Evaluation Research of the Nutrition Interventions in the Integrated Nutrition and Health Program (INHP) II Areas of CARE India

Final Report

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ANC	Antenatal care
ANM	Auxiliary nurse midwife
AWC	Anganwadi center
AWW	Anganwadi worker
ICDS	Integrated Child Development Service
IFA	Iron-folic acid (supplements)
INHP	Integrated Nutrition and Health Project
GOI	Government of India
HAZ	Height-for-age Z score
JHSPH	Johns Hopkins School of Public Health
KGMU	King George Medical University
MTR	Mid-term Review
NFHS	National Family Health Survey of India
NHD	Nutrition and Health Day
RACHNA	Reproductive and Child Health, Nutrition and HIV/AIDS Program
RDW	Recently delivered women
THR	Take-home ration
TT	Tetanus toxoid (immunization)
USAID	United States Agency for International Development
WAZ	Weight-for-age Z score

EXECUTIVE SUMMARY

Background

The Reproductive and Child Health, Nutrition and HIV/AIDS Program (RACHNA) is an umbrella program of CARE India with the goal of improving child survival and nutritional status, women's reproductive health and prevention of transmission of HIV/AIDS. It is a collaboration between CARE India and the Government of India (GOI) funded by the United States Agency for International Development (USAID), and consists of 2 projects: the Integrated Nutrition and Health Project (INHP) and the *Chayan* project. The INHP-II, a 5-year program initiated in October 2001, targets pregnant and lactating women, and children less than 2 years of age to reduce child mortality and improve nutritional status. The program's primary objective is to strengthen the Government of India's (GOI) Integrated Child Development Services (ICDS) program and increase convergence with the Ministry of Health and Family Welfare's (MOHFW) Reproductive and Child Health (RCH) Program for improved provision of health and nutrition services. Interventions include antenatal care, supplementary feeding, pediatric vitamin A and iron-folic acid supplementation, immunization, community-based newborn care, and promotion of appropriate breastfeeding and complementary feeding practices among children 0-2 years of age. INHP-II is currently implemented in ICDS catchment areas across 78 districts in nine states namely Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal.

The operational strategy of INHP-II is to demonstrate "best practices" in 10% of anganwadi center (AWC) areas while simultaneously replicating and scaling up these practices through government systems in other areas. The 4 "best practices" promoted in this strategy are 1) community-based volunteers (Change Agents) to promote healthy maternal and child care practices, 2) fixed-day, fixed site provision of health services at monthly Nutrition and Health Days (NHD), 3) community-based monitoring systems, and 4) Block-Level Resource Mapping. After the mid-term review (MTR) in late 2004, CARE reformulated its INHP-II intervention strategies to better increase coverage of program components and their impact on program outcomes. The program focused more specifically on improving supportive supervision of service providers and more strongly emphasizing home visits by ANM and AWW to encourage behavior change during pregnancy and the first 2 years of life. Locally adaptable tools were developed for field use to track progress and encourage action. The 4 "best practices" were de-emphasized with the exception of NHD.

Nutrition Evaluation Research

The Johns Hopkins University was funded by USAID in 2003 to evaluate over a 2-year period the impact of the basic package of INHP-II interventions compared to the ICDS program alone in reducing malnutrition and anemia among children 0-23 months of age. A secondary study objective was to assess whether the INHP-II strategy was more suited by design to reducing child malnutrition only in ecological settings with relatively low economic and cultural constraints. To accomplish these objectives, the evaluation was planned as a pre-test, post-test quasi-experimental study design in an INHP-II intervention district and an ICDS comparison district in each of 2 states. Andhra Pradesh was chosen to represent a relatively low constraint ecological setting in India, and Uttar Pradesh was chosen to represent a relatively high-constraint setting. In Andhra Pradesh, the district of Karimnagar was chosen as the experimental district

while the district of Rangareddy was selected to serve as a comparison. In Uttar Pradesh, Barabanki was selected as the experimental district and Unnao as the comparison.

Baseline data were collected from samples of pregnant women, mothers, and their children 0-23 months of age in all 4 study districts in January-February 2004. The baseline survey interviewed and collected measurements from pregnant women, and mothers and their children 0-23 months of age to determine baseline levels of process indicators and outcomes for maternal and child nutrition prior to the intervention period. After 2 years of program intervention, another cross-sectional survey of the same target groups in the study area was conducted in January-March 2006 to assess the impact of the intervention. Two adequacy surveys were conducted during the 2-year interval, in January 2005 and July-August 2005, to provide feedback to CARE on the pace of implementation of various program components. Data were collected from the pregnant women and mothers of children 0-23 months to assess program exposure at the household level.

A second study component – a longitudinal cohort – was also conducted in the same two Uttar Pradesh districts to collect more detailed information on program exposures and nutrition outcomes. A cohort of pregnant women was enrolled starting in May 2004 and they and their infants were followed from delivery through 18 months of age to collect more detailed data on intervention exposures and dietary intakes, and repeated follow-up of children to assess nutritional outcomes, including child growth, over time. However, the cohort sample size was not designed to provide the primary means of assessing the program's impact on child nutritional status as this was provided by the cross-sectional evaluation.

Key Findings

- Child malnutrition and anemia did not decrease as a result of the intervention in the 2 districts included in the Nutrition ER cross-sectional, pre-test, post-test evaluation. In fact, a few specific measures of nutritional status worsened significantly among all children or in sex- or age-specific categories in the intervention relative to the comparison district in both states. However, small, but significant gains in weight and height were observed in the cohort study conducted in UP districts only. However, the prevalence of underweight, stunting, wasting and anemia among children under 2 years remain alarmingly high in both states. These results are incongruent with CARE's own before and after surveys across 8 states that demonstrated a decrease of 8 percentage points in underweight among young children. However, this change was documented over a 5-year rather than 2-year period, and data from control districts were not available for comparison as they were in this evaluation.

- The INHP-II intervention was effective at improving some infant and young child feeding practices, particularly in UP state where baseline proportions were quite low for all feeding indicators. Timely initiation of breastfeeding increased and inappropriate early introduction of complementary foods decreased in both states. Indicators of diet quantity, quality, and frequency increased significantly in UP, but not AP, where they were more prevalent initially. However, endline prevalence of these indicators remained too low, particularly diet quantity, quality and frequency of feeds, and appear to have been insufficient to improve child nutritional status.

- Outreach by service providers to pregnant women for antenatal care and health and nutrition advice improved dramatically in the INHP-II intervention districts compared to the ICDS districts. Coverage and frequency of Anganwadi worker (AWW) home visits and contacts in the community during pregnancy increased significantly in both states, but contacts with ANM and CA improved in UP state only.

- Coverage and utilization of health and nutrition services for pregnant women and their children increased in both states, but the effects of the intervention were greater for many services in UP. Improvements in both states were seen in distribution and consumption of SN among pregnant and postpartum women and children 6-23 months, attendance at NHD, and coverage of pediatric vitamin A and IFA supplementation. Coverage of ANC visits and antenatal IFA supplementation distribution and consumption were improved significantly in UP, but not AP.

- The INHP-II intervention yielded tangible improvements in the dietary intake and nutritional status of both pregnant and postpartum women in both states. Although nutrition advice in INHP-II was targeted at women during pregnancy and the first 6 months postpartum, broad improvements in dietary intake among all women were observed in both states. The gains in nutritional status among pregnant women and mothers of young children were an unexpected result. Unfortunately, they did not translate into gains in child nutritional status.

Summary Results

<u>Antenatal care</u>

- Receipt of ANC visits was universal in AP. INHP-II significantly increased ANC coverage in UP so that 50% of women reported at least one visit and 25% reported ≥3 visits during the most recent pregnancy.

- INHP-II was highly effective in both states at increasing outreach by service providers to provide ANC services and health and nutrition advice to pregnant women through home visits and contacts in the community. Approximately 50% of AP women and 60% of UP women reported at least one home visit by a service provider during the most recent pregnancy. Home visits by AWW increased most dramatically in both states. However, ANM and CA also increased their outreach significantly in UP. Service provider contacts at the Anganwadi Centers and Nutrition Health Days increased significantly also.

- Improvements in coverage and consumption of antenatal IFA supplementation were limited in AP. However, UP state recorded significant increases in the proportion of women who received (65%) and consumed (36%) ≥90 tablets during their most recent pregnancy. In both states, the proportion of women who consumed all the IFA tablets they received more than doubled by endline.

- Recent attendance at NHD increased significantly among pregnant women and mothers of children 0-23 months in both states. Coverage during the past 3 months was only

~15% in AP, but 34-39% in UP at endline. However, the proportion of women in both states who remain unaware of NHD is still too high.

Maternal nutrition

- Receipt of SN among pregnant and postpartum women increased significantly to ~50% in both states. At endline, consumption of SN was more common among intervention district than comparison district women also. In the recall of dietary intake during the past 7 days, SN intake was significantly increased among all groups of women in UP and among pregnant women only in AP.

- Consumption of at least 3 meals a day increased but snack consumption decreased in AP state where the vast majority of women already consumed 3 meals a day. In UP state, only 25% of women ate 3 meals a day at baseline, but both meal and snack consumption increased at endline. In both states, these changes in meal and snack consumption occurred among pregnant and recently delivered women as well as mothers of children 6-23 months of age.

- There were multiple improvements in women's diets attributable to INHP-II in both states. Recent consumption of legumes, dark green leafy vegetables, and yellow-orange fruits was increased among all groups of women in AP. In UP, only yellow-orange fruit intake increased significantly among all women, but pregnant women and mothers of children 6-23 months increased their weekly intake of meat, fish, chicken and eggs and recently delivered women increased their dairy intake. Dietary messages delivered to women during pregnancy and the early postpartum period appeared to have a positive effect on all women's diets in many cases.

- Malnutrition was very high among pregnant and non-pregnant women in both states, but it was particularly alarming in the AP intervention district where over 50% of mothers of children 6-23 months were malnourished. However, malnutrition prevalence decreased significantly among first trimester pregnant women and mothers of children 6-23 months of age in AP. In UP, malnutrition decreased among third trimester pregnant women only. The increase in BMI of ~1 unit among the first (AP) and third (UP) trimester pregnant women in the intervention districts over a 2-year evaluation period is an impressive improvement.

- The INHP-II was not effective in reducing the prevalence of anemia among pregnant women in either state. Overall prevalence was comparable to the NFHS-2 prevalence although the severity of anemia was greater in this study population.

Infant and child feeding

- The INHP-II program was highly effective at improving newborn feeding practices, including increasing early initiation of breastfeeding and reducing the provision of prelacteal feeds. The intervention effects were particularly dramatic in UP state. More modest changes in these feeding practices occurred in the UP cohort.

- Exclusive breastfeeding among infants 0-5 months increased at endline in UP, but declined in AP. However, inappropriate early introduction of complementary foods and liquids before 6 months of age decreased significantly in both states. The decline in exclusive breastfeeding in AP was explained by an increase in breastfeeding with water, but the reasons for this are unknown. In the UP cohort, exclusive breastfeeding at 3-5 months of age was more prevalent in the intervention than comparison district, but early introduction of complementary foods was not affected by the intervention.

- The proportion of mothers of children 6-23 months of age who reported timely introduction of complementary foods at 6-8 months increased in both states, but only the increase in AP was attributable to the INHP-II intervention. Increases in cereal intake from the 24-hour recall among children 6-8 months were observed also in both states, but the increase in the intervention relative to the comparison district was significant in UP state only. By contrast, the intervention did not influence timely introduction of complementary foods among UP cohort mothers when defined by maternal recall or reported current dietary intake.

- In UP, the INHP-II program was highly effective at increasing consumption of cereals and legumes among children 6-23 months. In AP, cereal intake increased equally in both districts and legume intake remained low. Fruit and vegetable intake was not influenced by INHP-II complementary feeding messages in either state, but intake increased in the UP districts and decreased in the AP districts. The intervention was highly effective also at increasing legume consumption from 9 to 18 months among children in the UP cohort. However, cereal intake increased equally in both districts and fruit and vegetable intake increased more rapidly among cohort children in the comparison than the intervention district.

- INHP-II was effective at increasing complementary feeding indicators of diet quantity, quality and feeding frequency among children 6-23 months of age in UP, but not AP state. Diet quantity, quality, and frequency did increase in AP and remained more prevalent than in UP, but improvements were comparable in the two AP districts. However, the quality, frequency, and particularly quantity of dietary intake among children 6-23 months remained quite inadequate at the end of the evaluation. The intervention was less effective in the UP cohort, increasing the feeding frequency, but not diet quantity or quality among children from 9 to 18 months of age.

- Receipt and consumption of SN among children 6-23 months was more prevalent in the intervention than comparison district in both states. However, recent declines in coverage and utilization of SN in late 2005 in the AP intervention district are of concern for the ongoing success of the program. The intervention was effective at distributing SN to families of weaning age children in the UP cohort as well.

- Mothers in the intervention district of both states were more likely than those in the comparison district to report that they usually fed their child. In UP only, the intervention was also effective at encouraging mothers to feed their young children from a separate, rather than a shared, plate. In the UP cohort, some variation in the

intervention effects was observed. While intervention district mothers were more likely to usually feed their child than comparison district mothers, they were less likely to feed them from a separate plate. The explanation for the inconsistency in the intervention effect in UP is unknown.

Micronutrient supplementation

- Vitamin A supplementation coverage increased significantly in both states. Receipt of at least one dose of vitamin A syrup among children 12-23 months increased by ~50% to 79% coverage in AP and four-fold to 69% coverage in UP.

- Pediatric IFA supplementation coverage increased modestly to 30% in AP and dramatically to 69% in UP. Gains in coverage occurred during the second year of the intervention. However, few children reported consumption of more than a handful of tablets.

Child nutritional status and anemia

- The INHP-II intervention did not have an effect on child nutritional status in the study populations in AP and UP states.

- In AP state, underweight and stunting among all children did not change significantly. However, the mean HAZ score declined and severe wasting increased significantly in the intervention district. Stunting was increased significantly also among boys, but not girls.

- In UP state, underweight, stunting, and wasting did not change significantly. However, the underweight prevalence increased and mean HAZ score declined significantly among girls, but not boys in the intervention district.

- In the UP cohort, all 3 indicators of nutritional status followed the same worsening trend over the first 18 months of life that were observed in the cross-sectional data. However, there was limited evidence of a positive effect of the intervention on nutritional status and growth in the cohort sample. Mean WHZ was increased and wasting prevalence reduced among intervention children, particularly among girls from 3 to 12 months of age. The same benefits of the intervention were observed for mean WAZ and underweight prevalence at 6 and 9 months only. No effects on HAZ and stunting were observed.

- Longitudinal modeling of weight and height gains among cohort children identified small positive effects of the intervention on physical growth from 0 to 18 months of age. The borderline significant weight gain in intervention district children was larger and statistically significant for girls only. The height gain among intervention district children was statistically significant also, but was larger for girls also. When calculated over a 12-month period, children in the intervention district were predicted to have an additional 200 g weight gain and 0.6 cm gain in height relative to those in the comparison district. The comparable gains for girls only were an additional 300 g weight gain and 0.8 cm gain in height.

- The INHP-II program was not effective at reducing anemia among children 12-23 months of age in both states, and anemia prevalence remained >85% at endline.

Recommendations for Further Analyses

The INHP-II program was quite successful at improving maternal dietary practices and nutrition, infant and child feeding practices, and micronutrient supplementation in the intervention districts of both states, but particularly in UP. The pre-test, post-test, quasi-experimental design of this study allowed for evaluation of program impact on various indicators of these outcomes that are considered key to improved child nutritional status and health. However, study data from both the pre-test, post-test evaluation and the cohort also provide a valuable and unique resource to explore in detail the sociodemographic, environmental, health care utilization, and program factors that are associated with or predict key study outcomes. Listed below are some examples of additional analyses of the Nutrition Evaluation Research data that would be of high priority to better understand which factors and program inputs were most strongly associated with positive maternal and child nutrition outcomes. The following list is a starting point only.

<u>Infant and child feeding</u>

- Sociodemographic, environmental, pregnancy, antenatal care utilization and program factors/predictors associated with early initiation of breastfeeding
    - Survey data: cross-sectional association of the factors with early breastfeeding initiation in the endline data in AP and UP.
    - Cohort data: Factors assessed at pregnancy enrollment and immediately postpartum that predicted early breastfeeding initiation in the 2 UP districts

- Sociodemographic, environmental, pregnancy, health care utilization, delivery, infant feeding, and program factors/predictors associated with exclusive breastfeeding and early introduction of complementary foods and liquids.
    - Survey data: cross-sectional association of factors with exclusive breastfeeding and early introduction of complementary foods and liquids among children 0-5 months of age in AP and UP
    - Cohort data: Factors assessed at pregnancy enrollment, and 1, 3, and 6 months postpartum that predicted a) exclusive breastfeeding until 6 months of age or b) early introduction of complementary foods and liquids in 2 UP districts.

- Sociodemographic, environmental, health care utilization, infant, and program factors/predictors associated with introduction of solids to breastfeeding infants 6-11 months of age

- Sociodemographic, environmental, health care utilization, infant, and program factors/predictors associated with adequate quantity, frequency, and diversity of dietary intake among children 6-23 months of age

- The association between diversity in the diets of mothers and their children (cross-sectionally from survey data and longitudinally from cohort data).

- Evaluation of variation in intervention impact on infant and child feeding practices by child sex and household socioeconomic status (survey data).

Child nutritional status and anemia

- Sociodemographic, environmental, health care utilization, maternal, infant, and program factors/predictors of a) malnutrition, and b) good nutritional status of children at 6, 12, 18, and 24 months of age
    - Survey data: cross-sectional association of factors with a) malnutrition, and b) good child nutritional status
    - Cohort data: Factors assessed at pregnancy enrollment, and at 1, 3, 6, 9, 12, 15, and 18 months of age that predicted a) malnutrition and b) good nutritional status as 6, 12, and 18 months of age.

- Intervention effect on nutritional status and growth from 0-18 months of age in the 2 UP districts (cohort – in process)

- Sociodemographic, environmental, health care utilization, maternal, infant, and program predictors of good physical growth between birth and 18 months of age in the 2 UP districts (cohort).

- Sociodemographic, environmental, health care utilization, maternal, infant, and program factors associated with anemia among children 12-23 months of age

- The association between receipt and consumption of pediatric IFA supplements and child anemia.

Micronutrient supplementation

- Sociodemographic, environmental, health care utilization, maternal, infant and program factors/predictors of receipt and consumption of pediatric IFA supplements (survey and cohort data)

Maternal Nutrition

- Sociodemographic, environmental, dietary, and program factors/predictors (advice given, receipt of SN, etc.) of women's BMI and malnutrition
    - Survey data: cross-sectional association of factors with BMI and malnutrition
    - Cohort data: Factors assessed at pregnancy enrollment associated with third trimester BMI
- Association of third trimester BMI and neonatal weight (cohort data)
- Sociodemographic, environmental, dietary, health utilization, pregnancy, delivery, and program (contacts with service providers, attendance at NHD, advice given, etc.) factors associated with the receipt and consumption of SN

CHAPTER 1: BACKGROUND

Malnutrition Worldwide and in India

Malnutrition is responsible, directly or indirectly, for 60% of the 10.9 million deaths annually among children under five. Within this age range, the sharpest increase in malnutrition occurs between 6 to 24 months of age, the time when children grow most rapidly. This is due primarily to poor feeding practices that include not exclusively breastfeeding during the first six months of life, early cessation of breastfeeding, early introduction of complementary foods, and the feeding of inadequate quantity, and quality of complementary foods. These poor feeding practices compound the dangers for infants who are at highest risk of mortality because of their exposure to disease and limited access to health services.

