate amount of iron-folate tablets, and they may have taken the supplements too late to prevent birth defects. Tetanus deaths could be reduced by tetanus toxoid immunization and clean cord care, indicators that improved during the intervention. However tetanus was identified as a cause of only about 4% of deaths, a small contribution to the total burden. Similarly, diarrhea deaths could be reduced up to 60% through the the family care practices promoted through the intervention, but only 1% of deaths were due to diarrhea (16). ***Therefore, some proven interventions that might be expected to have the greatest impact on neonatal mortality in this setting were not included in this program, or were included but were not adequately implemented to impact mortality.***

Figure 59. Causes of Neonatal Deaths Established by Baseline Verbal Autopsy Study



Two other factors are also important for interpreting the mortality data. The first is that the verbal autopsy methods found no cause for 23% of deaths. This is partially a reflection of the limitations of verbal autopsy methodology. However, it also demonstrates that the signs and symptoms of neonatal complications can be difficult to recognize and that newborns need to be assessed by trained workers. The second factor is that most deaths occurred very early in the neonatal period. For example, 26% of deaths in the intervention area occurred on the first day of life and 73% occurred within the first week. The incidence of death in the early neonatal period was higher than expected and warrants a great deal of emphasis on intrapartum care and care-seeking during the first week of life, particularly the first three days. At endline, the proportion of women in the intervention area that gave birth with a skilled attendant was 22%, 16% of women reported taking their newborn for a check-up during the first three days after birth and 6% of women were visited at home by an ANM, AWW or change agent during the first three days after birth. Furthermore, the data suggests that in the INHP II program, service providers' ability to detect newborn danger signs was less than optimal. Mothers' knowledge of newborn danger signs showed limited improvement during the intervention. Additionally, if complications were recognized, it may have been difficult to seek care because of limited access, high cost, unsatisfactory facilities, distance, or cultural norms surrounding newborn care, although this evaluation does not have facility assessment data to tease out these barriers. As a result, it is clear that many serious newborn illnesses went unrecognized or untreated.

Recommendations:

Our assessment is that this program has laid the groundwork for the promotion of newborn health through India's health and ICDS programs. Some of the lessons learned from this evaluation research should inform the next cycle of program development and implementation.

One critical aspect of future program development will be to improve ongoing supervision and quality of counseling for service providers. It will be important to assure that the

service providers have resources (such as cue cards or pamphlets) to refresh their own knowledge in the field. It is equally important to continue to improve the field-based supervision and ongoing refresher training that the workers receive. The value of supervision and continuous training in the field has been recognized by CARE, and steps were taken, particularly after the midterm review, to improve these activities. From an evaluation research perspective, it will be critical to determine how to best assess the quality of counseling at the household level. This evaluation was based entirely on maternal recall, an approach that has both strengths and weaknesses. Future evaluations could consider direct observation or exit interviews of mothers to assess quality of visits. Program planners should also seek ways to maintain knowledge at the household level. One strategy to do this is the individual monitoring systems, but this approach was later rejected in Uttar Pradesh as not being scalable. Health education that improves women's knowledge of dangers signs for themselves and their newborns will be one critical step toward improving care-seeking behaviors.

A substantial amount of program resources were devoted to recruiting and training the volunteer change agents. However, their contribution to the increase program coverage was limited. Also, their performance on knowledge tests suggests that they may have had difficulty retaining the information coveyed during trainings. For future program planning, it may be more appropriate to ask the change agents to focus on community mobilization activities, instead of providing health education or recognition and referral of complication. At the same time, improved training and supervision for the existing cadres of government workers, AWWs and ANMs, would be beneficial.

The lack of skilled birth attendance in the study community was clearly a barrier to reducing neonatal mortality. The program sought to improve awareness of the need for skilled birth attendance in the presence of complications and increase preparations necessary for institutional deliveries, such as saving money and arranging transport. However, no changes were measured in the coverage of skilled birth attendance, either when examining all recently delivered women or women with a self-reported delivery complication. Future program planning should: (a) assess the access to skilled birth attendance and emergency obstetric care in the communities; (b) determine community barriers to accessing skilled care.

Finally, the program should focus particularly on strategies to improve program coverage during the first three days of life. Routes for delivering case management of pneumonia and serious infections should be explored. Although this intervention is more complex than other interventions, it can be expected to have great impact in this setting, when combined with preventive and supportive neonatal care practices.