Moderately and severely malnourished children are five to eight times more likely to die than are adequately nourished children. Even mildly malnourished children have a greater risk of death than children who are normally nourished. The total number of child deaths attributable to mild and moderate malnutrition is far greater than those attributable to severe malnutrition. Among children who survive, malnutrition contributes to long-term negative effects on growth, health, cognitive development, and educational achievement. As adults, malnourished women are more likely to deliver intrauterine growth retarded infants, thereby creating an intergenerational cycle of malnutrition.

India is the world's largest contributor to malnutrition. According to the National Family Health Survey (NFHS-2) of 1998-99, 47% of children under the age of 3 years are underweight and 46% are stunted; 74% of children between 6 months and 3 years of age suffer from anemia. Malnutrition is strikingly high in Madhya Pradesh (55%), Bihar (45 %), Orissa (45 %) and Uttar Pradesh (52 %) states. Malnutrition in the girl child continues into adulthood, with over a third of women 15-49 years chronically malnourished. Malnutrition is prevalent in both women and men, but it is more serious in women because of the intergenerational effect. The prevalence of anemia among women is ~50%, and approximately one-third of these women have moderate to severe anemia.

Program Background

The Reproductive and Child Health, Nutrition and HIV/AIDS Program (RACHNA) is an umbrella program of CARE India, supported by USAID and aimed at impacting on child and women's health and nutrition, women's reproductive health and prevention of transmission of HIV/AIDS. It consists of the Integrated Nutrition and Health Project (INHP) and the *Chayan* project. In October 1996, CARE, GOI and USAID initiated the Integrated Nutrition and Health Project (INHP), which transformed the program from primarily provision of supplementary food support to the ICDS into a maternal health and child survival initiative. INHP is a ten year project implemented in partnership with the Ministry of Human Resources Development's Department of Women and Child Development and Ministry of Health and Family Welfare's (MoH&FW) Department of Family Welfare, local NGOs and Community Based Organizations. While the first phase was successful in several key areas, some of the recommendations from final evaluation of the first phase of INHP included: the strengthening of INHP's focus on

nutritional impact, clearer definition of operational approaches, strengthening of capacity building and communication approaches to deliver the intervention package and a deliberate strategy for replication. The first five-year phase of the project was concluded in September 2001 and the second five-year phase, referred to as INHP II, began in October 2001. INHP II is currently implemented in ICDS catchment areas across 78 districts in nine states namely Andhra Pradesh, Bihar[1], Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal.

In July 2002, USAID funded a six-year reproductive health and HIV/AIDS prevention project, called *"Chayan"* (meaning Choices or Selection), to build upon the INHP program platform in 29 districts from four out of nine INHP states[2]. HIV prevention interventions among high-risk behavior groups and youth are implemented in 22 cities[3] in these four states. In the same year, a shift from project-based approach to program approach and organizational restructuring within CARE led to the creation of the RACHNA program. Thus, INHP and *Chayan* along with other health and nutrition projects were operationally and managerially integrated under the RACHNA program umbrella at all levels. The *Chayan* project, originally proposed to last until 2008, was synchronized with INHP II and both are scheduled now to end in late 2006.

Overview of RACHNA

RACHNA's goal is for vulnerable families to achieve sustainable improvement in the nutrition and health status of women and children in approximately 70 districts across 8 states in India by 2006.

INHP II intends to fulfill the following two sub-objectives**:**

- Service providers (especially auxiliary nurse midwives [ANM] and *anganwadi* workers[AWW]) improve the quality and coverage of maternal and child health services and key systems, including training, supply chain management and information management
- Communities sustain activities for improved maternal and child survival.

Impact and outcome commitments

INHP II is committed to specified improvements in a set of *impact and outcome* indicators by 2006, at program scale:

Impact:

- A 10 percentage point increase in the proportion of normally nourished children of age 12-23 months
- A reduction in IMR (not to be directly measured)

Outcome:

- A set of indicators related to maternal and newborn care, nutrition and immunization, including reported practice of key behaviors and coverage of specified services, each having

[1] Following bifurcation of Bihar, INHP was discontinued in the state in year 2000 since majority of program areas fell iinn the newly formed state of Jharkhand. Subsequently, in year 2003, the program was restarted in three districts of Bihar based a request from Government of India and state Government.

[2] The reproductive health interventions of *Chayan* project is implemented in rural areas of 29 districts from Uttar Pradesh, Jharkhand, Chhattisgarh, Rajasthan. These districts form a subset of 78 districts covered by INHP in nine states

[3] HIV prevention interventions are in 22 cities from the same four states, in addition to selected slums of National Capital Territory (NCT) of Delhi

a specified increment to be achieved by the end-of-program in 2006.

In addition, there are specified management indicators that are tracked annually by the program donor.

Interventions package

The interventions chosen are those that have been proven to be associated with the program's impact targets based on global evidence and the experiences from the first phase of INHP. The package includes:

- *Antenatal care:* emphasis on check-ups, Tetanus Toxoid (TT) vaccination, iron-folic acid (IFA) supplementation, Supplementary Nutrition (SN), increased dietary intake, reduced workload, rest and preparations for safe delivery
- *Community-based newborn care:* emphasis on clean childbirth, adequate warmth, early and exclusive breastfeeding, clean handling including cord care, recognition and extra care for the weak newborn (low-birth weight or premature)
- *Infant feeding practices:* exclusive breastfeeding, appropriate complementary feeding (appropriate timing, quantity, quality and responsive feeding) with emphasis on feeding during and after illness, vitamin A supplementation, pediatric IFA supplementation and SN
- *Child immunization*: complete and timely vaccination of all children with BCG, DPT, OPV and Measles by the completion of one year.

Implementation approaches

The project was implemented by a hierarchy of district, state and national level teams. According to its operational strategy implemented since early 2002, innovation and demonstration in selected areas provided lessons on the ground that were simultaneously replicated elsewhere. Initially, the main lessons came from the previous phase of the project in the form of four "best practices", and these were the mainstay of the program until the mid term review (MTR) of the program. The MTR provided an opportunity to thoroughly review lessons learnt and to plan for the rest of the life of the program. A brief overview of the operational strategy is provided here:

Pre-MTR strategies / approaches:

- Building on the food platform: Having supplied food commodity (corn-soya-blend and refined vegetable oil) to ICDS for decades using USAID Title II supplies, ICDS was the natural and nodal point for all operations. The AWC was the unit of implementation. The RCH program was a necessary partner for fulfilling several health-related objectives. All these were carry-overs from the previous phase.
- Food supplementation: While the intention was to continue food supplementation throughout the program period, commodity supply was disrupted due to Genetically Modified Organisms (GMO) considerations by the GoI in mid-2002. The corn-soya blend supply ceased by about early 2003, while oil supplies continue to be programmed.
- The Best Practices: Based on experience in INHP I, a number of approaches were assessed and the following four were chosen for wide application during INHP II:
    - Change Agents (CA): community-based volunteers, each representing / catering to a cluster of 15-25 households, working with support of the AWW and community

organizations, primarily to promote healthy maternal-child care practices.
    - Nutrition-and-Health Day (NHD): The use of food distribution by ICDS as incentive to enhance effectiveness of fixed-day, fixed-site service provision by the RCH program, with value addition through involvement of community organizations
    - Community-based monitoring systems (CBMS): The use of individual (Self-Monitoring Tool) and collective (Social Map) tools to track caring practices and service utilization, leading to identification and addressing of problems by community groups.
    - Block Level Resource Mapping (BLRM): A process of program review and action by concerned system functionaries at the block level, with participation of NGOs and people's representatives
- Technical interventions: using specified interventions that were known from global evidence to be effective in reducing mortality and malnutrition in the broad areas of antenatal care, essential newborn care, maternal infant and child feeding, and supplementary nutrition, and primary immunization (see Appendix I for details).
- Behavior Change Communication (BCC): Using multiple channels to reach communities with relevant information support
- System strengthening: to improve supply chains, information use and training institutions
- Capacity building (CB) and advocacy: as the primary tools for achieving all of the above. All INHP staff, and virtually all systems and NGO functionaries in the program universe, including resource persons from government training bodies participated in structured CB efforts.
- Gender and equity: increasing attention was paid through the program period to learning to assess the influence of gender and poverty / inequity on maternal and child health, and find ways to address them.
- Demonstration Sites (DS), NGO partnerships and Replication: Partnering with local NGOs for the development of about 10 per cent of AWCs as DS, where program implementation could be demonstrated, that the ICDS and RCH programs could adapt elsewhere in a phased manner (Replication Sites, or RS), while ongoing learning in the DS would contribute to program refinements.
- Early Learning Sites (ELS): Where fast-paced implementation over the first few months in a handful of sites would give field teams hands-on learning opportunities.
- Rapid assessments in a panel of districts (RAPs): Using independently conducted annual household surveys to assess progression of outcomes and processes in one district in each state, and using this information for planning program refinements with government and other partners.
- HMIS: A largely process-based that ensured process integrity across the program

Using these approaches, interventions had reached about 40% of the program universe (up to 10% DS and the rest RS) by December 2004. There was clear evidence of improvements in several outcome indicators as revealed by the RAPs, but this was not uniform, and the changes were not of sufficient magnitude to bring about impact level changes at scale. What was clear was that the processes as in use were not adequate to achieve this. Detailed independent and internal reviews, including the MTR, helped formulate approaches that had the best chance of success.

Post-MTR strategies / approaches

The primary change post-MTR was from an implicit process-orientation to an explicit results-orientation of the program. The main elements of the changed approach are:

- Closely engaged existing systems at multiple levels to get these interventions to scale:
    - Primarily, used the supervisory level of ICDS functionaries to deliver interventions to full scale.
    - Prioritized the mechanism of targeted home visits by AWW and ANM as primary vehicle for taking interventions to families.
    - Utilized NGOs beyond conventional DS-associated roles to assist ICDS supervisors and CDPOs to implement / monitor interventions, and to try out any innovations at small scale before wider adaptation.
    - Reorganized internally, assigning geographical regions within districts to individual district team (DT) members for ensuring implementation
    - Used locally adaptable tools for AWW, ICDS supervisors, NGO staff and DTs to systematically track progress and take appropriate action. These tools emphasized use of information where generated, minimized upwards reporting and encouraged supportive supervision at all levels.
    - Closely engaged district / block administration to initiate these mass-level processes and to monitor progress internally
    - Used locally generated process / output data to inform program planning in each district, wherever possible ("mini-RAPs" were used in 53 districts, besides RAPs in the panel of 8 districts as previously)
- BCC: was continued / universalized / optimized use of BCC materials
- The "Best Practices":
    - Continued to look for ways to enhance effective community involvement in program monitoring, but not necessarily using the previous CBMS tools.
    - Continued to use change agents where available and effective, but desisted from engaging in time-consuming structured recruitment and training of new CAs, mainly from the feasibility perspective.
    - Continued promoting NHD, but with primary emphasis on fixed-day, fixed-site service provision
    - The function of BLRM evolved into more frequent block level program reviews using existing forums within ICDS/health
- Gender and equity: Used the best available experience to make the program sensitive to gender and equity issues while going to full scale
- CB: Transformed structured CB to ongoing, on-the-job CB, using primarily ICDS sector meetings for strengthening program focus and content
- Strengthening supply chains: Continued emphasis on attention to supply chains, as appropriate in each district
- Demonstration and Replication:
    - Specific focus and intensity on maintaining 10 per cent DS with NGO partners was considerably reduced
    - With focus shifting to reaching every mother and child in every village, "replication" was no longer limited to selected sites.
    - With the systems taking over the implementation in entirety, effectively, the distinctions between "DS", "RS" and the rest became blurred by the end of program

- HMIS: pruned down to include only donor-required data coming up to Delhi; the rest decentralized and given strong results-orientation, and largely integrated into government systems
- Overall, there was considerably greater implementation flexibility and freedom to adapt these approaches to local contexts in individual states and districts

In addition, common themes at state and national levels through the program life included strategies to build alliances for organizational learning and advocacy, with national and international agencies, and attempts to create synergy with other CARE and non-CARE projects.

INHP II underwent through many challenges. One of them was the Genetic Engineering Approval Committee (GEAC) of Government of India's decision not to approve the import of food supplement i.e. Corn Soy Blend (one of the commodities used in INHP to support the ICDS Program), and its implications on the program. Non-import of CSB and availability of reduced resources levels from the donor implied significant change in the resource levels along with other implications of sudden stoppage of CSB.

Nutrition Evaluation Research

Objectives

This report presents findings from the program evaluation of CARE India's INHP-II intervention impact on maternal and child nutritional outcomes. Findings presented in this report come from two study components: a pre-test, post-test cross-sectional evaluation in AP and UP states and a longitudinal cohort in UP state only. For the pre-test, post-test, cross-sectional evaluation, the baseline survey was conducted in January – February 2004, two adequacy surveys were carried out in January and July 2005 during program implementation, and the endline survey was conducted in January – March 2006. The objectives of this analysis are as follows:

1. Compare the intervention districts (AP – Karimnagar, UP – Barabanki) to the comparison districts (AP – Rangareddy, UP – Unnao) in AP and UP states with regard to socio-demographic characteristics.
2. Describe the change in key process indicators (service provider contacts and advice, antenatal care, maternal and child micronutrient supplementation, supplemental feeding) from baseline to endline in the intervention and comparison districts in AP and UP states.
3. Describe the changes in key maternal and child nutrition outcomes (underweight, stunting, anemia, infant and child feeding practices) from baseline to endline in the intervention compared to the comparison district in AP and UP states, respectively.
4. Compare and contrast the impact of the intervention on key maternal and child nutrition indicators in AP and UP states.

The longitudinal cohort was carried out in the same intervention and comparison districts in UP state that were selected for the cross-sectional evaluation surveys. A cohort of pregnant women was enrolled starting in May 2004 and they and their infants were followed from delivery through 18 months of age until June 2006. The objective of this study component was to collect more detailed data on intervention exposures and nutrition outcomes to further explore the intervention impact on key child nutrition indicators over time.

The purpose of this program evaluation was to determine the impact of the basic package of INHP-II interventions in reducing malnutrition among children 0-23 months of age compared to the ICDS package alone. A secondary study objective was to assess whether the INHP-II strategy was more suited by design to reducing child malnutrition only in ecological settings with relatively low economic and cultural constraints. Child malnutrition and anemia are key impact indicators for INHP-II, but it is not possible to collect these outcomes data with a quasi-experimental study design that includes comparison areas in all 8 states where INHP-II is being implemented. Therefore, the program impact using this rigorous study design was evaluated in 2 districts each in AP and UP states only. To address the secondary objective, the evaluation research examined also the differential impact of INHP-II in a relatively low-constraint ecological setting in India, AP state, and a relatively high-constraint setting, UP state.

Study sites

A key focus of the study was to determine whether programs seeking to enhance child nutrition were likely to be more effective in areas where constraints to adequate child nutrition and growth are less formidable. Given this background, it was important to select areas with distinct ecological settings, including child nutritional status and resource endowments. The need to compare project impact in different settings was balanced with the importance of having the necessary service delivery infrastructure to maintain project fidelity. This balance was met by the selection of the two states of Andhra Pradesh and Uttar Pradesh. While the state of UP has high rates of child malnutrition and infant mortality, the state of AP has some of the better nutritional status figures in the whole of India. Andhra Pradesh also has a receptive state government, high potential uptake of evaluation results, and capacity to operationalize and monitor implementation of the evaluation activities. Uttar Pradesh also had basic implementation resources including its ongoing participation in the INHP Newborn Care Project that ensured an additional layer of site supervision.

To select districts within each of the two states, data from the Reproductive and Child Health (RCH) rapid survey were used to compare outcomes targeted by INHP II. Only districts implementing the government's ICDS program could be selected for comparison. In Andhra Pradesh, the district of Karimnagar was chosen as the experimental district while the district of Rangareddy was selected to serve as a comparison. In Uttar Pradesh, Barabanki was selected as the experimental district and Unnao as the comparison. .

Collaborating partners

The INHP-II program is implemented by CARE India. Johns Hopkins Bloomberg School of Public Health (JHSPH) is conducting the evaluation of the nutrition impact of CARE India's INHP-II program. JHSPH, in partnership with King Georges Medical University (KGMU), has designed the evaluation and is carrying out its implementation. Evaluation data were collected by TNS, a private survey research firm in India, under the supervision of JHSPH and KGMU.

SECTION I: CROSS-SECTIONAL, PRE-TEST, POST-TEST EVALUATION IN ANDHRA PRADESH AND UTTAR PRADESH STATES

CHAPTER 2: METHODOLOGY AND DATA COLLECTION

Rationale for the Study Design

The purpose of this study was to evaluate the effectiveness of the INHP-II program to reduce the prevalence of malnutrition and anemia among children less than 2 years of age in 2 rural districts in India over a 2-year period. Health workers (ANM), community-based health and development workers (AWW), and change agents (community volunteers) were trained to provide counseling to women during pregnancy, after delivery, and during the first 2 years of their children's lives to utilize antenatal care, delivery, and postpartum care services and to practice good maternal and child feeding behaviors to improve maternal and child nutritional status and health. To assess rigorously the impact of the program's services, a pre-test, post-test, quasi-experimental evaluation design was employed with an intervention and comparison area in each state. The adequacy of the intervention implementation was assessed twice during the 2-year evaluation period; the first one after one year of program implementation, and the second 6 months later.

Study Design

In each state, an INHP district was selected as an intervention area while a similar non-INHP (ICDS) district was chosen as comparison area for the nutrition evaluation research. In Uttar Pradesh, Barabanki was selected as the INHP district and Unnao was selected as the comparison district where the GOI's ICDS program was in place. In Andhra Pradesh state, Karimnagar was selected as CARE's INHP district and Rangareddy was selected as the ICDS comparison district. The baseline survey interviewed and collected measurements from pregnant women, and mothers and their children 0-23 months of age to determine baseline levels of process and outcome indicators for maternal and child nutrition prior to the intervention period. After 2 years of program intervention, another cross-sectional survey of the same target groups in the study area was conducted to assess the impact of the intervention. Two adequacy surveys were conducted during the 2-year interval to provide feedback to CARE on the pace of implementation of various program components. Data were collected from the pregnant women and mothers of children 0-23 months to assess program exposure at the household level.

Sampling Design

<u>Sample size for baseline and endline surveys</u>
Sample size was calculated to detect differences in various nutrition outcomes between each intervention district and its comparison district. Assumptions in making these calculations included a statistical power of 80% to detect a difference and a significance level of 95% (alpha = 0.05). The sample size was not increased to account for a design effect, which in nutrition studies has been small or trivial. The sample size estimations for children were based on three primary outcomes: shift in average z-scores in length and weight, stunting and anemia. Calculations for the primary outcomes for children and pregnant women are found in below.