After the intervention began, the Lancet neonatal series and other research became available to further the research community's understanding of the most effective interventions to reduce neonatal mortality. Increasing efforts are being made to understand and reduce the 4 million newborn deaths that occur globally. A recent update on the Lancet neonatal series noted, "Although we know what we should be aiming for – high coverage of several simple cost-effective interventions – major questions remain about how to get there" (21). This study is significant to researchers' understanding of the benefits and challenges of implementing a newborn health program within an existing government health and development system.

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APPENDIX: BEHAVIOR CHANGE MATRIX

Lifecycle period 1: Pregnancy: (i) First Trimester			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (Mother): Report probable pregnancy (cessation of menses) to CA / AWW / ANM Seek antenatal checkup, ask ANM for expected date of delivery Consume 1 additional meal / day Eat available variety of foods, including cereals, pulses, green leafy vegetables, other vegetables and fruits. Consume milk, milk products, meat, fish and eggs if available and feasible Procure and consume SN Take rest – lie down for 1-2 hours during the day Seek treatment for fever from ANM / PHC / Hospital Make birth plan (with family) Begin saving for delivery Decide on whether to deliver at home or hospital (own choice, ANM/doctor's advice) Identify hospital for hospital delivery Identify trained birth attendant for home delivery (CA/AWW/ANM's advice) Begin self-monitoring antenatal care	Change Agent: Report probable pregnancy to the AWW and ANM at the earliest (usually, when a second month passes without menses) Advise early antenatal checkup at the NHD / hospital Advise monthly attendance at NHD Counsel on diet, rest Begin making birth plans with family: Counsel on saving for delivery Help family plan place of delivery, and identify hospital / TBA Learn about whether woman plans to deliver in this village or parental village Explain the need for IFA tablets and TT from fourth month onwards Refer to facility Initiate and encourage self-monitoring TBA: Note expected date of delivery Help CA / AWW / ANM provide antenatal care to mother	AWW: Register pregnancy Report pregnancy to ANM; get confirmation and expected date of delivery from ANM Provide SN / THR as applicable Visit family at least once, along with CA Learn from CA about the family and their plans for birth Counsel on diet, rest and birth plan (as for CA) Keep CBO informed once a month (facilitate monthly CBO meeting) ANM: Register pregnancy Learn from CA and AWW about the family and their plans for birth Check up woman on NHD – obstetric history, pallor, baseline blood pressure, weight Enquire whether pregnancy was desired and planned Note and enquire into failure of contraception Advise against second trimester	Supervisors: Help diagnosis of pregnancy, and of gestational age in doubtful situations Enquire about families likely to be difficult Help find/provide support to poor families Ensure SN/THR being provided Note problems for discussion at block (related to registration and contraceptive failure) Act on decisions taken at block Review social map and quality of CBO monitoring process Observe NHD and identify supply and training needs CDPO: Track registered vs expected pregnancies and address possible left-outs Track proportion of women registering early Track proportion of pregnant women getting SN/THR Attend to problems brought up by supervisors or the CBOs/PRI

Lifecycle period 1: Pregnancy: (i) First Trimester, continued			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Family (husband, in-laws, parents): Report probable pregnancy (cessation of menses) to CA / AWW / ANM Ensure that woman gets checked by the ANM or at the PHC/hospital, and decide on where she will deliver, identify hospital or trained TBA Note expected date of delivery from ANM Ensure that woman stops doing hard labor Ensure that woman gets rest for two hours every afternoon and a full night's sleep Make birth plans as above Ensure immediate treatment of any illness	CBOs: Mark new pregnancies on map Identify and discuss unintended pregnancies Identify and discuss women with problems Identify and discuss families likely to be problematic Identify and discuss areas of village with no reported pregnancies Support AWW/CA in their work	termination of pregnancy / pre-natal sex determination as needed Estimate expected date of delivery and inform woman, CA, AWW Advise hospital delivery if indicated (previous stillbirth / caesarian section, major medical problems, very small stature) and feasible Counsel on diet, rest and birth plan, and for forthcoming TT, IFA, and chloroquine Refer woman with illness in first trimester to appropriate referral center; advise not to take any treatment till fourth month without doctor's advice	MO (PHC): Track registered vs expected pregnancies and address possible left-outs Track proportion of women registering early Keep special tag on areas not covered by ICDS Handle referrals Attend to problems brought up by supervisors or the CBOs/PRI Agenda for BLAC/BLRM: Clusters / sectors / villages reporting less than 30% early registration – reasons Clusters / sectors reporting 25% less pregnancies than previous quarter – reasons Contraceptive failures Coverage in non-ICDS areas Problems identified by CDPO / MO Supply issues Training needs Problems brought up by individual supervisors Unusual problems

Lifecycle period 1: Pregnancy: (i) First Trimester, continued			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (Mother): Report pregnancy to CA / AWW / ANM if not yet reported Seek antenatal checkup at NHD, at least twice this trimester Seek two doses of TT injections, one month apart Consume IFA, 1 tablet / day, or 1 tablet twice a day, as advised by ANM/AWW Consume mebendazole 1 tablet twice daily for 3 days (one course) Consume 1 additional meal / day Eat available variety of foods, including cereals, pulses, green leafy vegetables, other vegetables and fruits. Consume milk, milk products, meat, fish and eggs if available and feasible Procure and consume SN Consume chloroquine, 2 tablets once every week, as advised by ANM/AWW Seek treatment for fever from ANM / PHC / hospital	Change Agent: Encourage antenatal check up, 2 doses of TT and consumption of IFA,mebendazole, and chloroquine tablets as advised Refer any problems woman has with IFA, mebendazole or chloroquine to ANM Encourage diet and rest as before Make birth plan with family, including plans for birth in parental village if the woman is going away. Discuss possible danger signs: Any bleeding before childbirth or excessive bleeding at or after childbirth Convulsions at any time Sudden appearance of facial / hand / genital swelling Severe headache Prolonged labor, beyond 12 hours of mild pain, or beyond 2 hours of active, severe pains Onset of labor more than a month before the expected date of delivery	AWW: Visit family at least once during this trimester, and more frequently if there are problems Track progress of the mother at NHDs and through the CA, with respect to diet, rest, IFA, mebendazole chloroquine and birth plans In case of women planning to deliver in parental village, ensure that she has received two doses of TT and the clean delivery kit, is aware of danger signs and has made contingency birth plans before leaving In case of late registrations, ensure that the woman is seen by the ANM at the first available opportunity Ensure SN/THR, and supply of IFA Keep CBO informed once a month	Supervisors: As for first trimester, plus Enquire into causes of late registration Note problems with supplies and report to block Help handle problems of families not participating in NHDs / receiving services Check on supplies Enquire about and address problems in consuming IFA, mebendazole and chloroquine Review social map and quality of CBO monitoring process

Lifecycle period 1: Pregnancy: (ii) Second Trimester			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Make birth plan (with family): Continue saving for delivery Decide on place of delivery (hospital or home) if not yet decided, and identify trained TBA if planning home delivery Identify hospital to rush to in case of danger signs Accumulate enough clean cloth for the delivery / baby Self-monitor progress of own ante-natal care Family (husband, in-laws, parents): Ensure she gets checked up at least once, gets two doses of TT and takes IFA, mebendazole and chloroquine tablets as advised by the AWW/ANM Ensure that woman continues to get enough food and rest; help reduce her workload Report any problems to the AWW/ANM Make birth plans as above; especially, identify hospital, vehicle for transport and person to accompany woman in an emergency	In case of late detections, ensure that the woman is seen by the ANM at the first available opportunity, and that birth plans begin immediately Identify women likely to arrive newly in late pregnancy and inform AWW Initiate and encourage self-monitoring, if not yet done TBA: Maintain contact with family and encourage them to follow the advice of the CA, AWW and ANM CBOs: Identify and discuss women not seeking services or consuming tablets as advised Identify and discuss adverse outcomes Identify women not likely to have needed support in emergency situations, and discuss ways of community support Identify shortcomings in service provision and take up the matter through PRI if need be	ANM: Conduct at least two antenatal checkups: pallor, BP, weight, fundal height Advise woman and family about any specific actions to be taken, including advice for hospital delivery Confirm expected date of delivery and inform/remind woman of this Decide if woman needs therapeutic dose of IFA and advise CA, AWW and woman of this Ensure two doses of TT are given during this trimester Ensure supply of IFA, mebendazole and chloroquine to pregnant woman Handle referrals from AWW/CA In case of late registrations, ensure at least one antenatal checkup and two TT doses are completed at earliest possible, and that birth plans begin immediately Track drop-outs with help of CA and AWW Counsel on clean delivery kit to women likely to deliver in some other village	CDPO: As for first trimester, plus – Address supply problems MO (PHC): As for first trimester, plus – Address supply problems Agenda for BLAC/BLRM: Clusters / sectors / villages reporting less than 50% completion of TT2 in second trimester – reasons Clusters / sectors reporting less than 30% or more than 70% of women as anemic – reasons Coverage in non-ICDS areas Problems identified by CDPO / MO Supply issues Training needs Problems brought up by individual supervisors Unusual problems