Table 2.1. Target sample size calculations for primary nutritional outcomes in cross-sectional surveys at baseline and 24 months

Outcome Measure	SD or P^0	Detectable difference in means by intervention arm	Sample size per intervention arm*
Nutritional status			
Children			
Shift in average z-score			
12-17 months	1.1	.18 z-score	587 ~600
18-23 months	1.1	.18 z-score	587 ~600
Stunting (%)			
12-23 months	60%	Absolute reduction 6%	1101 ~1200
Anemia			
Children 12-23 months	80%	Absolute reduction 6%	772 ~800
Pregnant women	50%	Absolute reduction 8%	633 ~800

*Estimated sample size rounded to nearest '00.

We needed approximately 1200 children aged 12-23 months for nutritional status outcomes and at least 800 children for anemia. The NFHS-2 data show that the prevalence of stunting (height-for-age <-2 SD of median of reference population) among children 12-23 months was 57.5%. We estimated a minimum sample size requirement of 1101 children for the detection of 6% absolute reduction in stunting from a 60% prevalence of stunting at baseline. We rounded the target sample to 1200 children aged 12-23 months. The targeted 1200 sample size was also sufficient to detect a change of at least 0.18 z-score units for anthropometric z-scores.

NFHS-2 reported that the prevalence of anemia among children aged 12-23 months nationally was 77.7% (children aged <3 years: 74.3% nationally, 73.9% in Uttar Pradesh, and 72.3% in Andhra Pradesh). We estimated that a sample of 772 children could detect a 6% reduction in anemia from the assumed 80% prevalence at baseline among children aged 12-23 months. However, recruitment for hemoglobin assessment included all children 12-23 months of age who were enrolled in the surveys for anthropometry and an interview, yielding a larger sample. For women of reproductive age, the prevalence of anemia was 51.8% nationally (48.7% in Uttar Pradesh and 49.8% in Andhra Pradesh). We estimated a minimum sample size requirement of 633 (~800) pregnant women to detect a 8% reduction in anemia prevalence.

Sample size for adequacy surveys

For the 2 adequacy surveys, we targeted 100 currently pregnant women and 500 mothers of children 0-23 months of age for interviews. The purpose of the adequacy surveys was to monitor the progress and implementation of the INHP-II intervention for various process indicators (e.g., home visits received, antenatal iron-folic acid supplements received), and statistical power was not a primary consideration in sample size estimation. However, we estimated the required sample size of at least 97 currently pregnant women to estimate the process indicators with 10% margin-of-error, and rounded the sample size to 100 pregnant women for the adequacy surveys.

With a targeted sample of 500 mothers of children 0-23 months, we expected to detect at least a 9% difference in program coverage between the arms.

Based on population size, we needed 24 and 13 AWC areas in AP and UP districts, respectively, to meet the sample size requirements.

Sample Selection

In each of the 4 districts in the evaluation, rural blocks were selected for the evaluation surveys. In UP state, the intervention district of Barabanki has 16 blocks, and CARE worked in 14 of the 16 blocks in the district, all of which were rural. The evaluation study was planned for the 10 blocks where CARE was able to start their replication strategy immediately as the other 4 blocks had too many sector supervisor vacancies. The comparison district of Unnao has 16 blocks also, 15 of which are rural. Nine blocks were randomly selected to represent this district in the evaluation. In AP state, each district selected for the evaluation has 15 blocks. In the intervention district of Karimnagar, CARE worked in 9 of the 15 blocks, and the evaluation was conducted in these 9 CARE blocks. In the comparison district of Rangareddy, 8 blocks were selected randomly for the purpose of this evaluation.

Each block contains 3-6 sectors, an area with 15-25 AWC and an estimated population of 20,000-25,000 persons. In the intervention districts in each state, the sampling universe for survey sample selection included only those sectors and AWC areas that were participating in CARE's INHP-II program as replication sites. All sectors in the selected blocks had AWC areas participating in the intervention. In the comparison districts, the sampling universe included all functioning AWC from all sectors of the selected blocks in the district.

Baseline survey
We used multi-stage survey sampling design to achieve the targeted sample of children and women.

Uttar Pradesh. In the intervention district (Barabanki), 2 sectors were randomly sampled from each block (n=20 sectors). In the comparison district (Unnao), 2-4 sectors were randomly sampled per block in proportion to the number of AWC per block (n=20 sectors). In both districts, 3 AWC areas were randomly sampled from each selected sector (n=60 AWC). Women were randomly selected from the sampled AWC areas.

Andhra Pradesh. In both districts, 2-3 sectors per block were sampled in proportion to the number of AWC per block (n=20 sectors), and 4-6 AWC areas were randomly sampled per sector (n=110 AWC). Women were randomly selected from the sampled AWC areas.

Endline survey
The same sample selection process used at baseline was employed again at endline. However, the sampling universe in the intervention district in Uttar Pradesh was modified slightly by the removal of some AWC that did not exist at the time of the endline survey.

Adequacy surveys

In all districts, one sector was randomly sampled from each block for selection of the Adequacy Survey sample. In AP districts, 2-3 AWC per sector were sampled in proportion to the number of AWC per block for a total of 24 selected AWC areas. In UP districts, 1-2 AWC per sector were sampled in the same manner for a total of 13 selected AWC areas. The same sample of AWC areas were used for both adequacy survey rounds to allow for tracking of program exposures in the same AWCs over time.

Study Instruments

The study included three separate instruments:

i. Sociodemographic Questionnaire: This questionnaire was administered to pregnant women and mothers of children 0-23 months. It collected data on the respondents sociodemographic characteristics including pregnancy history, age, education, religion, caste, parity, birth intervals, occupation, work history, land ownership, source of income, and basic household amenities.

ii. Currently Pregnant Women's (CPW) questionnaire: This questionnaire was administered only to women who were pregnant at the time of survey. It collected information on a wide variety of issues including antenatal care utilization, health behaviors during pregnancy, micronutrient supplementation, dietary intake and practices, rest and workload, and nutritional status.

iii. Mothers' (MOM) questionnaire: This questionnaire was administered to women with children 0-23 months of age. It collected information on similar topics as those covered in the pregnant women's questionnaire. In addition, it included questions on delivery, postpartum contacts with service providers, infant and child feeding practices and dietary intake, immunization, micronutrient supplementation, and maternal and child nutritional status.

Data Collection

The evaluation involved 4 rounds of cross-sectional survey data collection: the baseline survey in January-February 2004, the Adequacy I survey in January 2005, the Adequacy II survey in July-August 2005, and the endline survey in January-March 2006. At each survey round, we conducted interviews with currently pregnant women and mothers of children 0-23 months of age. Anthropometric measures of weight and height/length were obtained at the baseline, Adequacy II and endline surveys. Hemoglobin measurement for assessment of anemia was carried out among currently pregnant women and children 12-23 months of age at the baseline and endline surveys only. The surveys were implemented by TNS with guidance from Johns Hopkins and CARE India investigators.

House listing

TNS conducted a household listing operation in all the sampled AWC areas selected for the samples at each survey round. The purpose of the household listing was to identify households with eligible women and children only. If more than one pregnant woman or mother of a child 0-23 months of age was identified in a household, interviewers selected one eligible woman randomly from that household. The sample of AWC areas was selected with the expectation of

identifying at least 2,400 mothers of children 0-23 months of age and 800 currently pregnant women in each district. For the adequacy surveys, the sample targets were 500 mothers of children 0-23 months of age and 100 currently pregnant women. However, all eligible women from sampled AWC areas were recruited for survey enrollment. This resulted in actual survey samples that may have fallen short of or exceeded the sample targets.

Training and field work

Training of interviewers and supervisors for each survey round was carried out by TNS with on-site technical guidance from JHU and CARE personnel. The interview teams consisted of 4 interviewers, 1 supervisor and 1 field editor each. The supervisors were trained to take the weight and height/length measurements from women and children, and to collect a fingerprick blood sample for hemoglobin assessment. The interviewers and field editors were trained to assist in both these tasks. The JHU field office in Lucknow organized, trained, and managed independent quality control teams to supervise the TNS interview teams and assure data quality. The surveys in Uttar Pradesh and Andhra Pradesh were conducted simultaneously at all survey rounds.

Data Management

All questionnaires for baseline and endline surveys were returned to the TNS office from the field immediately after interview completion and data were entered by TNS. Quality of data was checked and validated both at TNS and Johns Hopkins University (JHU) for completion, range check, skip-pattern matching, heaping and and consistency. In case of discrepancies, the data were cross-checked with the questionnaire for immediate resolution. The final statistical analyses were conducted at JHU.

Sample Coverage

The eligible population identified for each survey round and coverage rates are reported below (Table 2.2). A total of 4878 mothers of children 0-23 months and 1205 pregnant women eligible for recruitment were found in the sampled households of the 2 AP districts at baseline, and coverage for the two groups was 83.7% and 78.2%, respectively. In UP districts, a total of 4895 mothers of children 0-23 months and 1437 pregnant women eligible for recruitment were found in the sampled households at baseline, and coverage was 80.3% and 86.5% in the 2 groups, respectively. At endline, coverage in the AP districts was 80.5% among the 6892 mothers and 69.4% among the 1902 pregnant women identified as eligible for the survey. In the UP districts, coverage was 82.8% among 5935 mothers and 83.5% among 1755 pregnant women. The main reason for non-response was failure to find the women at home despite 3 re-visits for all eligible survey respondents.

Table 2.2. Eligible population and sample coverage at each survey round of the Nutrition Evaluation Research Study

	Andhra Pradesh				Uttar Pradesh			
	Intervention		Comparison		Intervention		Comparison	
	Population	Coverage	Population	Coverage	Population	Coverage	Population	Coverage
Baseline								
MOM	2964	2375 (80.1%)	2866	2503 (87.3%)	3126	2443 (78.2%)	2972	2452 (82.5%)
CPW	763	574 (75.2%)	777	631 (81.2%)	853	734 (86.0%)	809	703 (86.9%)
Adequacy I								
MOM	652	529 (81.1%)	735	556 (75.6%)	686	548 (79.9%)	633	520 (82.1%)
CPW	165	120 (72.7%)	183	140 (76.5%)	171	133 (77.8%)	186	136 (73.1%)
Adequacy II								
MOM	606	498 (82.2%)	877	576 (65.7%)	672	542 (80.7%)	650	531 (81.7%)
CPW	129	87 (67.4%)	229	161 (70.3%)	238	191 (80.3%)	214	164 (76.6%)
Endline								
MOM	3323	2668 (80.3%)	3569	2878 (80.6%)	3186	2512 (78.8%)	2749	2403 (87.4%)
CPW	809	550 (68.0%)	1093	770 (70.4%)	867	761 (87.8%)	888	704 (79.3%)

Statistical Methods

After careful evaluation of the quality of data, we examined the frequency distribution of the sample characteristics with descriptive statistics. We compared the similarity in the characteristics of sample distribution between intervention and comparison arms with Student's t-test and Pearson's chi-square for metric (continuous) and non-metric (categorical) variables, respectively.

The main analysis of this study is based on "difference-in-difference" analysis (Wooldridge, 2002) that compares the differences in health outcomes between baseline and endline survey periods by intervention and comparison arms.

Statistical comparisons of intervention and comparison arms

The tables presented in the result section compare results from the baseline and endline surveys of this evaluation. For each indicator given in the tables, the change from baseline to endline is reported within each district (Δ = endline minus baseline value). A positive change indicates that the prevalence of an indicator has increased from baseline to endline and a negative change indicates it has decreased over time. The difference of differences (difference of Δ) is the test of the impact of the intervention. It is calculated as the change in the intervention district relative to the change in the comparison district (intervention Δ – comparison Δ). For an indicator where an increased proportion represents improvement (e.g. proportion of mothers consuming IFA supplements), a large positive difference of differences demonstrates program effectiveness. For an indicator where a decreased proportion represents improvement (e.g. proportion of children with weight-for-age Z-score <-2 SD), a large negative difference of differences demonstrates program effectiveness. We used probability linear model for statistical significance testing in "difference-in-difference" analysis (baseline to endline differences between intervention and comparison arms). One advantage of using regression model is to adjust the effect of intervention net of confounding covariates. The addition of variables for various sociodemographic characteristics to the regression models to test for confounding did not change significantly the evaluation results. Therefore, unadjusted results are presented in the subsequent chapters to facilitate interpretation of the "difference of differences" results.

All analyses were conducted with STATA 8.0 (Stata Corp, TX).

CHAPTER 3: SOCIODEMOGRAPHIC CHARACTERISTICS

The endline survey included two groups of respondents: mothers of children 0-23 months of age and currently pregnant women. Mothers in the former group who were also pregnant at the time of the interview contributed data to both questionnaires. Since most of the data presented in the following chapters come from the mothers of children 0-23 months, we present sociodemographic characteristics on this respondent group only in this chapter. The distributions of characteristics from the currently pregnant women closely matched the distributions presented here for mothers of children 0-23 months. Because of the large sample sizes, even very small differences in the distributions of two districts may be statistically significant. However, such statistical significance may not reflect a meaningful difference in the distribution of a characteristic that could affect the evaluation results in subsequent chapters.

Maternal Age

In the AP districts, approximately three-quarters of the women were <25 years of age and only ~5% were ≥30 years of age (Table 3.1). The only significant difference in the age distributions in the 2 districts was the smaller proportion of adolescent girls (<20 years) in Karimnagar district.

The age distribution of women in UP state was skewed older than in AP. Only 9% of the samples were adolescent girls and approximately two-thirds were 20-29 years of age in both UP districts. In contrast to AP, more than 25% of the UP sample was ≥30 years of age. Although the age distributions of the 2 UP districts were statistically different, the differences in proportions for each age category were quite small.

Table 3.1. Age distribution among mothers of children 0-23 months by age

Age categories (years)	Age of mothers of children 0-23 months (%)			
	Andhra Pradesh		Uttar Pradesh	
	Karimnagar*	Rangareddy*	Barabanki *	Unnao *
< 20	16.2	22.1	8.7	9.5
20-24	57.6	55.5	31.7	34.3
25-29	20.8	18.0	31.6	30.4
30-34	4.4	3.4	17.1	17.3
35-49	1.1	0.9	10.9	8.6
Total no. of mothers	2575	2656	2413	2306

* Statistical test comparing distributions between districts within a state, significant at p<0.05

Child Age

Overall, the samples were split approximately evenly between the first and second years of life in all districts, but the age distribution of children in AP skewed older than in UP. In the AP districts, there were 5% fewer children <12 months of age and 5% more children ≥18 months of age in Karimnagar than Rangareddy district. In the UP districts, ~30% of children were <6 months of age compared to 22-3% in the AP districts. The oldest children 18-23 months of age comprised ~20% of the sample in both UP districts.

Table 3.2. Age distribution among children 0-23 months by age

Age categories (months)	Child Age (%)			
	Andhra Pradesh		Uttar Pradesh	
	Karimnagar*	Rangareddy*	Barabanki *	Unnao *
0-5	21.9	23.4	31.6	29.6
6-11	25.9	28.4	19.4	22.6
12-17	27.1	27.6	29.8	26.8
18-23	25.2	20.5	19.2	21.0
Total no. of children 0-23 months	2575	2656	2413	2306

* Statistical test comparing distributions between districts within a state, significant at $p<0.05$

Child Sex

The proportion of boys in the UP districts was slightly higher than in the AP districts (Table 3.3). In AP, there was no difference in sex distribution with almost equal percentage of male and female children in both districts. In UP, the distribution was skewed more to boys by a couple of percentage points in Unnao compared to Barabanki district, but this difference was not statistically significant.

Table 3.3. Sex distribution among children 0-23 months by age

Sex	Child Sex (%)			
	Andhra Pradesh		Uttar Pradesh	
	Karimnagar	Rangareddy	Barabanki	Unnao
Girl	49.2	50.8	48.7	46.5
Boy	50.8	49.2	51.3	53.5
Total no. of children 0-23 months	2575	2656	2413	2306

Religion

The majority of respondents in both states were Hindu. In AP districts, >90% in both districts were Hindi with Muslims at 4-6% and other religions – primarily Christian, Sikh, Buddist, and Jain – at 3%. However, the proportion of Hindus and Muslims in the 2 UP districts differed significantly. Barabanki District had a much larger Muslim population (19%) whereas it was <5% in Unnao District.

Table 3.4. Religion among mothers of children 0-23 months by age

Religion	Andhra Pradesh (%)		Uttar Pradesh (%)	
	Karimnagar *	Rangareddy *	Barabanki *	Unnao *
Hindu	93.2	90.7	80.9	95.5
Muslim	4.1	6.0	19.1	4.4
Others	2.7	3.3	0.1	0.1
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at $p<0.05$

Caste

Other backward caste was the most common caste group in all four districts (Table 3.5). However, there was significant variation in the population distribution among caste groups between the intervention and comparison district in each state. In AP, Karimnagar had more other backward caste women than Rangareddy (60% vs. 43%) whereas Karimnagar had more scheduled tribe women. In UP, Barabanki had more other backward caste women than Unnao (52% vs. 41%), but scheduled caste women were more common in Unnao. Scheduled tribe women were virtually non-existent in both UP districts.

Table 3.5. Caste among mothers of children 0-23 months by age

Caste groups	Andhra Pradesh		Uttar Pradesh	
	Karimnagar *	Rangareddy *	Barabanki *	Unnao *
Scheduled caste	23.7	23.6	33.9	41.8
Scheduled tribe	4.6	19.2	0.9	1.7
Other backward caste	61.3	42.9	51.6	41.4
Not applicable	0.1	0.1	0.3	0.1
Other	10.3	14.2	13.3	15.0
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at $p<0.05$

Education

Education level was reported as the number of school years completed by mothers using the categories from the NFHS II survey (Table 3.6). Illiteracy was more prevalent and high school education less prevalent in the UP than AP districts. In AP, approximately three-quarters of women had ≤7 years of education and ~15% had 10 or more years. However, there was some variation among the less educated women as illiteracy was more prevalent in Rangareddy than Karimnagar. In the UP districts, approximately two-thirds of women were illiterate and only 8% had 10 or more years of education. The distribution of women by education level differed statistically between UP districts, but the distributions were quite similar and unlike to bias any evaluation results.

Table 3.6. Education level among mothers of children 0-23 months by age

Education level (years)	Andhra Pradesh		Uttar Pradesh	
	Karimnagar *	Rangareddy *	Barabanki *	Unnao *
None	45.5	57.8	66.9	65.3
1-7	30.7	21.2	15.5	13.7
8-9	7.3	6.2	10.0	12.9
10+	16.4	14.8	7.8	8.1
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at $p<0.05$

Parity

Parity was much lower among women in AP than UP (Table 3.7). Over one-third of women in AP were primiparous compared to ~20% of women in UP. In the AP districts, the number of live births was skewed slightly higher in Rangareddy where 11% of women had ≥4 live births compared to 4% in Karimnagar. The distribution of live births were quite similar in the 2 UP districts, but were skewed slightly higher in Barabanki where 46% of women had ≥4 live births compared to 40% in Unnao.