Lifecycle period 1: Pregnancy (iii) Third Trimester			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (Mother): At least two antenatal checkups during this trimester Diet as in second trimester, IFA and chloroquine as advised by ANM Increase period of rest to at least two hours during the day Seek treatment for fever from ANM / PHC / hospital Finalize birth plans with family: Learn about what can possibly go wrong at or around childbirth (bleeding, unusual swelling and convulsions, prolonged labor, premature labor), and make contingency plans with family Inform family members / CA / AWW immediately in case of such problems	Change Agent: Maintain touch with woman and family Encourage antenatal checkup, diet, rest, IFA, chloroquine as advised by ANM/AWW In case of new arrivals in village, enquire about previous antenatal care, ensure earliest possible checkup by ANM or PHC, and discuss birth plans and contingencies with family at the earliest Counsel on danger signs and finalize birth plans with family and TBA: advise preparedness for immediate referral to hospital in case of: Any bleeding before childbirth or excessive bleeding at or after childbirth Convulsions at any time Sudden appearance of facial / hand / genital swelling, or severe headache	AWW: Track progress of the mother at NHDs and through the CA, with respect to diet, rest, IFA, chloroquine and birth plans Visit family at least twice during this trimester and counsel on diet, rest, IFA and chloroquine Ensure birth preparedness is complete and satisfactory Address/refer problems related to IFA and chloroquine consumption In case of late arrivals, help expedite TT doses and birth preparedness Ensure SN/THR, and supply of IFA Keep CBO informed	Supervisors: Conduct random home visits to assess quality of birth preparedness and help make improvements Review list of women advised hospital delivery and their birth plans with ANM Review and note all adverse events and report to block Review social map and quality of CBO monitoring process Seek poorest households and identify and address any specific problems there

Lifecycle period 1: Pregnancy (iii) Third Trimester			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Continue saving, identify clean site of delivery that is well-ventilated and away from smoke, with help of CA/AWW/ANM, and get clothes ready for childbirth Procure and keep clean delivery kit handy (OR keep ready two clean blades, several pieces of clean thread, and soap for hand-washing) Continue self-monitoring Family (husband, in-laws, parents): As in second trimester, plus – Ensure woman does not have to indulge in hard labor Finalize birth plans: Understand danger signs (as above) Finalize arrangements for transport to hospital, cash and persons to accompany in case of danger signs Discuss contingency plan with TBA and CA Prepare for normal birth at home or at hospital, as advised by ANM (clean delivery kit, clean clothes, clean site)	Prolonged labor, beyond 12 hours of mild pain, or beyond 2 hours of active, severe pains Onset of labor more than a month before the expected date of delivery Counsel on need to avoid bathing the newborn for a week, initiating BF within 1 hour after birth and avoiding prelacteal feeds, water, any other liquids or solids for the first 6 months (exclusive breast feeding) Support and encourage self-monitoring TBA: Participate in birth planning with family, CA, AWW, ANM and cooperate with the plan Help family identify danger signs CBO: As above, plus Identify women due to deliver within the next month and review their birth plans, with special attention to women without resources: plan for them	ANM: Conduct at least two antenatal checkups and keep family, CA and AWW informed about any changes needed in birth plans Identify nonanemic women who have completed 100 days of IFA and advise them to stop taking IFA Ensure supply of IFA and chloroquine Handle referrals from AWW/CA In case of late registrations, ensure at least one antenatal checkup and two TT doses are completed at earliest possible, and that birth plans are completed satisfactorily Track drop-outs with help of CA and AWW Supply clean delivery kits to all women	CDPO: As for second trimester, plus – Track adverse events reported vs expected MO (PHC): Track proportion of anemic women in the third trimester vs first trimester Track adverse events reported vs expected Agenda for BLAC/BLRM: Clusters / sectors / villages reporting higher proportion of anemic women in late pregnancy Coverage in non-ICDS areas Problems identified by CDPO / MO Supply issues Training needs Unusual problems