Table 3.7. Number of live births (parity) among mothers of children 0-23 months by age

Number of live births	Andhra Pradesh		Uttar Pradesh	
	Karimnagar *	Rangareddy *	Barabanki*	Unnao*
1	38.5	34.2	18.1	20.6
2-3	57.7	54.3	35.7	39.3
4-5	3.5	10.3	26.6	23.2
6+	0.3	1.2	19.4	16.7
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at p<0.05

Birth Interval

Intervals between 2 births that are too short or too long not only pose difficulty for the mother, but also influence health outcomes for the newborn. In AP state, birth intervals were significantly longer in Karimnagar compared to Rangareddy district (Table 3.8). In Karimnagar, 45% of mothers had a birth interval of <48 months compared to 55% in Rangareddy. In UP, the birth interval distribution did not differ between districts. Just under 20% of women in both districts had birth intervals of <24 and ≥48 months each. Primiparous women were almost twice as common in AP as in UP districts, and did not contribute to the birth interval distribution.

Table 3.8. Inter-pregnancy birth intervals among mothers of children 0-23 months by age

Birth interval (months)	Andhra Pradesh		Uttar Pradesh	
	Karimnagar *	Rangareddy *	Barabanki	Unnao
<24 months	15.5	22.2	19.8	18.7
24-47 months	29.1	32.9	41.6	41.5
48+ months	15.6	10.2	19.8	18.0
N/A	39.8	34.7	18.9	21.8
Total no. of women	2575	2656	2413	2306

* Statistical test between districts within a state, significant at p<0.05

Household Toliet Facilities

Women in UP districts were much more likely than those in AP to have no toilet in their households and much less likely to have a flush toilet (Table 3.9). In AP, the type of toilet available in the household differed significantly between districts. Households in Rangareddy were twice as likely as those in Karimnagar to have a flush toilet. Three-quarters of Karimnagar households and a little more than half of Rangareddy households did not have a toilet in the home. In the UP districts, approximately 90% of households did not have a toilet.

Table 3.9. Household toilet facilities among mothers of children 0-23 months by age

	Andhra Pradesh		Uttar Pradesh	
Type of toilet facility	Karimnagar *	Rangareddy *	Barabanki *	Unnao *
Flush toilet	22.6	40.9	9.1	6.8
Open/shared/public Toilet	0.4	0.7	2.0	1.2
No facility	76.9	58.4	88.6	91.9
Other	0.2	0.1	0.3	0.1
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at $p<0.05$

Drinking Water Source

Approximately 80-90% of the mothers in all four districts reported piped water as their household's drinking water source (Table 3.10). However, the piped water was more likely to come from a public tap than from within the household in AP compared to UP. In both states, the distribution of drinking water source differed significantly between districts. In AP, piped water within the home was more common in Rangareddy, but a little more than half of mothers in both districts obtained piped water from a public tap. In Karimnagar, well water was available within the home, but this was not a drinking water source in Rangareddy.

In UP, piped water was available in over half of Barabanki households, but only 40% of Unnao households. More than a third of households in both districts had piped water from a public tap. A public well was the drinking water source for 5% of Barabanki households and 13% of Unnao households.

Table 3.10. Household drinking water source among mothers of children 0-23 months by age

Drinking water source type	Andhra Pradesh		Uttar Pradesh	
	Karimnagar *	Rangareddy *	Barabanki *	Unnao *
Piped water in residence	28.9	34.9	56.0	40.2
Piped water in public tap	51.5	56.7	36.4	43.4
Well water in residence	12.6	0.6	1.9	1.8
Public Well	5.0	1.5	5.0	13.1
Natural water/other	2.1	6.3	0.7	1.6
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at $p<0.05$

Child Care for Mothers who Work Outside the Home

For mothers who worked outside the home, their child care arrangements were somewhat different in AP than UP. In AP, mother-in-laws were the most commonly used source of child care, but this option was more common in Karimnagar than Rangareddy. By contrast, women in Rangareddy were 3 times more likely than those in Karimnagar to take their child with them to work. Other relatives or neighbors were also a significant source of child care (8-10%).

In UP, mothers in Barabanki were less likely than those in Unnao to work outside the home. For women who required child care, older children were the most common source in both districts at 16%. Mothers-in-law or taking the child to work were additional options that were frequently used, but they were more common in Unnao than Barabanki.

Table 3.11. Child care arrangements among mothers of children 0-23 months by age

Child care arrangments	Andhra Pradesh		Uttar Pradesh	
	Karimnagar *	Rangareddy *	Barabanki *	Unnao *
Take child to work	3.6	11.6	7.3	12.2
Husband	1.8	0.5	0.7	0.3
Mother in law	25.4	18.0	8.9	13.0
Older children	1.6	4.5	15.7	16.1
Other relatives/ neighbor	10.4	7.7	3.7	3.6
Do not work outside the home	57.2	57.7	63.7	54.8
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at $p<0.05$

Socioeconomic Status Index

In developing countries, income data are difficult to gather and are of poor quality. Several studies have suggested that a "wealth index" measured from household assets as a score through principal component analysis (PCA) is quite robust and serves as a good proxy for socioeconomic status (SES) (Filmer, and Pritchett, 2001; Bollen, Glanville, and Stecklov, 2001). Wagstaff and Watanabe (2002) showed that inequity in malnutrition, whether measured by a wealth index or consumption – a direct measurement of economic condition – provides similar degrees of inequity magnitudes. Currently, the wealth index is widely used for inequity studies in developing countries. We also used the wealth index to stratify respondents in SES terciles based on a principal component analysis of domestic assets and household possessions. The lowest tercile indicates the poorest group and the highest tercile indicates the richest group. The SES index distribution was determined separately for each state, and then the distribution in terciles was compared between the intervention and comparison districts within a state.

The distribution of households across the SES index differed significantly between districts in both states. Approximately one-third of women were classified in the medium tercile of the index in all 4 districts. However, a larger proportion of households were classified in the low tercile and a smaller proportion in the high tercile in Karimnagar (intervention) district in AP state and in Unnao (comparison) district in UP state.

Table 3.12. Socioeconomic (SES) Index among mothers of children 0-23 months of age

SES Index level	Andhra Pradesh		Uttar Pradesh	
	Karimnagar *	Rangareddy *	Barabanki *	Unnao *
Low	37.6	29.5	27.7	39.3
Medium	35.2	31.4	33.5	33.2
High	27.3	39.1	38.8	27.5
Total no. of mothers	2575	2656	2413	2306

* Statistical test between districts within a state, significant at $p<0.05$

CHAPTER 4: ANTENATAL CARE SERVICES

Antenatal care

Antenatal care (ANC) is critical for the health and wellbeing of both the mother and the developing fetus. Frequent and regular use of quality antenatal care throughout pregnancy protects against adverse birth outcomes and maternal health complications. The GOI recommends that women have a minimum of 3 antenatal visits during pregnancy.

Andhra Pradesh. Virtually all women in both AP districts reported receipt of some antenatal care during their most recent pregnancy (Table 4.1a). Even though ~85% of women made at least 3 ANC visits at baseline, the intervention was successful at increasing significantly this proportion to 95% at endline.

Table 4.1. Antenatal care (ANC) visits among mothers of children 0-23 months of age

a. Andhra Pradesh

ANC visits	Frequency of ANC visits among mothers of 0-23 month olds (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1+ visits	97.9	99.5	1.6	94.7	98.2	3.5	-1.9
3+ visits	86.4	95.1	8.7	84.7	91.6	6.9	1.8
Total # of mothers	2369	2574		2476	2656		

b. Uttar Pradesh

ANC visits	Frequency of ANC visits among mothers of 0-23 month olds (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1+ visits	35.1	53.4	18.3	29.7	28.0	-1.7	20.0*
3+ visits	11.5	25.3	13.8	8.9	8.8	-0.1	13.9*
Total # of mothers	2445	2413		2388	2306		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. Utilization of ANC was dramatically lower in UP than AP districts. Nonetheless, the INHP-II intervention was effective at improving ANC coverage and intensity of exposure. The proportion of women in the intervention district who received 1+ or 3+ ANC visits increased significantly to 53% and 25%, respectively (Table 4.1b). The proportions in the comparison district were unchanged.

Service provider contacts

Mothers of children 0-23 months during their most recent pregnancy

Andhra Pradesh. Service provider home visits during the most recent pregnancy were reported by only one-third of women at baseline in the intervention district, but this increased to approximately half by endline (Table 4.2). This improvement in coverage of home visits during pregnancy was attributable to a significant increase in the visits by AWW in the intervention relative to the comparison district. Data in Figure 4.1 illustrate significant increases in the

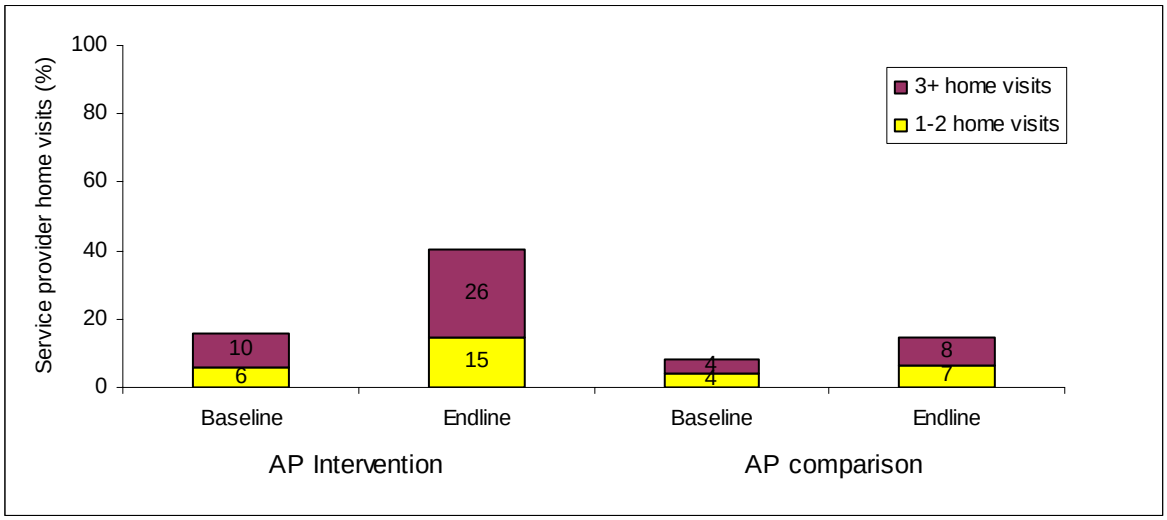
intensity of contact with AWW as well. The proportion of women reporting visits by ANM did not change over time, and there was little evidence of CA participation in this intervention activity.

Table 4.2. Service provider home visits during pregnancy among mothers of children 0-23 months in Andhra Pradesh

Service provider type	1+ service provider home visit during the most recent pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall	36.1	49.4	13.3	22.1	28.5	6.4	6.9*
ANM	31.5	35.6	4.1	20.0	22.1	2.1	2.0
AWW	15.7	41.3	25.6	8.4	15.2	6.8	18.8*
CA	0.3	2.4	2.1	0.1	0.1	0	2.1*
Total # of mothers	2369	2574		2476	2656		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Figure 4.1. Anganwadi worker (AWW) home visits during pregnancy among mothers of children 0-23 months in Andhra Pradesh



Women were asked to report on pregnancy advice received outside the home other than at ANC visits. Women in the intervention district were significantly more likely to report receiving advice at the Anganwadi Center (AWC) (49 vs. 37%) or at a Nutrition Health Day (NHD) (12 vs. 7%) than women in the comparison district during their most recent pregnancy.

Uttar Pradesh. The proportion of women who reported any service provider home visits during the most recent pregnancy was ≤20% at baseline in both UP districts (Table 4.3). However, this proportion increased significantly to 60% at endline in the intervention district relative to little change in the comparison district. This dramatic increase was a result of improved outreach to pregnant women by ANM and AWW. Change Agents played a role as well. By endline, 40% of women reported at least one home visit by ANM and 44% by AWW in the intervention district.

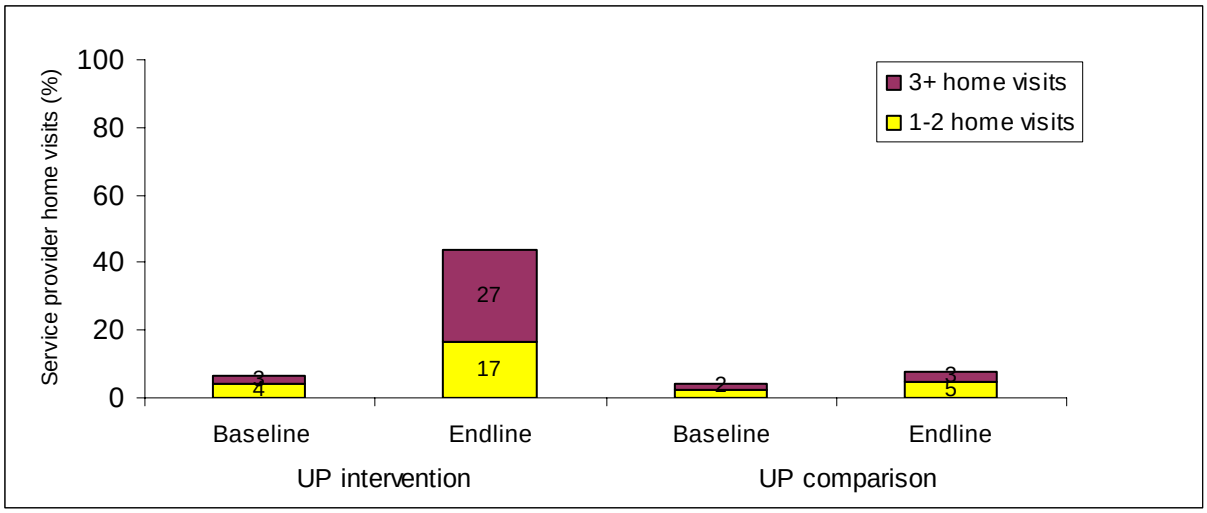
Significantly increased intensity of contacts was reported for ANM (data not shown) and AWW (Figure 4.2) in the intervention relative to the comparison district.

Table 4.3. Service provider home visits during pregnancy among mothers of children 0-23 months in Uttar Pradesh

Service provider type	1+ service provider home visit during the most recent pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall	20.2	59.7	39.5	17.8	22.4	4.6	34.9*
ANM	15.0	39.8	24.8	12.0	17.0	5	19.8*
AWW	6.8	44.0	37.2	3.9	7.3	3.4	33.8*
CA	0.8	19.4	18.6	0.1	0.1	0	18.6*
Total # of mothers	2445	2413		2386	2306		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Figure 4.2. Anganwadi worker (AWW) home visits during pregnancy among mothers of children 0-23 months in Uttar Pradesh



Intervention district women in UP were more than twice as likely as comparison district women (47 vs. 21%) to report receipt of pregnancy advice outside the home other than at ANC visits. Pregnancy advice was significantly more common for intervention than comparison district women at the Anganwadi Center (AWC) (31 vs. 7%) and at a Nutrition Health Day (NHD) (26 vs. 2%).

Currently pregnant women

Andhra Pradesh. Third trimester pregnant women in the intervention district were twice as likely to be visited at home by a service provider at endline (70%) compared to baseline (36.8%; Table 4.4). In contrast to the findings among mothers of children 0-23 months, this improved coverage was due to increased contacts with both ANM and AWW. Home visits by CA increased significantly, but remained rare at endline. Nevertheless, the greatest improvements were observed with AWW home visits that increased more than 3-fold in the intervention district

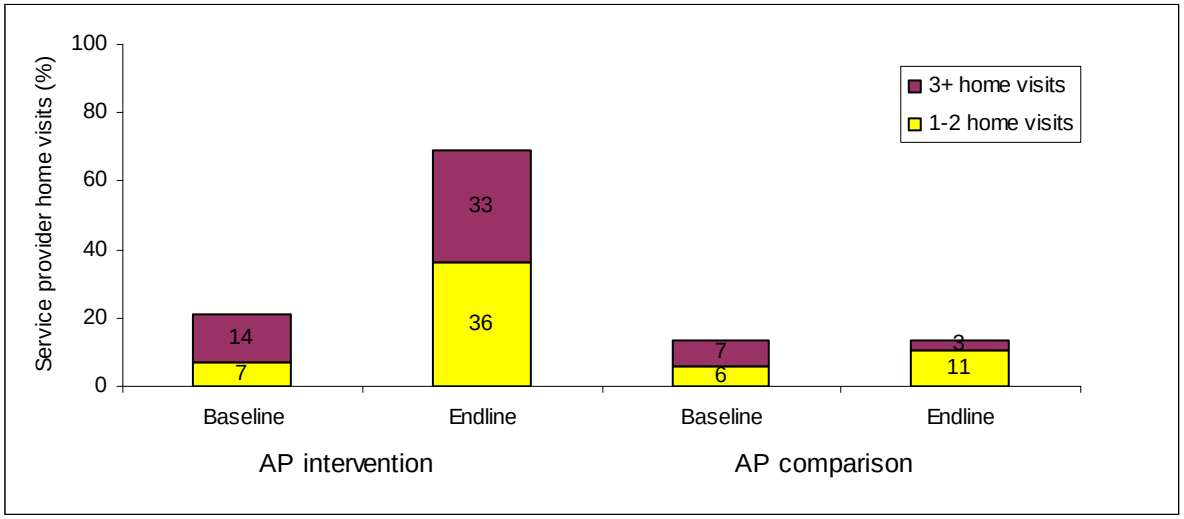
relative to no change in the comparison district. Increased intensity of visits was observed for AWW only (Figure 4.3).

Table 4.4. Service provider home visits during pregnancy among third trimester pregnant women in Andhra Pradesh

Service provider type	Third trimester pregnant women reporting 1+ service provider home visits during pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall	36.8	70.0	33.2	22.9	24.6	1.7	31.5*
ANM	29.0	43.0	14.0	16.9	15.6	-1.3	15.3*
AWW	21.3	69.0	47.7	13.3	13.6	0.3	47.4*
CA	2.6	8.0	5.4	1.2	0	-1.2	6.6*
Total # of 3rd trimester pregnant women	155	100		166	199		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Figure 4.3. Frequency of AWW home visits during pregnancy among third trimester pregnant women in Andhra Pradesh



Approximately two-thirds of third trimester pregnant women in both AP districts reported receipt of pregnancy advice from places outside the home (intervention: 67%, comparison: 60%). However, women in the intervention district were significantly more likely than those in the comparison district to have received pregnancy advice at an AWC (61 vs. 42%) or NHD (16 vs. 8%).

At baseline, advice on maternal diet was received by >50% of women who received any pregnancy advice from a service provider during home visits (Table 4.5). Specific advice on consumption of IFA supplements was also received by ~40% of women whereas advice on extra rest during pregnancy was less common. The intervention was effective only at increasing the

proportion of women who received advice on extra rest. The occurrence of advice on maternal diet, IFA supplementation, and breastfeeding did not change significantly.