Lifecycle period 2: From Delivery to 28 days (i) Delivery and the first two hours			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (Mother): Carry out birth plan Initiate BF within 1 hour Skin-to-skin contact for very small newborn, as advised by CA Recognize danger signs in self (bleeding, prolonged labor, premature labor, swelling on face/hand/genitals, severe headache) and newborn (not feeding well) and seek immediate care Family (husband, in-laws, parents): Carry out birth plan In case of home delivery, summon TBA and CA at onset of labor Ensure 5 cleans and use of clean delivery kit Avoid bath, immediately after tying and cutting cord, wipe newborn dry and wrap with multiple layers of dry, clean cloth Assist early BF, as soon as baby is wrapped up In case of danger signs in mother and newborn, seek immediate care	Change Agent: Be present with the family at childbirth Help summon trained birth attendant Inform AWW of impending birth Ensure that preparations for childbirth are as planned Help ensuring 5 cleans, and use of clean delivery kit where available Ensure avoidance of bath and of provision of adequate warmth Support early and exclusive BF Assist in recognition of danger signs in mother and in activating contingency plans Assess feeding, activity and maturity of newborn, and determine need for referral Leave the home only after making sure that bleeding is normal and newborn has taken a good first breast feed TBA: Practice 5 cleans (use clean delivery kit OR clean site, hands, blade, thread, cloth) Avoid bath, immediately after tying and cutting cord, wipe newborn dry and wrap with multiple layers of dry, clean cloth Initiate BF immediately after wrapping and counsel on EBF; avoid pre-lacteal feeds Identify danger signs in mother and assist family in decision making for referral to predetermined facility Leave the home only after bleeding has stopped and breast feeding is well-established CBO: Support family in taking correct decisions and acting upon them	AWW: Try to attend childbirth whenever possible Weigh child immediately after birth (or within the first week); record the weight and report to ANM Assist in recognition of danger signs in mother and in activating contingency plans Assess birth weight, feeding, activity and maturity of newborn, and determine need for referral Record and report birth, death, and any adverse events ANM: Try to be present at every home delivery that happens during a visit to the village Meet family, AWW, TBA and CA at first opportunity after delivery and obtain details of the delivery; assess whether everything went according to plan; discuss deviations from plan with AWW, TBA and CA Observe and assess newborn and examine mother Support CA or AWW in providing care for small newborn Record and report birth, death and adverse events	Supervisors: Enquire about each delivery in each village, and its outcome Probe all adverse events (stillbirths, deaths, complications, referrals, etc), identify where things went wrong and record observations CDPO: Track adverse events reported; compare with expected Compare reported with expected births, analyze by sector and enquire about discrepancies MO (PHC): Track adverse events reported; compare with expected Compare reported with expected births, analyze by cluster and enquire about discrepancies, with special attention to non-ICDS areas Agenda for BLAC/BLRM: Take note of all adverse events Discuss serious maternal complications and deaths Discuss preventable newborn deaths For each adverse event, identify system and behavior failures; identify positive deviants and possible solutions, and plan strategies for correction

Lifecycle period 2: **From Delivery to 28 days (ii) 2 hours post-delivery to 7 days post-delivery**			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (mother): Practice exclusive breastfeeding Consume 1 additional meal/day Eat available variety of foods, including cereals, pulses, green leafy vegetables, other vegetables and fruits. Consume milk, milk products, meat, fish and eggs if available and feasible Consume SN/THR Consume IFA 1 tablet daily, or as advised by CA/AWW/ANM Seek assistance from CA/AWW for newborn who does not feed vigorously; provide expressed breast milk with clean cup and spoon as long as breast feeding is not adequately vigorous Provide more frequent feeding for a small newborn Continue to keep the newborn warm; take special care to ensure this constantly in a small newborn Minimize number of people who handle the newborn; ensure this particularly in the small newborn Seek care in hospital for danger signs in mother (bleeding, high fever, foul discharge) or newborn (poor feeding, poor activity) Seek BCG/OPV 0 (if hospital-delivered) Family (husband, parents, in-laws): Encourage EBF Provide 1 additional meal/day, help improve quality of diet, encourage consumption of SN	Change Agent: Visit home 12 hours after birth and reassess mother and newborn Visit home once daily for this week if all is well Visit home more frequently on the first day and twice daily for the first week when the newborn needs special care Assess newborn for feeding and activity at each visit, and refer to predetermined facility if these are not satisfactory Recognize and address problems with breastfeeding Encourage diet, rest, IFA Recognize danger signs in mother and refer to predetermined facility TBA: Avoid bathing newborn till the end of the week Encourage EBF Encourage family to follow advice of CA/AWW/ANM CBO: Support family in taking correct decisions in care and referral of mother and	AWW: Visit home on day of birth, day 3 and day 7, or daily if birth weight less than 2 kg, or with problems Weigh newborn at the earliest during the week, and record as birth weight Counsel on EBF and problem solving, refer if necessary Support mother in care of small newborn: help identify feeding that is less than adequately vigorous, help in expressing breast milk and using clean means to feed expressed breast milk Recognize danger signs in mother and newborn and take timely action for referral ANM: Meet family, AWW, TBA and CA at first opportunity after delivery and obtain details of the delivery; assess whether everything went according to plan; discuss deviations from plan with AWW, TBA and CA Observe and assess newborn and examine mother Support CA or AWW in providing care for small newborn Address breastfeeding problems Record and report birth, death and adverse events Begin counseling about plans for the	Supervisors: Make visits to homes reporting recent births Enquire about each delivery in each village, and its outcome Probe all adverse events (stillbirths, deaths, complications, referrals, etc), identify where things went wrong and record observations Identify and address problems in AWW making immediate postpartum visit CDPO: Track adverse events reported vs expected Compare reported vs expected births, analyze by sector and enquire about discrepancies Address problems related to AWW finding time to provide newborn care MO (PHC): Track adverse events reported vs expected Compare reported vs expected births, analyze by cluster and enquire about discrepancies Track and analyze newborn deaths; make visits where possible to homes with newborns Agenda for BLAC/BLRM:

Support mother in care of small newborn: help identify feeding that is less than adequately vigorous, help in expressing breast milk and using clean means to feed expressed breast milk Recognize danger signs and take timely action for referral	newborn, and acting upon them Provide additional support to family to care for small newborn, and for referrals Mark birth / death / adverse event on map	next child and for contraception	Take note of all adverse events Discuss serious maternal complications and deaths Discuss preventable newborn deaths For each adverse event, identify system and behavior failures; identify positive deviants and possible solutions, and plan strategies for correction Identify and address training needs

Lifecycle period 2: From Delivery to 28 days (ii) 8 days post-delivery to 28 days post-delivery			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (mother) Practice EBF Consume 1 additional meal/day Eat available variety of foods, including cereals, pulses, green leafy vegetables, other vegetables and fruits. Consume milk, milk products, meat, fish and eggs if available and feasible Consume SN/THR Continue to take rest and be with the newborn as much as possible; keep the small newborn close to body all the time, and check frequently to ensure that palms and soles are not cold Consume IFA 1 tablet daily, or as advised by CA/AWW/ANM Continue extra care of small newborn (warmth, feeding, minimal handling) Decide on birth spacing method to delay next birth, or appropriate method to limit conceptions; seek counseling from ANM Family (husband, parents, in-laws): Encourage EBF Provide 1 additional meal/day, help improve quality of diet, encourage consumption of SN (for mother) Continue extra care of small newborn Provide support so that the mother has time for rest and for care of the newborn Support mother in her decision to adopt spacing method; husband be equally responsible for decision and action	Change agent: Visit home once a week if all is well and once a day in the second week after birth for newborn needing special care Encourage EBF, warmth, diet, rest, IFA Advise timely DPT1/OPV1 Recognize danger signs in mother and newborn and refer to predetermined facility Identify the need for contraception and inform ANM Refer any problems to ANM TBA: Support advice given by CA/AWW/ANM Ensure exclusive breast feeding; avoid water or other liquids or solids CBO: Support family in taking correct decisions in care and referral of mother and newborn, and acting upon them Track families ensuring early breastfeeding Provide additional support to care for small newborn Mark birth / death / adverse event on map	AWW: Visit home about once a week Counsel on EBF and any breast feeding problems Counsel on weight gain of child Report newborn deaths to ANM Identify need for contraception and refer to ANM Keep a tag on the mother and child via the CA Keep CBO informed Refer any problems to ANM ANM: Track health of newborn with help of CA/AWW Handle referrals	Supervisors: Visit homes with adverse events and try to understand events; report to block Enquire about outcomes of mothers and newborn with danger signs / referrals Observe special care of small newborn, identify problems, report Ensure pregnancy outcome data have been accurately recorded and reported Identify villages with exemplary behavior changes CDPO: Compare reported vs expected neonatal deaths; verify a sample; compare different sectors and probe discrepancies Identify positive deviants and show recognition Insist on birth weights MO (PHC): Probe a sample of newborn deaths to understand cause of death Probe quality of care issues in special care of small newborn, identify and address training needs Identify TBA training needs; other training needs Handle referrals Agenda for BLAC/BLRM: Take note of all adverse events Discuss serious maternal complications and deaths Discuss preventable newborn deaths For each adverse event, identify system and behavior failures; identify positive deviants and possible solutions, and plan strategies for correction Identify and address training needs