Table 4.5. Pregnancy advice on diet, rest, and IFA supplementation received during home visits to currently pregnant women who received any pregnancy advice in Andhra Pradesh

Pregnancy advice by service provider type	Advice received (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Auxilary Nurse Midwife (ANM)							
Diet	50.4	52.1	1.7	45	49.3	4.3	-2.6
Rest	23.5	52.1	28.6	28.3	30.7	2.4	26.2*
IFA supplements	44.5	58.2	13.7	43.3	40	-3.3	17.0
Breastfeeding	2.5	2.1	-0.4	3.3	1.3	-2.0	1.6
Total # pregnant women who received advice from ANM	119	146		60	75		
Anganwadi worker (AWW)							
Diet	61.3	56.5	-4.8	40.9	42.2	1.3	-6.1
Rest	30.1	55.8	25.7	27.3	31.3	4.0	21.7
IFA supplements	46.2	41.2	-5.0	34.1	23.4	-10.7	5.7
Breastfeeding	4.3	3.5	-0.8	3.5	1.6	-1.9	0.8
Total # pregnant women who received advice from AWW	93	260		44	64		
Change Agent							
Diet	55.6	60.0	4.4	0	n/a		
Rest	44.4	65.0	20.6	0	n/a		
IFA supplements	33.3	50.0	16.7	40	n/a		
Breastfeeding	0	5.0	5.0	0	n/a		
Total # of pregnant women who received advice from CA	9	20		5	n/a		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. Service provider home visits for pregnancy advice reported by third trimester pregnant women were more common than those reported by mothers of children 0-23 months, but followed the same increasing trend in the intervention district. Over 80% of third trimester pregnant women at endline reported a service provider home visit during pregnancy compared to only 21% at baseline - a highly significant increase relative to the modest improvement observed in the comparison district over time (Table 4.6). This dramatic intervention effect was a result of dramatic increases in home visits by ANM, AWW, and CA so that almost two-thirds of women reported a home visit by ANM and by AWW at endline. Change Agent visits were most

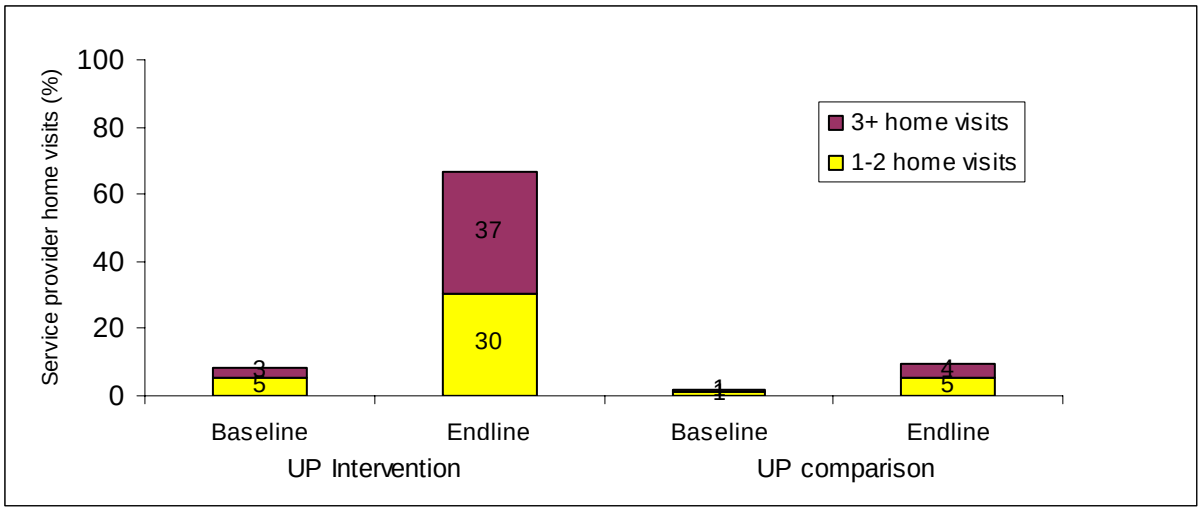
commonly reported by this target group compared to other program indicators. Increased coverage was accompanied by significantly increased intensity of exposure to this program component for all three service provider types. Figure 4.4 illustrates the significantly increased proportion of intervention district pregnant women receiving 1-2 and 3+ AWW home visits. The same trend was observed for ANM and to a lesser extent, CA.

Table 4.6. Third trimester pregnant women reporting 1+ service provider home visits during pregnancy in Uttar Pradesh

Service provider type	Third trimester pregnant women reporting 1+ service provider home visits during pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall	20.7	82.9	62.2	17.8	31.0	13.2	49.0*
ANM	15.2	58.6	43.4	13.6	23.4	9.8	33.6*
AWW	8.0	67.0	59	1.9	9.8	7.9	51.1*
CA	0.8	32.2	31.4	0	1.1	1.1	30.3*
Total # of 3rd trimester CPW	237	239		214	184		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Figure 4.4. Third trimester pregnant women reporting 1-2, 3+ AWW home visit during pregnancy in Uttar Pradesh



Pregnant women in the intervention district were also much more likely than those in the comparison district to receive pregnancy advice from places outside the home (63 vs. 13%). This difference was due to increased contact with service providers at the AWC (46 vs. 11%) and NHD (38 vs. 3%).

Information on IFA supplementation was the most common type of pregnancy advice given by ANM at baseline (Table 4.7). Advice on maternal diet and rest were much less frequently mentioned. However, the proportion of pregnant women who received advice from ANM on diet and rest was significantly increased at endline in the intervention relative to the comparison district. Advice from AWW on diet and rest was also more likely at endline, but the increase did

not differ significantly between the intervention and comparison districts. Advice on IFA supplementation by both ANM and AWW also increased equally in the two districts.

Table 4.7. Pregnancy advice on diet, rest, and IFA supplements given during home visits to currently pregnant women who received any advice

Pregnancy advice by service provider type	Advice received (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Auxilary Nurse Midwife (ANM)							
Diet	10.7	54.5	43.8	17.3	16.2	-1.1	44.9*
Rest	10.7	44.2	33.5	5.8	17.2	11.4	22.1*
IFA supplements	34.5	55.3	20.8	34.6	56.6	22.0	-1.2
Breastfeeding	0	1.9	1.9	1.9	1.0	-0.9	2.8
Total # of pregnant women who received advice from ANM	84	371		52	99		
Anganwadi worker (AWW)							
Diet	33.3	59.7	26.4	22.2	30.4	8.2	18.2
Rest	30.6	49.2	18.6	11.1	17.4	6.3	12.3
IFA supplements	36.1	52.8	16.7	33.3	56.5	23.2	-6.5
Breastfeeding	2.8	1.8	-1.0	0	2.2	-2.2	1.2
Total # of pregnant women who received advice from AWW	36	449		9	46		
Change Agent							
Diet	62.5	63.8	1.3	n/a	n/a		
Rest	37.5	53.7	16.2	n/a	n/a		
IFA supplements	62.5	40.8	-21.7	n/a	n/a		
Breastfeeding	0	0.9	0.9				
Total # of pregnant women who received advice from CA	8	218		n/a	n/a		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Iron-folic acid supplementation

The GOI policy is that all women should receive and consume at least 3 months' supply of IFA supplements during pregnancy. ANM work together with AWW to distribute these supplements and encourage their consumption by pregnant women as part of antenatal care visits and during other service provider contacts at health centers, AWC, NHD, and at womens' homes.

Andhra Pradesh. At baseline, receipt of any IFA supplements during the most recent pregnancy was significantly lower in the intervention than the comparison district (Table 4.8). However, the ~30% increase in this proportion in the intervention district at endline was significantly greater than the small increase in the comparison district. Nonetheless, the 54% coverage at endline in the intervention district still falls short of desired coverage levels.

Table 4.8. Receipt of any IFA tablets during the most recent pregnancy among mothers of children 0-23 months in Andhra Pradesh

	Receipt of any IFA supplements (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Receipt of any IFA supplements	40.9	54.5	13.6	74.4	75.8	1.4	12.2*
Total # of mothers	2369	2575		2476	2656		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Among women who received any IFA supplements during their most recent pregnancy, only one-quarter at baseline received the recommended quantity of 90+ supplements and this proportion remained unchanged at endline in both districts (Table 4.9). Consumption of at least 90 supplements during pregnancy was reported by <10% of women at baseline and increased by ~10 percentage points by endline. However, the increase was comparable in the intervention and comparison districts, providing no evidence that the intervention contributed to this improvement. In contrast to the lack of intervention effect on the program targets for receipt and consumption of IFA supplements, there was a significant positive effect on compliance with IFA supplement intake. The proportion of women who consumed all of the supplements they received approximately doubled in both districts, but the increase was significantly larger in the intervention than comparison district.

Table 4.9. Receipt and consumption of IFA supplements during the most recent pregnancy among mothers of children 0-23 months who received any supplements in Andhra Pradesh

Indicators of IFA supplementation	%						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Received 90+ supplements	26.9	26.5	-0.4	28.9	31.5	2.6	-3
Consumed 90+ supplements	7.5	17.8	10.3	6.3	18.4	12.1	-1.8
Consumed all supplements received	24.7	57.2	32.5	22.5	44.4	21.9	10.6*
Total # of mothers who received any IFA	968	1403		1841	2014		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Uttar Pradesh. Receipt of any IFA supplements during the most recent pregnancy was >50% in both districts at baseline (Table 4.10). This proportion increased significantly by endline in the intervention district, but was unchanged in the comparison district. By endline, IFA supplementation coverage had reach 76% in the intervention district.

Table 4.10. Receipt of any IFA supplements during the most recent pregnancy among mothers of children 0-23 months in Uttar Pradesh

	Receipt of any IFAsupplements (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Receipt of any IFA supplements	62.7	75.6	12.9	56.5	55.4	-1.1	14.0*
Total # of mothers	2445	2410		2388	2305		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Receipt and consumption of at least 90 IFA supplements during pregnancy increased significantly at endline in the intervention relative to the comparison district (Table 4.11). Among women receiving any IFA supplements, receipt of at least 90 supplements during pregnancy increased from 50 to 65% in the intervention district, but remained unchanged in the comparison district. Consumption of at least 90 supplements doubled at endline in the intervention district to achieve approximately 30% coverage relative to <20% coverage in the comparison district. The project intervention was also effective at increasing compliance with IFA supplementation, almost doubling at endline the proportion of women who reported consumption of all IFA supplements received.

Table 4.11 Receipt and consumption of IFA supplements during the most recent pregnancy among mothers of children 0-23 months who received any supplements in Uttar Pradesh

IFA supplementation indicator	%						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Received 90+ supplements	49.8	65.3	15.5	52.7	53.1	0.4	15.1*
Consumed 90+ supplements	14.6	36.4	21.8	13.4	18.6	5.2	16.6*
Consumed all supplements received	25.3	45.4	20.1	21.5	31.7	10.2	9.9*
Total # of mothers	1534	1821		1348	1278		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Nutrition Health Days

Nutrition Health Days (NHD), fixed-day, fixed-site delivery of health and nutrition services for mothers and their children, were among the four "best practices" employed by the INHP-II

intervention to improve maternal and child health outcomes. CARE integrated distribution of supplementary food from the ICDS into community-based provision of health and nutrition services from the RCH program to increase NHD coverage. The services offered for pregnant women included provision of SN, ANC check-ups, tetanus toxoid (TT) immunizations, antenatal IFA supplements, monitoring of pregnancy weight gain, provision of safe birth kits, and health education and counseling. Services for lactating women, infants and young children included provision of SN, immunization, growth monitoring, vitamin A syrup, and health education and counseling.

Andhra Pradesh. Recent attendance at NHD was low (<20%) at baseline in both districts, but it was twice as common among mothers of children 0-23 months compared to currently pregnant women (Table 4.12). Participation doubled approximately among pregnant women in the intervention district relative to a slight decrease in the comparison district. However, participation by mothers of children 0-23 months was unchanged in the intervention district, but decreased by more than 30% in the comparison district, yielding a significant relative difference. Among pregnant women, the 4 most commonly provided NHD services were provision of SN (as take-home rations), monitoring of pregnancy weight gain, TT immunization, and antenatal IFA supplements. Mothers and their children 0-23 months of age were most likely to receive SN, child immunizations, growth monitoring, and health education and counseling.

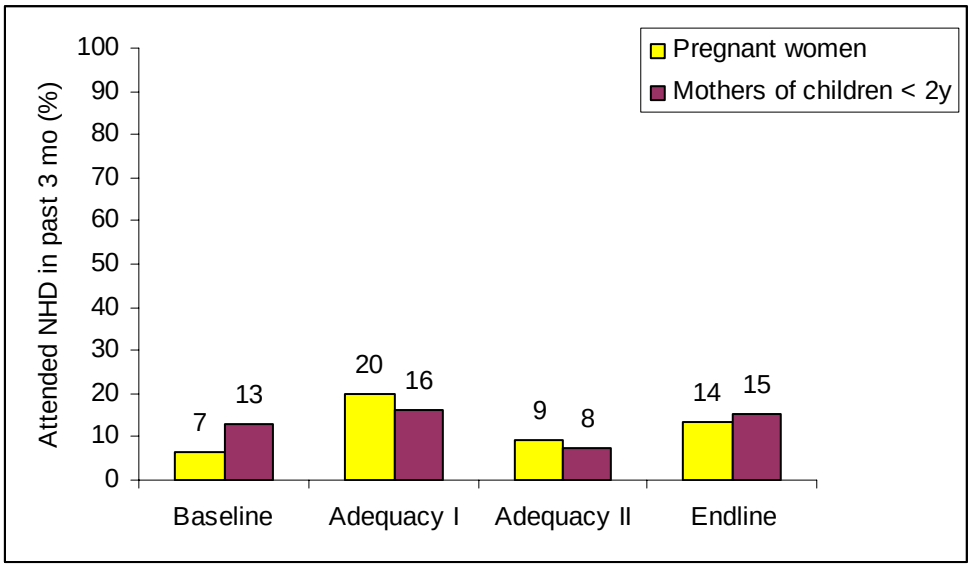
Table 4.12. Attendance at Nutrition Health Days (NHD) in the past 3 months among pregnant women and mothers of children 0-23 months in Andhra Pradesh

	Attendance at NHD in the past 3 months, % (n)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	6.5 (582)	14.1 (573)	7.6	4.6 (632)	4.3 (705)	-0.3	7.9*
Mothers of children 0-23 months	13.4 (2270)	15.1 (2446)	1.7	8.5 (2291)	4.9 (2430)	-3.6	5.3*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Coverage of NHD varied across the evaluation period in the AP districts. Among pregnant women, coverage almost tripled to 20% by the Adequacy I survey in early 2005 (Figure 4.5). Increases were more modest among mothers of children 0-23 months. However, coverage decreased to <10% in both groups by the Adequacy II survey. By the endline survey in early 2006, coverage had increased again, approximately doubling in the last 6 months of 2005. The reasons for the variability in coverage across the evaluation period are unclear. Lack of awareness of NHD among mothers was much higher in the comparison (82-6%) than the intervention (59%) district at endline. Nonetheless, the proportion of mothers unaware of NHD in the intervention district was quite high and represented an increase from baseline (42-4%).

Figure 4.5. Attendance at Nutrition Health Days in the past 3 months at each survey round among pregnant women and mothers of children 0-23 months in Andhra Pradesh intervention district (Karimnagar)



Uttar Pradesh. Attendance at NHD was virtually non-existent in both UP districts at baseline, suggesting that NHD may not have been held in the months immediately proceeding the baseline survey (Table 4.13). The reasons for this are not known. However, dramatic increases in NHD participation were observed at endline among pregnant women and mothers of children 0-23 months in the intervention district. Coverage in the intervention district was approximately one-third in each target group at endline compared to <3% in the comparison district. The list of most commonly provided services was similar to the AP intervention district: provision of SN, TT immunization, antenatal IFA supplements, and monitoring of pregnancy weight gain among pregnant women, and provision of SN, child immunizations, growth monitoring, and provision of vitamin A syrup among mothers and their children 0-23 months of age.

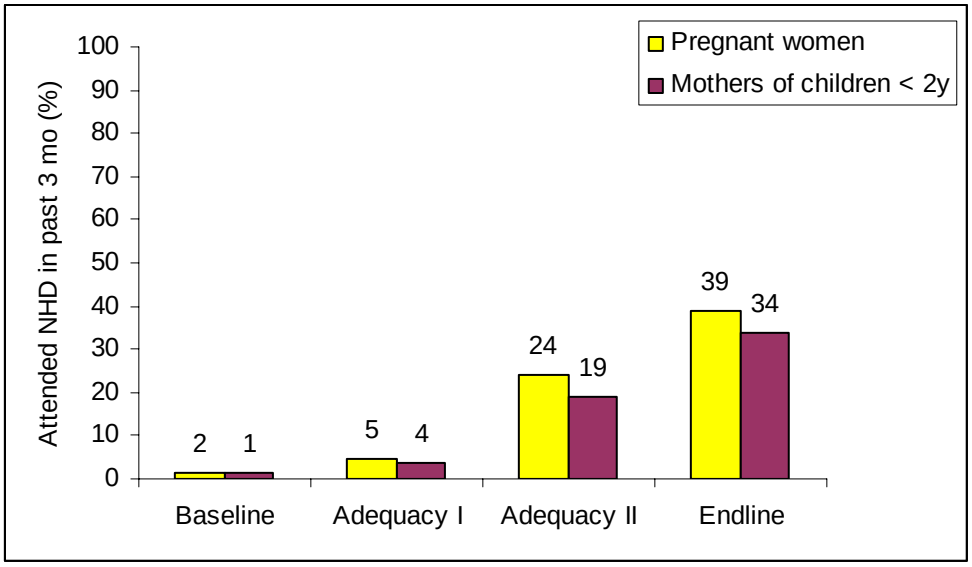
Table 4.13. Attendance at Nutrition Health Days (NHD) in the past 3 months among pregnant women and mothers of children 0-23 months in Uttar Pradesh

	Attendance at NHD in the past 3 months, % (n)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	1.5 (745)	38.9 (723)	37.4	0 (706)	2.2 (673)	2.2	35.2*
Mothers of children 0-23 months	1.2 (2288)	33.7 (2273)	32.5	0.04 (2230)	2.8 (2150)	2.76	29.7*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Participation in NHD among pregnant women and mothers of children 0-23 months in the UP intervention district did not improve during the first year of the evaluation period (in 2004), but thereafter increased markedly in 2005 (Figure 4.6). Coverage in both target groups increased eight-fold between the Adequacy I and endline surveys. Unlike in AP, lack of awareness of NHD dropped dramatically in the intervention district from 57-59% at baseline to 15-20% at endline. Three-quarters of women surveyed in the comparison district were unaware of NHD at endline.

Figure 4.6. Attendance at Nutrition Health Days in the past 3 months at each survey round among pregnant women and mothers of children 0-23 months in Uttar Pradesh intervention district (Barabanki)



Summary

The task facing CARE with regard to improvement of coverage and quality of antenatal care services varied by state and by specific program component. With regard to receipt of ANC visits by pregnant women, the underlying conditions in AP and UP states differed tremendously. The facility-based health care infrastructure for provision of ANC services in AP state was already strong prior to the evaluation, so coverage of ANC visits among pregnant women and achievement of the program target of at least 3 visits was nearly universal in the intervention and comparison districts at baseline and endline. Extensive use of health services in the private sector was common also. By contrast, baseline receipt of ANC visits was quite low in UP. However, INHP-II was effective at increasing receipt of ANC visits in the intervention district so that 50% of women reported any ANC visits during their previous pregnancy and 25% reported receipt of 3 or more visits.