Lifecycle period 3: 1-5 Months (until end of sixth month)			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (mother): Practice EBF Seek BCG/DPT/OPV as advised by CA/AWW/ANM Practice EBF Consume 1 additional meal/day, Eat available variety of foods, including cereals, pulses, green leafy vegetables, other vegetables and fruits. Consume milk, milk products, meat, fish and eggs if available and feasible Consume SN Decide on birth spacing method if need to delay next birth; seek counseling from ANM Continue to monitor for child and self Family (husband, parents, in-laws): Seek BCG/DPT/OPV as advised by CA/AWW/ANM Encourage EBF; avoid giving water or other liquids or solids to the child Provide 1 additional meal/day, help improve quality of diet, encourage consumption of SN (for mother) Support mother in her decision to adopt spacing method; husband be equally responsible for decision and action	Change agent: Remind family of BCG/DPT/OPV vaccine days (on NHDs); counsel on immunization Counsel on EBF and help resolve breastfeeding problems Counsel on diet, rest and IFA Identify need for contraception and refer couple to ANM Identify mothers who return from parental village, expedite vaccine/contraceptive use Encourage to continue monitoring for child and self TBA: Support advise given by CA/AWW/ANM CBO: Track vaccine progress of each child on map; identify left-outs and drop-outs Identify and discuss families having problems with EBF Identify and discuss families having problems with using contraceptives Identify supply problems related to vaccines, contraceptives, etc., and take appropriate action through PRI	AWW: Weigh child monthly at NHD Visit family once in second, third and fourth months to remind about vaccines, and in sixth month to begin advising about CF from seventh month Encourage EBF; discourage giving water Track vaccine / NHD left-outs and drop-outs with help of CAs, identify problems, discuss with ANM/supervisor Refer problems with contraceptive use to ANM Identify mothers who return from parental village, expedite vaccine/contraceptive use ANM: Encourage EBF Counsel on diet, rest and IFA Track NHD left-outs and drop-outs with help of CAs/AWW Provide FP services and counseling Handle referrals, including STIs Ensure cold chain maintenance for vaccines	Supervisors: Use social map to assess left-out areas from all services Identify any geographical clusters of left-outs and drop-outs and probe reasons Observe NHDs and identify gaps in training or supplies Attend to specific problems brought up by AWW/ANM Identify issues related to cold chain and follow-up care of vaccine and of FP method users Note and report problems to block CDPO: Identify sectors / villages having good / poor coverage of vaccination (use DPT3/OPV3 within 6 months age as indicator), probe reasons Track proportion of normal grade children MO (PHC): Identify clusters / villages having good / poor coverage of vaccine and FP services, probe reasons Handle referrals Address quality of care issues in vaccination and FP services, particularly cold-chain and adequacy of follow-up support for families with problems Tag complication rates Agenda for BLAC/BLRM: Review coverage situation cluster-wise and village-wise if needed Identify and address gaps in cold chain and supplies Identify and address training needs