The INHP-II program was highly effective in both states at increasing service provider contacts with pregnant women at home and in communities. In AP state, the proportion of women who reported at least one home visit by a service provider during pregnancy increased from approximately one-third at baseline to 50% among mothers of children 0-23 months and to 70% among third trimester pregnant women at endline. In UP, the coverage was even lower at baseline (~20%), and increased to 60% and over 80% among mothers and third-trimester pregnant women, respectively. In both states, the dramatic improvements were driven primarily by large increases in the coverage and frequency of home visits by AWW. In UP state, home contacts during pregnancy with ANM and CA increased significantly also. However, increased contacts with ANM were more modest in AP state, and were significant among third trimester pregnant women only. Change Agents did not make home visits to provide advice in AP, but did have some success in UP. Despite the significant increases in home visits by service providers during pregnancy, women were not more likely to report receipt of maternal nutrition advice

during these visits. Only pregnant women in the UP intervention district were more likely to receive advice on maternal diet and rest from ANM during these contacts.

Coverage of home contacts by service providers was consistently higher among third trimester pregnant women than mothers reporting on their most recent pregnancy in both states. This discrepancy could be explained by differences in the recall period as mothers could be reporting on a pregnancy that took place as far back as 2 and a half years ago. Alternatively, reported contacts by currently pregnant women may reflect more accurately the current state of the program because exposure was more recent. The original INHP-II strategy for increasing home contacts and community outreach by service providers was to encourage these activities through Block Level Advisory Committees (BLAC). Medical Officers attending these meetings with the CDPO had macro level discussions of operational issues, but this did not translate into corrective actions at the field level very often. After the MTR, the strategy shifted to better align efforts between ICDS and the health sector. ICDS supervisors attended PHC monthly reviews to discuss service provider activities in communities with the Medical Officers, thus increasing convergence between the ANM and AWW in their outreach efforts.

Recruitment and training of CA to support AWW in their community outreach efforts was an initial strategy of INHP-II that was de-emphasized after the MTR. Nonetheless, CA activities did continue where the program was successful at putting them in place. At endline, the data suggested some success with recruitment and training of CA to provide health and nutrition advice to pregnant women and their children in UP, but not AP. One reason for this discrepancy may relate to the CA candidates who were recruited in the different states. In the UP intervention district, CA were recruited from among Dai, mothers-in-law, and other men and women of varied ages. After their training, retention was fairly good. By contrast, ~50% of the CA recruited in the AP intervention district were adolescent girls. The dropout rate in this group of CA was very high because of migration due to marriage. This necessitated additional recruitment and training that was not entirely successful because newly recruited CA and existing CA were trained together. The reasons for this difference in the types of CA candidates are unknown.

The effectiveness of INHP-II at increasing coverage and consumption of antenatal IFA supplementation varied by state. In AP state, coverage was much lower in the intervention than comparison district initially, and the program had only limited success at improving it. Coverage had increased to over 50% at endline, but only one quarter of women reported receipt of at least 90 tablets during pregnancy and less than 20% consumed that amount. More sizeable increases in coverage were achieved in the UP intervention district where 65% of women received at least 90 tablets during pregnancy and consumption of at least 90 tablets more than doubled to 36% at endline. In both states, women in the intervention districts were at least twice as likely at endline to consume all the IFA supplements they received. Increased contacts with service providers during pregnancy may have influenced compliance positively.

The state-specific trends with NHD followed along the same lines as antenatal IFA supplementation. Attendance at NHD in the past 3 months by pregnant women and mothers of children 0-23 months increased significantly in the intervention relative to the comparison district in both states. However, the changes in AP were quite modest, increasing coverage to ~15% only in both groups, whereas the improvements in UP were dramatic, with attendance

increasing from almost nothing to ~34-39% in the two groups. The pace of implementation also varied by state. The increases in AP occurred within the first year of the evaluation period, but were not maintained consistently or improved upon further in year 2. In UP, the gains in coverage occurred almost entirely in the second year after the MTR.

CHAPTER 5: MATERNAL NUTRITION

Supplementary Nutrition

The INHP-II Program was designed to support the ICDS supplementary feeding intervention for women during pregnancy and the first 6 months postpartum. USAID's Title II Program provided two commodities, corn soya blend (CSB) and refined vegetable oil (RVO), for distribution in this program. However, the GOI disallowed import of CSB in mid 2002 because of concerns about genetically modified foods. Subsequently, CARE's INHP-II mandate was amended in 2003 to facilitate the transition from imported CSB to locally available foods in the ICDS Program. Vegetable oil continued to be distributed as part of the feeding intervention.

In AP state, the period during which Supplementary Nutrition (SN) was unavailable was relatively brief as the State government initiated provision of locally available food through ICDS as of January 2003. Therefore, recall of receipt of SN during the most recent pregnancy and postpartum at the time of the baseline survey in early 2004 did include the ~6 month period in 2002 when SN was unavailable. By the time of the endline survey, the recall period occurred after the transition to the state government's program with locally available food.

The shift from CSB to locally available foods for SN was more prolonged in UP state. There were some efforts to supply locally available food during mid-2003, but this initial effort was unsuccessful. The UP State government succeeded in re-initiating the ICDS supplementary feeding program successfully in February 2004. Therefore, recall of SN receipt at the baseline survey included up to a one and a half year period during which provision of SN was sporadic or non-existent. Endline recall covered a period when the SN program had already transitioned to locally available food with the exception of mothers with the oldest children who were pregnant in 2003.

Andhra Pradesh. Receipt of SN during the most recent pregnancy among mothers of children 0-23 months was fairly low at baseline, but was higher in the intervention (38%) than in the comparison (22%) district (Table 5.1). By endline, this proportion had increased by over 20 percentage points in both districts, so that almost two-thirds of intervention district women and almost half of comparison district women reported receipt of SN sometime during their most recent pregnancy. However, the increase in the intervention district cannot be attributed to the INHP-II program because of the comparable increase in the comparison district during the same period. It is important to keep in mind that these proportions were not completely reflective of the current status of the ICDS supplementary feeding program because these data referred to a period as far back as two and a half years prior to each survey. The large increases in coverage in both districts most likely reflect the fact that the endline data cover the period when the AP state program had completed its transition to provision of locally available food. It should be kept in mind that CARE played a key role in facilitating this transition by the ICDS program at the state level during that period, so the INHP-II program impact may not be as easily discernable at the district level for this SN indicator.

Table 5.1. Receipt of Supplementary Nutrition during pregnancy among currently pregnant women and mothers of children 0-23 months during the last pregnancy in Andhra Pradesh

	Supplementary nutrition use during pregnancy, % (n)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of children 0-23 months (during last pregnancy)	38.1 (2369)	62.6 (2575)	24.5	22.4 (2476)	45.5 (2656)	23.1	1.4
Pregnant women	11.0 (582)	48.9 (573)	37.9	8.2 (632)	25.4 (705)	17.2	20.7*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Coverage of SN was lower among currently pregnant women in both districts at baseline (Table 5.1). These numbers are expected to be slightly lower than among women recalling receipt of SN after the end of pregnancy because women in the pregnancy survey samples were at various stages of pregnancy. However, this bias in the data is consistent between districts, and therefore, should not affect the evaluation of program impact. Coverage among currently pregnant women increased more than twice as much in the intervention (38 percentage points) as in the comparison (17 percentage points) district by endline, resulting in a statistically significant intervention effect on SN receipt.

Receipt of SN during the postpartum period among mothers of children 0-5 months followed the same trends as were observed among currently pregnant women (Table 5.2). Coverage was low overall at baseline, but twice as high in the intervention as compared to the comparison district. At endline, the increase in the proportion of mothers who received SN postpartum was significantly greater in the intervention relative to the comparison district. These results among currently pregnant and postpartum women represent the current state of program activities, suggesting that the INHP-II program was more effective at improving SN coverage among pregnant and postpartum women than the ICDS services alone.

Table 5.2. Receipt of Supplementary Nutrition during the postpartum period among mothers of children 0-5 months in Andhra Pradesh

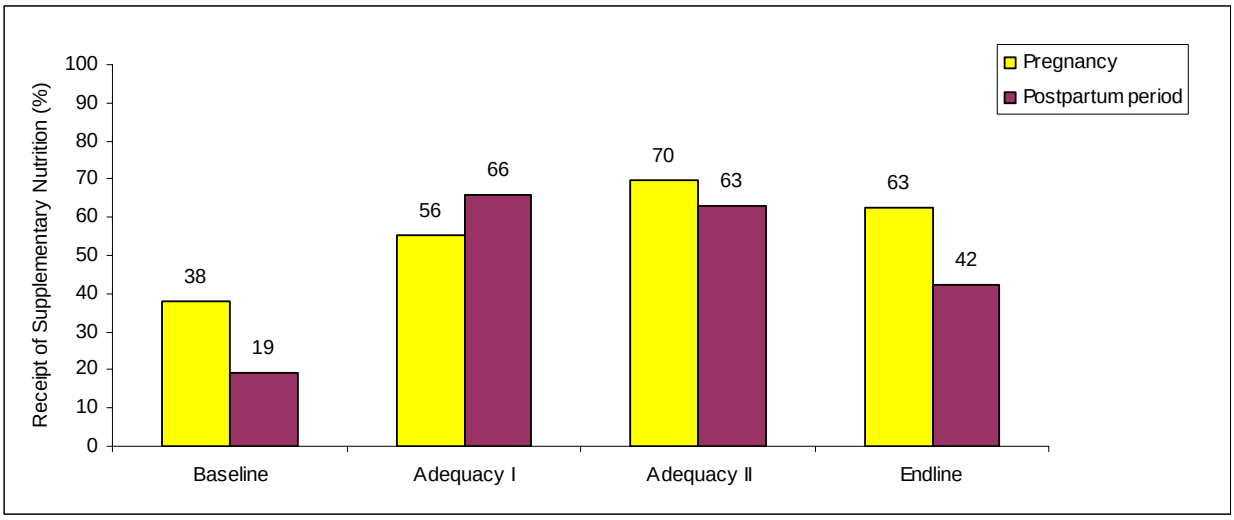
	Supplementary Nutrition use during the postpartum period (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of children 0-5 months	19.2	42.1	22.9	11.0	21.2	10.2	12.7*
Total # of mothers	625	563		648	622		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

The data across all survey rounds suggest that the intervention was active early in the evaluation period with respect to the provision of SN through ICDS services (Figure 5.1). Coverage among both pregnant and postpartum women increased dramatically in 2004 between the baseline and

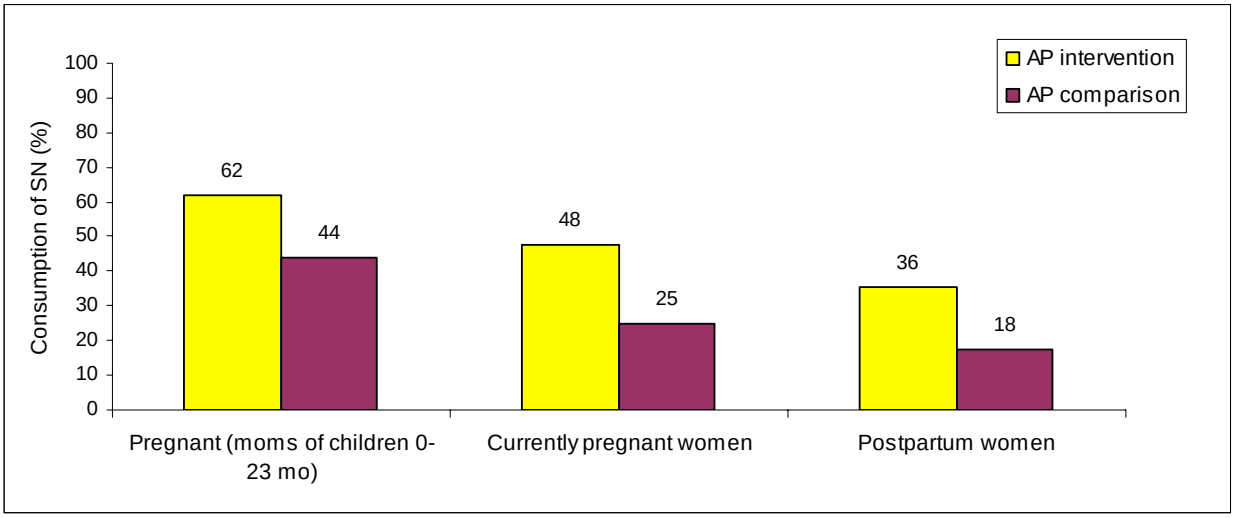
Adequacy I surveys. However, there is some evidence that the program was encountering some difficulties in late 2005 as the endline numbers among postpartum women indicate a large drop in coverage.

Figure 5.1. Receipt of Supplementary Nutrition during the last pregnancy and the postpartum period in Andhra Pradesh intervention district (Karimnagar) by survey round



Information on consumption of SN was collected at the endline survey in early 2006. Therefore, the proportion of women who consumed SN at endline can be compared between the intervention and comparison districts as a proxy for assessing whether the INHP-II program was effective at increasing SN intake in the intervention districts. Both during pregnancy and the postpartum period, women in the intervention district were significantly more likely than those in the comparison district to have consumed SN (Figure 5.2). When these proportions are compared to the endline coverage of SN receipt reported in Tables 5.1 and 5.2, it is apparent that SN was consumed by virtually all women who received any SN during pregnancy or the postpartum period.

Figure 5.2. Consumption of Supplementary Nutrition during pregnancy and the postpartum period at endline in Andhra Pradesh



* Statistical test result comparing intervention and comparison districts, significant at p<0.05 for all 3 target groups.

Uttar Pradesh. Baseline coverage of SN in UP districts was lower than in AP districts, but the effectiveness of the intervention at improving coverage was greater. Among mothers of children 0-23 months at baseline, more than one-third in the intervention district and one-quarter in the comparison district received SN during their most recent pregnancy (Table 5.3). This proportion increased in the intervention district, but decreased in the comparison district, yielding a statistically significant relative difference for this indicator. The positive effect of the INHP-II program on receipt of SN was even stronger among currently pregnant women, increasing from 5% at baseline to 48% at endline in the intervention district. A more modest increase to only 18% at endline was observed in the comparison district.

Table 5.3. Receipt of Supplementary Nutrition during pregnancy among currently pregnant women and mothers of children 0- 23 months during the last pregnancy in Uttar Pradesh

	Supplementary nutrition use during pregnancy, % (n)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of children 0-23 months (during last pregnancy)	38.9 (2445)	50.2 (2413)	11.3	24.9 (2388)	19.5 (2306)	-5.4	16.7*
Pregnant women	4.7 (745)	48.1 (724)	43.4	3.7 (699)	17.6 (676)	13.9	29.5*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

The trend for receipt of SN among women in the postpartum period followed that of currently pregnant women. Baseline coverage was <10% in both districts, most likely reflecting the current status of the supplementary feeding program in UP state in late 2003 when provision of locally available commodities by the ICDS was not yet up and running fully (Table 5.4). However, the proportion of mothers who received SN during the postpartum period increased

dramatically (by 37 percentage points) at endline in the intervention district relative to a modest increase in the comparison district.

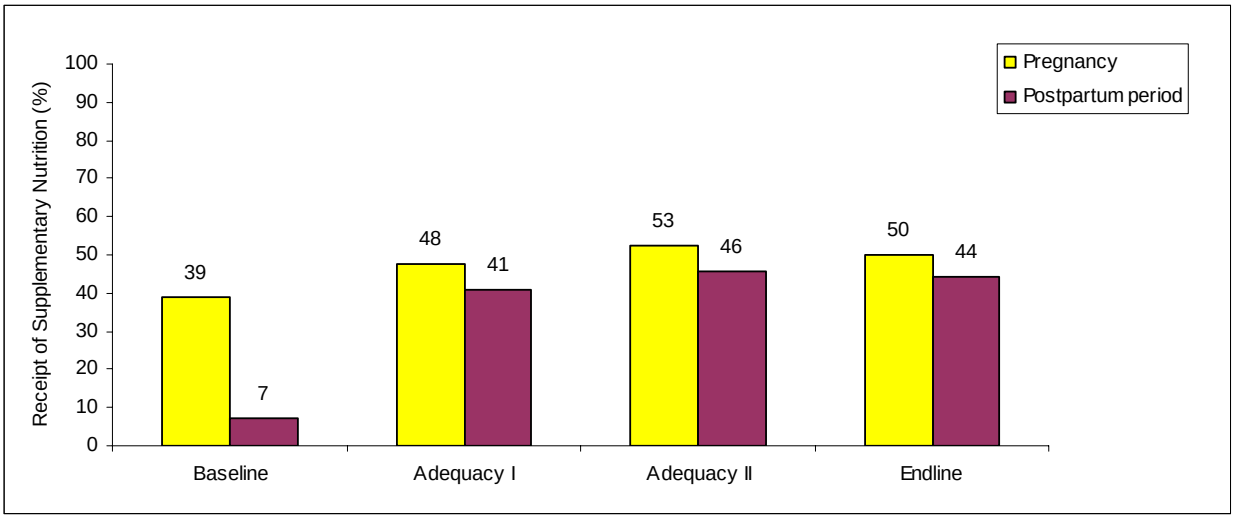
Table 5.4. Receipt of Supplementary Nutrition during the postpartum period among mothers of children 0-5 months in Uttar Pradesh

	Supplementary Nutrition use during the postpartum period (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of children 0-5 months	7.3	44.0	36.7	5.5	14.2	8.7	28.0*
Total # of mothers	804	763		731	682		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

The pace of implementation for distribution of SN was similar for all target groups in the UP intervention district. Improvements in coverage occurred early in the evaluation period, with significant increases observed at the Adequacy I survey in early 2005. Coverage remained at the same level during 2005 until the endline survey in early 2006. These data suggest that the intervention was fairly effective at facilitating supplementary food distribution through the ICDS services once the UP state government had transitioned its program to the use of locally available food in early 2004.

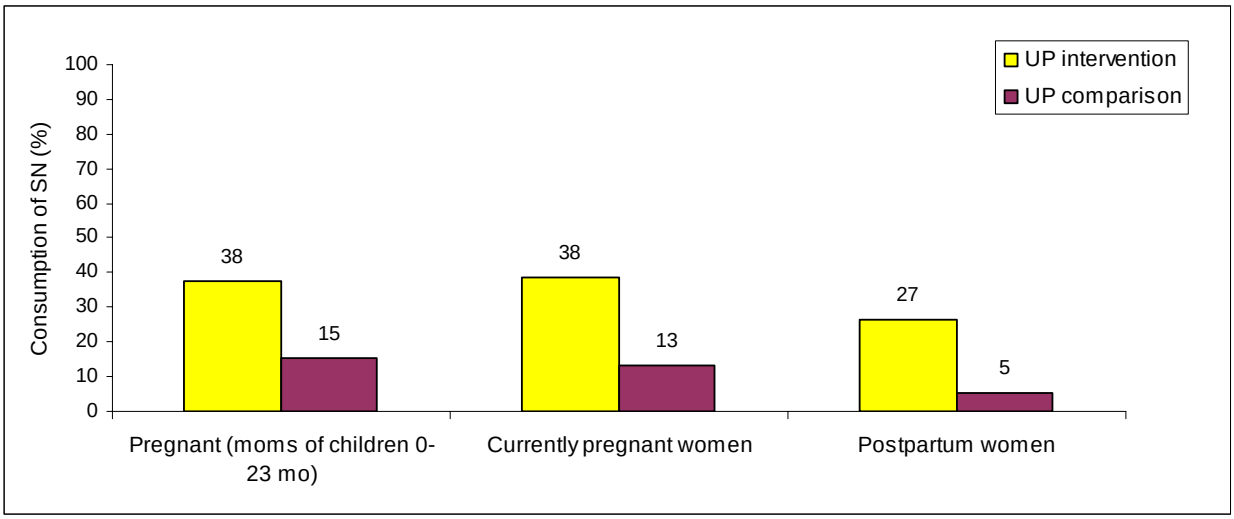
Figure 5.3. Receipt of Supplementary Nutrition during the last pregnancy and the postpartum period in Uttar Pradesh intervention district (Barabanki) by survey round



As with AP districts, UP data were available at endline only for assessment of program effectiveness on SN intake. Both pregnant and postpartum women in the UP intervention district were significantly more likely than those in the comparison district to have consumed SN (Figure 5.4). When these proportions are compared to the endline coverage of SN receipt reported in Tables 5.3 and 5.4, some gap between receipt and consumption of SN is noticeable, particularly among women during the postpartum period (receipt=44%, consumption=27%). Supplementary food from ICDS contributed to the food supply in many intervention district households, but was

not necessarily consumed by women themselves for reasons that are unknown. Pregnant and postpartum women may have disliked the locally available SN commodity or may have prioritized its use for other household members.

Figure 5.4. Consumption of Supplementary Nutrition during pregnancy and the postpartum period at endline in Uttar Pradesh



* Statistical test result comparing intervention and comparison districts, significant at $p<0.05$ for all 3 target groups

Maternal Diet

INHP-II advice on maternal diet focuses on two messages for women during pregnancy and the first 6 months postpartum: 1) consume an additional meal every day, and 2) consume all available foods in the home. In addition to assessing whether women were more likely to receive these messages during pregnancy from service providers (see chapter 4), data were collected on current dietary practices and intake during pregnancy and postpartum to evaluate the impact of the INHP-II intervention on maternal diet.

Meals and snacks

Andhra Pradesh. More than two-thirds of women in the AP districts usually consumed at least 3 meals a day at baseline (Table 5.7). Pregnant women were the least likely and mothers of children 6-23 months of age were most likely to consume ≥3 meals a day in both districts. At endline, the proportion of women consuming at least 3 meals per day increased significantly in the intervention district relative to little or no change in the comparison district. It is interesting to note that the message about increased meal intake, targeted at women during pregnancy and the first 6 months postpartum, had a positive effect on the number of meals consumed among all groups of women surveyed.

Table 5.7. Meal consumption among pregnant women and mothers of children 0-23 months in Andhra Pradesh

Target group	≥3 meals consumed per day, % (n)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	68.7 (582)	83.9 (572)	15.2	73.9 (632)	77.5 (703)	3.6	11.6*
Mothers of children 0-5 months	78.0 (624)	94.0 (550)	16.0	83.1 (637)	83.4 (596)	0.3	15.7*
Mothers of children 6-23 months	81.5 (1646)	91.6 (1886)	10.1	84.4 (1652)	82.8 (1815)	-1.6	11.7*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Trends in usual snack consumption differed from meal consumption in the AP districts. Snacks were most common among pregnant and least common among newly delivered mothers of children 0-5 months of age in both districts (Table 5.8). Snack intake decreased among all groups of women in the intervention district relative to increases in the comparison district. One possible explanation for these opposing trends in the intervention district may relate to how women acted upon the nutrition message they received to add one meal a day to their diets. A period of dietary intake at some point in the day may have been increased from a snack to a full meal by the added consumption of a staple food such as rice or other grains. It is not known whether the net difference between an added meal and an omitted snack resulted in additional caloric intake, but it is a reasonable assumption given the Indian definition of a meal as including a staple food. Alternatively, micronutrient intake may have been unchanged or even reduced by this substitution.

Table 5.8. Snack consumption among pregnant women and mothers of children 0-23 months in Andhra Pradesh

Target group	≥1 snack consumed per day, % (n)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	45.4 (582)	38.3 (572)	-7.1	37.5 (632)	40.4 (703)	2.9	-10.0*
Mothers of children 0-5 months	30.3 (624)	21.5 (550)	-8.8	19.6 (637)	30.4 (596)	10.8	-19.6*
Mothers of children 6-23 months	34.6 (1646)	25.5 (1886)	-9.1	24.8 (1652)	35.7 (1815)	10.9	-20.0*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. Consumption of at least 3 meals a day was much less common among women in UP than AP districts (Table 5.9). Only 14% of pregnant women and 25% of postpartum women in the intervention district consumed at least 3 meals a day at baseline, and the proportions comparable in the comparison district. By endline, consumption of at least 3 meals a day had

increased 4 times as much among pregnant women and twice as much among postpartum women in the intervention relative to the comparison district.

Table 5.9. Meal consumption among pregnant women and mothers of children 0-23 months in Uttar Pradesh

Target group	≥3 meals consumed per day, % (n)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	14.2 (745)	37.8 (723)	23.6	20.0 (699)	26.0 (676)	6.0	17.6*
Mothers of children 0-5 months	25.4 (802)	42.6 (758)	17.2	26.2 (724)	34.7 (677)	8.5	8.7*
Mothers of children 6-23 months	25.0 (1485)	37.6 (1519)	12.6	29.5 (1504)	36.4 (1473)	6.9	5.7*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Snack consumption was much more common in the UP intervention district than in the AP districts. This may be compensation for the lower usual meal intake by UP women. However, women in the UP comparison district were approximately half as likely as intervention district women to have reported snack consumption at baseline (Table 5.10). Snack consumption among pregnant women increased modestly in both districts, resulting in no impact of the intervention in this target group. By contrast, the program was very effective at increasing snack intake among postpartum women so that 90% reported consumption of at least one snack a day in the intervention district relative to 43-4% in the comparison district at endline. The more consistent positive effects of the intervention on meal and snack intake in UP state suggest that women in the intervention district may have increased their caloric and micronutrient intake relative to their comparison district peers.

Table 5.10. Snack consumption among pregnant women and mothers of children 0-23 months in Uttar Pradesh

Target group	≥1 snack consumed per day, % (n)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	63.1 (745)	76.4 (723)	13.3	34.5 (699)	44.4 (676)	9.9	3.4
Mothers of children 0-5 months	59.9 (802)	90.0 (758)	30.1	34.8 (724)	44.2 (668)	9.4	20.9*
Mothers of children 6-23 months	60.8 (1485)	89.7 (1519)	28.9	34.8 (1505)	42.6 (1473)	7.8	21.1*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

It is interesting to note that the maternal nutrition messages aimed at women during pregnancy and the early postpartum period (0-5 months after delivery) had a significant positive effect on the dietary practices of mothers of older children (6-23 months) as well. Whether this

phenomena is due to insufficient targeting of health messages to the appropriate audiences, overly general information in the messages, or the desire of women to improve their diets in general is not clear. In all fairness, women of reproductive age in the study population are cycling rapidly through these various reproductive stages so that distinctions made by the intervention (e.g. recently delivered mothers of children 0-5 months versus mothers of children 6-23 months) may not seem very relevant in the real life context.

Dietary intake

Usual dietary intake among women was characterized by data collected from a 7-day food frequency recall. Results are reported here as intake of specific categories of food one or more times in the past 7 days. Staple foods included rice, bread, and other foods made from cereal grains. Intake of staple foods is not reported here because intake was 100% in all groups.

Andhra Pradesh. AP state women in all target groups had very diverse diets that included frequent consumption of legumes, meat and eggs, dairy products, fruits and vegetables in addition to cereal grains (Tables 5.11-5.13). Legumes (65-95%), meat/fish/chicken and eggs (65-79%), and dark green leafy vegetables (DGLV; 44-72%) were the most commonly consumed foods among pregnant and postpartum women at baseline and endline. Usual intake of legumes and DGLV increased significantly in the intervention relative to the comparison district for all 3 target groups of women. Intake of yellow-orange fruits was <11% among non-pregnant and 18-19% among pregnant women at baseline, but these proportions increased significantly for all 3 groups at endline in the intervention relative to the comparison district. Fewer than one-quarter of women reported any intake of yellow-orange vegetables in the past week at baseline (or the Adequacy I survey for non-pregnant women). This proportion remained unchanged or decreased significantly at endline among non-pregnant women. By contrast, it increased to over 80% among currently pregnant women in both districts. The reason for this dramatic increase in consumption of yellow-orange vegetables cannot be explained by seasonal variation as baseline and endline surveys were conducted in the same season of the year. It is possible that nutrition advice given to pregnant women emphasized the inclusion of yellow-orange vegetables in the diet as a source of micronutrients to improve pregnancy outcomes. Dairy products were consumed by 24-52% of women at baseline, but this proportion decreased significantly in the intervention relative to the comparison district among non-pregnant women only. Intake of SN was low at baseline and increased significantly among pregnant women only in the intervention relative to the comparison district.

Table 5.11. Dietary intake during the past 7 days among pregnant women in Andhra Pradesh

	Intake ≥1 times during the past 7 days among pregnant women (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Legumes	85.4	94.9	9.5	92.7	91.0	-1.7	11.2*
Dairy	52.2	49.8	-2.4	38.1	35.0	-3.1	0.7
Meat, chicken, fish and eggs	70.1	79.4	9.4	70.6	76.8	6.2	3.2
Dark green leafy vegetables	48.8	68.2	19.4	72.0	70.1	-1.9	21.3*
Yellow-orange vegetables +	14.3	82.3	78	21.0	89.6	68.6	9.4
Yellow-orange fruits	17.9	29.8	11.9	18.7	19.4	0.7	11.2*
Other fruits	51.9	64.1	12.2	47.9	65.4	17.5	-5.3
Butter/oil/fat	10.5	10.8	0.3	9.5	6.1	-3.4	3.7
Supplementary Nutrition	14.8	24.0	9.2	10.4	10.2	-0.2	9.4*
Total # of pregnant women	582	572		632	702		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

+ sweet potatoes are not included

Table 5.12. Dietary intake during the past 7 days among mothers of children 0-5 months in Andhra Pradesh

	Intake ≥1 times during the past 7 days among mothers of children 0-5 months (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Legumes	65.5	76.7	11.6	84.0	85.5	1.5	10.1*
Dairy	46.6	36.4	-10.2	30.4	28.4	-2.0	-8.2*
Meat, chicken, fish and eggs	65.4	75.3	9.9	67.9	75.3	7.4	2.5
Dark green leafy vegetables	56.1	72.9	16.8	76.2	75.3	-0.9	17.7*
Yellow-orange vegetables #+	21.7	23.3	1.6	7.2	14.8	7.6	-6
Yellow-orange fruits	8.7	24.6	15.9	9.9	16.1	6.2	9.7*
Other fruits	34.6	48.6	14.0	26.8	49.3	22.5	-8.5*
Butter/oil/fat	13.5	8.7	-5.2	9.1	7.7	-1.4	-3.8
Supplementary Nutrition	9.8	18.8	9.0	5.3	10.8	5.5	3.5
Total # of mothers of children 0-5 mo	624	550		638	594		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$.

Baseline data from Adequacy I data

+ Sweet potatoes not included

Table 5.13. Dietary intake during the past 7 days among mothers of children 6-23 months in Andhra Pradesh

	Intake ≥1 times during the past 7 days among mothers of children 6-23 months (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Legumes	83.6	92.1	8.5	92.3	94.0	1.7	6.8*
Dairy	41.1	33.7	-7.4	26.1	24.0	-2.1	-5.3*
Meat, chicken, fish and eggs	64.8	77.7	12.9	68.5	77.2	8.7	4.2*
Dark green leafy vegetables	44.1	62.8	18.7	72.3	69.4	-2.9	21.6*
Yellow-orange vegetables #+	22.2	18.0	-4.2	2.8	11.2	8.4	-12.6*
Yellow-orange fruits	9.9	22.2	12.3	11.0	17.3	6.2	6.1*
Other fruits	37.4	46.3	8.9	37.5	56.2	18.7	-9.8*
Butter/oil/fat	9.1	9.7	0.6	6.2	6.1	-0.1	0.7
Supplementary Nutrition	13.2	10.1	-3.1	6.5	8.7	2.2	-5.3*
Total # of mothers of children 6-23 mo	1646	1886		1653	1814		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Baseline data from Adequacy I data

+ Sweet potatoes not included

Uttar Pradesh. Legume and DGLV intake in the past week was nearly universal (legumes: ≥94%, DGLV: ≥88%) at baseline among women in the UP intervention district (Tables 5.14-16). Significant increases were not observed at endline because of the high baseline intake. Dairy consumption was ~40% at baseline in the intervention district for pregnant and non-pregnant women. Large increases in consumption were reported at endline in both districts except among mothers of children 0-5 months of age where the relative difference was statistically significant. Intake of meat, fish, chicken and eggs was much lower in UP than AP at baseline (16-24%), and modest increases in this proportion were observed at endline in all target groups. However, the relative difference in the increase in the intervention relative to the comparison district was statistically significant for pregnant women and mothers of children 6-23 months only. Consumption of yellow-orange vegetables at baseline varied greatly among pregnant (18%) and postpartum (0-5 months: 34%, 6-23 months: 65%) women. Intake increased fairly dramatically at endline for pregnant women and mothers of children 0-5 months, but these increases were comparable in the intervention and comparison districts. By contrast, there was a slight decrease in the proportion consuming yellow-orange vegetables among mothers of children 6-23 months who had the highest intake at baseline. Yellow-orange fruits were consumed by <7% of all women at baseline, but significant increases were reported in the intervention relative to the comparison district for all three target groups. Consumption of butter, oil, or fat increased to ~40% at endline for pregnant and postpartum women, but this change was statistically significant for non-pregnant women only. Finally, intake of SN from the ICDS was essentially non-existent at baseline, but increased dramatically to between 23 and 31% by endline.

Table 5.14. Dietary intake during the past 7 days among pregnant women in Uttar Pradesh

	Intake ≥1 times during the past 7 days pregnant women (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pulses	94.9	95.6	0.7	73.4	75.7	2.3	-1.6
Dairy	42.7	62.1	19.4	33.3	54.8	21.5	-2.1
Meat, chicken, fish and eggs	16.9	28.3	11.4	23.8	19.8	-4.0	15.4*
Dark green leafy vegetables	85.4	88.1	2.7	56.9	63.1	6.2	-3.5
Yellow-orange vegetables +	18.0	34.2	16.2	22.2	46.7	24.5	-8.3
Yellow-orange fruits	5.9	16.6	10.7	6.6	10.2	3.6	7.1*
Other fruits	29.9	48.0	18.1	32.8	45.0	12.2	5.9
Butter/oil/fat	20.4	41.9	21.5	21.2	36.4	15.2	6.3
Supplementary Nutrition	1.3	28.4	27.1	3.0	7.4	4.4	22.7*
Total # of pregnant women	745	723		699	676		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

+ Sweet potatoes not included

Table 5.15. Dietary intake during the past 7 days among mothers of children 0-5 months in Uttar Pradesh

	Intake ≥1 times during the past 7 days among mothers of children 0-5 months (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pulses	97.3	96.7	-0.6	77.5	75.6	-1.9	1.3
Dairy	39.0	60.8	21.8	37.7	47.7	10.0	11.8*
Meat, chicken, fish and eggs	16.7	24.7	8.0	18.0	20.3	2.3	5.7
Dark green leafy vegetables	85.2	86.9	1.7	61.6	67.8	6.2	-4.5
Yellow-orange vegetables #	33.6	66.3	32.7	31.7	60.7	29.0	3.7
Yellow-orange fruits	4.5	15.8	11.3	2.6	8.5	5.9	5.4*
Other fruits	23.6	35.6	12.0	20.4	30.1	9.7	2.3
Butter/oil/fat	20.8	41.8	21.0	20.4	32.1	11.7	9.3*
Supplementary Nutrition	1.3	31.1	29.8	1.2	9.0	7.8	22.0*
Total # of mothers of children 0-5 mo	802	758		724	677		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

baseline data from Adequacy I data

Table 5.16. Dietary intake during the past 7 days among mothers of children 6-23 months in Uttar Pradesh

	Intake ≥1 times during the past 7 days among mothers of children 6-23 months (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
Pulses	97.9	97.6	-0.3	74.7	74.2	-0.5	0.2
Dairy	38.6	57.9	19.3	31.6	47.5	15.9	3.4
Meat, chicken, fish and eggs	16.1	25.5	9.4	20.3	18.6	-1.7	11.1*
Dark green leafy vegetables	86.5	88.5	2	63.8	69.3	5.5	-3.5
Yellow-orange vegetables #	65.1	56.9	-8.2	30.6	30.4	-0.2	-8.0*
Yellow-orange fruits	4.6	13.2	8.6	4.1	7.8	3.7	4.9*
Other fruits	26.2	38.3	12.1	25.0	35.5	10.5	1.6
Butter/oil/fat	19.1	42.2	23.1	17.9	28.0	10.1	13.0*
Supplementary Nutrition	0.7	23.0	22.3	1.6	8.3	6.7	15.6*
Total # of mothers	1486	1518		1506	1472		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$
# baseline data from Adequacy I data

Nutritional status

Currently pregnant women and mothers of children 0-23 months had their weight and height measured at baseline and endline to examine whether the intervention had an effect on women's nutritional status. Body Mass Index (BMI; Kg/m^2) was used as an indicator of nutritional status for both pregnant and non-pregnant women. It is recognized that BMI is not an optimal measure of nutritional status for pregnant women because of pregnancy weight gain. Nonetheless, it is an overall measure of nutritional status that is useful for comparing changes from baseline to endline in the intervention and comparison districts in each state. Malnutrition was defined as a BMI<18.5. Nutritional status data on pregnant women was stratified by trimester of pregnancy to control for confounding by pregnancy weight gain.

Andhra Pradesh. Mean BMI among all pregnant women was lower in the intervention than in the comparison district at baseline, but increased by the same amount in both districts at endline (Table 5.17). Second and third trimester women had comparable increases in BMI at endline in both districts. However, there was an increase in the intervention district and a decrease in the comparison district among first trimester women at endline that resulted in a significant relative difference of 1.1.

Table 5.17. Body Mass Index (BMI) among pregnant women stratified by trimester in Andhra Pradesh

Trimester of pregnancy	Mean BMI among pregnant women (Kg/m^2)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	19.1	19.6	0.5	20.2	19.6	-0.6	1.1*
Second trimester	20.3	20.7	0.4	20.6	21.4	0.8	-0.4
Third trimester	22.0	22.5	0.5	22.2	22.4	0.2	0.3
All pregnant women	20.4	20.7	0.3	20.9	21.2	0.3	0
Total # of pregnant women	567	563		605	700		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

The intervention also had a significant positive effect on nutritional status among mothers of children 6-23 months who were the thinnest of the 3 target groups of women in this study (Table 5.18). Their BMI increased 0.6 units from baseline to endline relative to almost no change in the comparison district. By contrast, the mean BMI of mothers of children 0-5 months increased by approximately one-half a unit in both districts at endline.