Lifecycle period 4: 6-12 Months (i) 6-8 months (until end of 9th month)			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (mother): Practice appropriate complementary feeding Feed small frequent meals 2-3 times/day, of modified soft mashed (not watery) home foods e.g. rice, dal Introduce foods by feeding little at a time to gradually increasing the quantity, also increase consistency gradually Feed SN Feed child yourself, interact with child, feed from a separate bowl to assess how much the child has eaten Feed ill child frequently during illness and after child recovers. Breastfeed frequently Continue BF Switch to OCPs if appropriate and desired Continue to monitor for child and self Family (husband, in-laws, parents): Encourage and assist appropriate complementary feeding 2-3 times/d and feeding of SN Participate in feeding demonstrations Encourage continued BF Support mother in continued use of spacing method	Change Agent: Counsel on appropriate CF 2-3 times/d and continued BF Counsel on attending feeding demonstrations Closely follow quantity of food eaten by child Counsel on adequate weight gain Remind to complete measles and vitamin A at 9 months Inquire about mother's comfort with spacing method; refer for further counseling if she has problems (Identify couple's problems and refer) Encourage to continue monitoring for child and self CBO: Host feeding demonstrations Identify and discuss families unwilling to start CF Identify and discuss children not gaining adequate weight	AWW: Counsel and record appropriate CF 2-3 times/d, and continued BF Remind to complete measles and vitamin A at 9 months Weigh children monthly and counsel on adequate weight gain Identify and refer of sick and malnourished children Provide spacing method and continue counseling as required ANM: Treat sick children Counsel on adequate CF and continued BF Counsel mothers of children not gaining adequate weight	Supervisors: Use social maps to identify any geographical clusters of left-outs and drop-outs and probe reasons Talk to sample of mothers about CF; identify current barriers to starting or sustaining CF and address them Observe NHDs and identify gaps in training or supplies Attend to specific problems brought up by AWW/ANM Identify issues related to cold chain and follow-up care of vaccine and of FP method users CDPO: Track proportion of normal grade children MO (PHC): Handle referrals Keep note of measles, pertussis and diarrhea cases in the community; act on detecting outbreaks Agenda for BLAC/BLRM: Identify and address gaps in supplies Identify and address training needs Identify villages / clusters with low / high proportions of normal grade children – identify causes of continued low proportions / positive deviants; strategize ways of making improvements

Lifecycle period 5 & 6: 12 Months onwards			
Mother and the Family	Change Agent, TBA, CBO	AWW and ANM	Supervisors, CDPO, MO (PHC)
Woman (mother): Seek measles vaccination and vitamin A at 9 months Practice appropriate CF Feed small frequent meals 4-5 times/d, of modified home foods e.g. rice, dal, chapatti, green leafy vegetables, other vegetables and fruits. Feed milk products, eggs, meat, fish if available and feasible Feed SN Assist the child in feeding, interact with child, feed from a separate bowl to assess how much the child has eaten Frequent feeding of ill child during illness and after child recovers. Breastfeed frequently Continue BF Give pediatric iron supplements Seek Vitamin A every 6 months until five doses are complete Continue use of appropriate FP method Continue to monitor for child and self Family (husband, in-laws, parents) Encourage appropriate complementary feeding 4-5 times/d and feeding of SN Encourage continued BF Encourage consumption of pediatric iron supplements Continue use of appropriate FP method	Change Agent: Follow up 12 month olds and counsel on appropriate CF 4-5 times/d and continued BF Help arrange for pediatric iron supplements Counsel on importance of pediatric iron supplements Counsel on adequate weight gain Counsel on continuation of FP method; refer problems to ANM Encourage to continue monitoring for child and self CBO: Identify children not being given adequate CF; encourage and support families in providing CF Identify and discuss children not gaining adequate weight	AWW: Provide pediatric iron supplements Counsel on importance of pediatric iron supplements Counsel and record appropriate CF 4-5 times/d and continued BF Counsel on adequate weight gain Counsel on completing any uncompleted vaccine schedules Remind to seek second dose of vitamin A at 18 months, and every 6 months thereafter, and DPT/ booster ANM: Treat sick children Counsel on continued adequate CF and continued BF Provide DPT booster and six monthly doses of Vitamin A Counsel mothers of children not gaining adequate weight Counsel on continuing FP methods, and solve problems related to them	Supervisors: Identify reasons for drop- outs from services Ensure accurate growth monitoring CDPO: Track proportion of normal grade children MO (PHC): Handle referrals Keep note of measles, pertussis and diarrhea cases in the community; act on detecting outbreaks Agenda for BLAC/BLRM: Closely monitor proportion of normal grade children and vaccine drop-outs