Table 5.18. Mean Body Mass Index among non-pregnant women in Andhra Pradesh

	Mean BMI among non-pregnant women (Kg/m^2)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of children 0-5 months	19.6	20.0	0.4	19.7	20.3	0.6	-0.2
Mothers of children 6-23 months	18.5	19.1	0.6	19.3	19.4	0.1	0.5*
Total # of non-pregnant women	2197	2426		2149	2407		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

The malnutrition indicator followed the same trends as mean BMI in the AP districts. Malnutrition was more prevalent in the intervention than comparison district throughout the evaluation period. Among all pregnant women, the proportion who were malnourished decreased slightly in both districts at endline although the overall prevalence was ~30% higher in the intervention district (Table 5.19). By contrast, malnutrition prevalence among first trimester pregnant women decreased by 7 percentage points at endline in the intervention district relative to a comparable increase in the comparison district. There were modest decreases at endline in the proportion malnourished among second and third trimester women in both districts.

Table 5.19. Malnutrition (BMI<18.5 Kg/m^2) among pregnant women stratified by trimester in Andhra Pradesh

Trimester of pregnancy	BMI<18.5 among pregnant women (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	43.9	36.6	-7.3	28.9	35.6	6.7	-14.0*
Second trimester	23.8	18.7	-5.1	15.6	12.3	-3.3	-1.8
Third trimester	5.9	7	-1.1	8.4	4.0	-4.4	3.3
All women	25.0	21.9	-3.1	18.4	15.7	-2.7	-0.4
Total # of pregnant women	567	563		605	700		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Over one-third of recently delivered mothers (of children 0-5 months) and over half of mothers of children 6-23 months were malnourished at baseline in the intervention district (Table 5.20). Prevalence was lower among women in the comparison district. Malnutrition prevalence decreased among both groups of women at endline, but the relative difference between the districts was statistically significant among mothers of children 6-23 months only.

Table 5.20. Malnutrition (BMI<18.5 Kg/m^2) among non-pregnant women in Andhra Pradesh

	BMI<18.5 among non-pregnant women (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of children 0-5 months	37.8	29.8	-8.0	32.8	27.4	-5.4	-2.6
Mothers of children 6-23 months	55.6	46.6	-9.0	43.0	43.4	0.4	-9.4*
Total # of non-pregnant women	2197	2426		2149	2407		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

In summary, the intervention was effective at improving nutritional status and reducing malnutrition prevalence among non-pregnant women of children 6-23 months and women in the first trimester of pregnancy. Women later in pregnancy and during the early postpartum period also had improvements in nutritional status in the intervention district, but they were matched by comparable improvements in comparison district women.

Uttar Pradesh. Surprisingly, overall nutritional status among pregnant and non-pregnant women was somewhat better in UP than AP in this evaluation. In contrast to the AP findings, mean BMI among first and second trimester pregnant women did not change much from baseline to endline in the intervention district (Table 5.21). By contrast, the mean BMI of third trimester pregnant women in the intervention district increased significantly by 0.9 from baseline to endline relative to no change in the comparison district. However, it should be noted that BMI of third trimester

pregnant women was much higher in the comparison than the intervention district at baseline (22.4 vs. 21.0).

Table 5.21. Mean Body Mass Index among pregnant women stratified by trimester in Uttar Pradesh

Trimester of pregnancy	Mean BMI among pregnant women (Kg/m^2)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	20.0	19.9	-0.1	19.8	20.4	0.6	-0.7
Second trimester	21.0	21.1	0.1	21.4	21.3	-0.1	0.2
Third trimester	21.0	21.9	0.9	22.4	22.4	0	0.9*
All	20.8	21.1	0.3	21.2	21.4	0.2	0.1
Total # of pregnant women	481	653		605	604		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Mothers of children 6-23 months were the thinnest group of women in UP districts as was found in AP as well (Table 5.22). There were small increases in mean BMI at endline among non-pregnant women in both UP districts, but no intervention effect.

Table 5.22. Mean Body Mass Index among non-pregnant women in Uttar Pradesh

	Mean BMI among non-pregnant women (Kg/m^2)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of children 0-5 months	19.7	20.0	0.3	19.8	20.4	0.6	-0.3
Mothers of children 6-23 months	19.1	19.3	0.2	19.4	19.7	0.3	-0.1
Total # of non-pregnant women	1619	2074		1953	1941		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

The malnutrition prevalence among all pregnant women decreased slightly from baseline to endline in both districts, but this overall finding masked the variation observed in the trimester-specific data (Table 5.23). Among first trimester women, malnutrition increased slightly in the intervention district relative to a large decrease in the comparison district. However, the relative difference was not statistically significant. By contrast, malnutrition among third trimester women was reduced by more than half at endline in the intervention district compared to a small increase in the comparison district. This relative difference was statistically significant.

Table 5.23. Malnutrition (BMI<18.5 Kg/m^2) among pregnant women stratified by trimester in Uttar Pradesh

Trimester of pregnancy	BMI<18.5 Kg/m^2 among pregnant women (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	26.1	29.3	3.2	32	21.9	-8.1	10.9
Second trimester	14.2	13.2	-1.0	8.3	10.4	2.1	-3.1
Third trimester	12.6	5.1	-7.5	2.1	3.6	1.5	-9.0*
All women	16.4	14.1	-2.3	13.2	11.9	-1.3	-1.0
Total # of pregnant women	481	653		605	604		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Malnutrition was 30% and 38-46% among mothers of children 0-5 and 6-23 months, respectively in both districts at baseline (Table 5.24). Malnutrition prevalence decreased at endline among all non-pregnant women, but the decrease was smaller in the intervention relative to the comparison district with no significant relative differences.

Table 5.24. Malnutrition (BMI<18.5 Kg/m^2) among non-pregnant women in Uttar Pradesh

	BMI<18.5 Kg/m^2 among non-pregnant women (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Mothers of 0-5 month olds	30.5	26.3	-4.2	29.8	20.7	-8.9	4.7
Mothers of 6-23 month olds	45.5	43.0	-2.5	37.6	30.7	-6.9	4.4
Total non-pregnant women	1619	2074		1953	1941		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

The positive intervention effect on women's nutritional status observed late in pregnancy in UP state might reflect increased gestational weight gain as a result of increased food intake reported in the Dietary Intake section of this chapter (Table 5.14-16). However, this hypothesis is not supported by the fact that improvements in dietary intake were observed among non-pregnant women as well, but were not reflected in improved nutritional status at endline.

Pregnancy Anemia

Andhra Pradesh. Mean hemoglobin (Hb) at baseline was 10.6 and 10.4 g/dL among pregnant women in the intervention and comparison districts, respectively, and changed by 0.1 g/dL only at endline (data not shown). Anemia prevalence among pregnant women (hemoglobin <11.0 g/dL) was ~60% in both districts at baseline (Table 5.25). As expected, prevalence was higher in the second than in the first or third trimesters because of normal physiologic changes during pregnancy associated with hemodilution. There were small increases and decreases in anemia prevalence from baseline to endline in both districts, but none of the relative differences were statistically significant

Table 5.25. Anemia among pregnant women stratified by trimester in Andhra Pradesh

Trimester of pregnancy	Hemoglobin <11 g/dL among pregnant women (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	58.5	58.4	-0.1	49.0	47.0	-2	1.9
Second trimester	59.8	63.4	3.6	70.4	66.0	-4.4	8.0
Third trimester	55.3	53.1	-2.2	64.3	64.2	-0.1	-2.1
All women	58.2	60.1	1.9	61.5	61.0	-0.5	2.4
Total # pregnant women	567	554		605	676		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Moderate-severe anemia (hemoglobin<10.0 g/dL) prevalence at baseline was 34% and 41% in the intervention and comparison districts, respectively, and was virtually unchanged at endline (Table 5.26). The trend across trimesters matched that of overall anemia prevalence. Among women in the first and second trimesters, prevalence was increased slightly in the intervention district and decreased slightly in the comparison district. There was an 11 percentage point drop in prevalence at endline among third trimester women in the intervention relative to the comparison district, but the relative difference was not statistically significant. Severe anemia prevalence (<7.0 g/dL) was 1-2% at baseline and increased to 3-4% at endline, but did not differ between districts (data not shown).

Table 5.26. Moderate-severe anemia among pregnant women stratified by trimester in Andhra Pradesh

Trimester of pregnancy	Hemoglobin <10 g/dL among pregnant women (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	32.2	32.9	0.7	31.3	26.5	-4.8	5.5
Second trimester	34.8	37.6	2.8	46.5	45.3	-1.2	4.0
Third trimester	36.2	25.5	-10.7	44.2	44.2	0	-10.7
All women	34.4	34.1	-0.3	40.7	40.5	-0.2	-0.1
Total # pregnant women	567	554		605	676		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Considering the low coverage of antenatal IFA supplementation (26% received 90+ supplements) and low levels of supplement intake (18%) in the AP intervention district, the lack of change in anemia prevalence among pregnant women reported here is not surprising.

Uttar Pradesh. Mean hemoglobin at baseline was 10.8 and 10.7 g/dL among pregnant women in the intervention and comparison districts, respectively, and it did not change significantly at endline (data not shown). In contrast to AP state, hemoglobin decreased across the trimesters of pregnancy. Overall anemia prevalence was 56% in the intervention district and 52% in the comparison district (Table 5.27). At endline, anemia prevalence decreased in all trimesters in the intervention district relative to increases in the comparison district, but the relative differences

were not statistically significant. The difference was largest among third trimester pregnant women (-11.1%).

Table 5.27. Anemia among pregnant women stratified by trimester in Uttar Pradesh

Trimester of pregnancy	Hemoglobin <11 g/dL among pregnant women (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	40.0	37.2	-2.8	40.4	42.6	2.2	-5.0
Second trimester	60.8	58.3	-2.5	53.4	59.3	5.9	-8.4
Third trimester	61.6	56.8	-4.8	61.4	67.7	6.3	-11.1
All women	56.1	53.2	-2.9	52.2	56.7	4.5	-7.4
Total # pregnant women	608	619		607	593		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

More than half of all anemia was moderate-severe anemia in the UP districts (Table 5.28). Baseline prevalence was 31-2% and it did not change demonstrably at endline in either district. The same trend of increasing prevalence across the 3 trimesters of pregnancy was observed. Although overall anemia prevalence among pregnant women was lower in UP than in AP, the severity of anemia among the most anemic women was worse. Severe anemia prevalence was 4% at baseline and decreased by 0.5 to 1 percentage point only at endline in both districts.

Table 5.28. Moderate-severe anemia among pregnant women stratified by trimester in Uttar Pradesh

Trimester of pregnancy	Hemoglobin <10 g/dL among pregnant women (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
First trimester	22.1	21.9	-0.2	22.8	21.6	-1.2	1.0
Second trimester	32.2	36.6	4.4	32.8	31.6	-1.2	5.6
Third trimester	36.8	37.9	1.1	37.6	39.6	2.0	-0.9
All women	31.3	33.8	2.5	31.5	30.9	-0.6	3.1
Total # pregnant women	608	619		607	593		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Summary

The INHP-II program was very successful at improving maternal nutrition from numerous perspectives. The program's extensive efforts to support ICDS services in the transition from Title II commodities to locally available foods resulted in improved coverage of the supplementary feeding program and increased consumption of the SN by pregnant and postpartum women in both AP and UP states. Approximately half of women reported coverage during pregnancy or the early postpartum period at endline. INHP-II's support for the SN program component of ICDS appeared early in the evaluation period, with the majority of improvements in coverage occurring during 2004.

Maternal nutrition messages delivered by service providers to pregnant and postpartum women were effective at increasing consumption of at least 3 meals a day in both states. In AP, the vast majority of women already reported consumption of 3 or more meals a day, but the intervention was able to increase this proportion even more. However, snack consumption was not common and dropped significantly at endline in the intervention district. It may be that a snack was converted to an additional meal by the small proportion of women who were not already consuming 3 meals a day. In UP, only one-quarter of women reported eating at least 3 meals a day, but the intervention was effective at increasing this proportion by endline. Snack consumption was frequent already in UP (50-60%), but increased nonetheless at endline among postpartum women.

Advice to increase the quantity and diversity of dietary intake during pregnancy and the early postpartum period led to improvements in diet in the intervention district of both states. Pregnant and postpartum women from the AP intervention district increased consumption of legumes, DGLV, and yellow-orange fruits at endline. Supplementary Nutrition was consumed more frequently among pregnant women only. In UP, legume intake was very frequent already and consumption of yellow-orange fruits and SN increased significantly at endline. Pregnant women and mothers of children 6-23 months significantly increased their weekly intake of meat, fish, chicken, and eggs while women who had recently delivered increased their dairy intake. In general, maternal diet advice emphasized in the INHP-II program resulted in widespread dietary improvements among women during pregnancy and the early postpartum period as well as mothers with young children.

In light of the improvements in maternal diet achieved by the intervention, it is somewhat difficult to make sense of the findings on women's nutritional status. Overall, the prevalence of malnutrition among women of reproductive age was astoundingly high, particularly in AP state where it was over 50% in the intervention district. The ~1 unit increase in BMI and decrease in malnutrition prevalence documented among first trimester pregnant women in AP and third trimester pregnant women in UP over a 2 year evaluation period is an exciting finding. Malnutrition prevalence decreased and BMI increased significantly among mothers of children 6-23 months of age in the AP intervention district as well, but no comparable improvement was observed among this same group of women in UP. The increased use of SN and improvements in dietary intake during pregnancy and the postpartum may help explain these impressive results. However, given that improvements in dietary intake were observed among pregnant and postpartum women in both states, more widespread improvements in nutritional status would be expected for all women. Additional factors that could explain these discrepant results include provision of better quality foods or larger portion sizes to pregnant women, and reductions in workload during pregnancy.

The prevalence of anemia among currently pregnant women was higher in AP (60%) than in UP (53%). These proportions are slightly higher than those reported in NFHS-2 (just under 50%). The intervention had no significant impact on mean hemoglobin or the prevalence of anemia among pregnant women in either state. The prevalence of moderate-severe anemia in late pregnancy had a relative decrease of 11% in both states, but this difference was not statistically significant. Any program benefits for pregnancy anemia would be most easily identified among women late in pregnancy after IFA supplements had been consumed for a number of months. In

AP, given the continued low coverage and consumption of IFA supplements distributed to women as part of ANC visits, the lack of impact on anemia is not surprising. However, a reduction in anemia might be expected in the UP intervention district where 65% of women received and 36% consumed the IFA supplement program target of 90+ tablets at endline.

CHAPTER 6: INFANT FEEDING

Infant feeding is a crucial aspect of young child nutrition. Identifying and promoting optimal practices during this period may have considerable impact on improving the health and nutritional status of children ages 0-23 months. Data were collected at each survey round to generate key indicators of infant and young child feeding practices important for improved child nutrition. These indicators include initiation of and exclusive breastfeeding, timely introduction of complementary foods, and the content, quantity, and quality of children's diets. Details of the INHP-II infant and child feeding messages conveyed to mothers as part of the intervention are given in Appendix I.

Breastfeeding Initiation

Early initiation of breastfeeding

Significant improvement in initiation of breastfeeding within 1 hour of delivery was observed in the intervention relative to the comparison districts in both states (Table 6.1). However, the intervention effect was much more dramatic in UP districts with a relative increase of 46 percentage points in the proportion of mothers reporting timely breastfeeding initiation. By endline, almost twice as many UP mothers as AP mothers from the intervention districts reported timely breastfeeding initiation.

Table 6.1. Breastfeeding initiation among mothers of infants 0-5 months of age

State	% Breastfeeding initiated ≤ 1 hour after delivery (n)						
	Intervention			Comparison			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Andhra Pradesh	22.3 (614)	36.5 (545)	14.2	16.9 (591)	18.9 (610)	2.0	12.2*
Uttar Pradesh	4.6 (789)	59.0 (741)	54.4	2.1 (711)	10.5 (658)	8.4	46.0*

* Statistical test result comparing change from baseline to endline in intervention and comparison districts, significant at $p<0.05$

In UP state, approximately three-quarters of women in the endline sample delivered their infants at home. The dramatic improvement in early initiation of breastfeeding observed among intervention district women (Table 6.1) was comparable among women with home and institutional deliveries. However, the situation differed in AP state where only 20-30% of deliveries took place at home. Although the intervention was effective at increasing the proportion of women reporting early initiation of breastfeeding for both types of deliveries, the overall proportion was higher among women delivering at home (Figure 6.1).

Figure 6.1. Breastfeeding initiation within 1 hour of delivery among mothers of infants 0-5 months in Andhra Pradesh by place of delivery

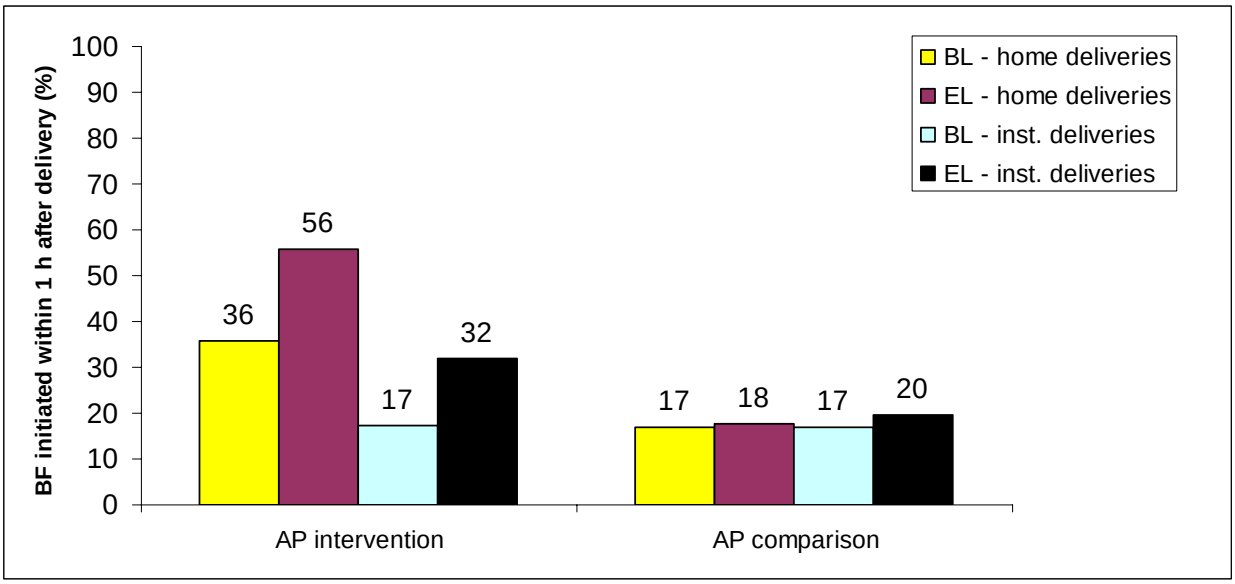
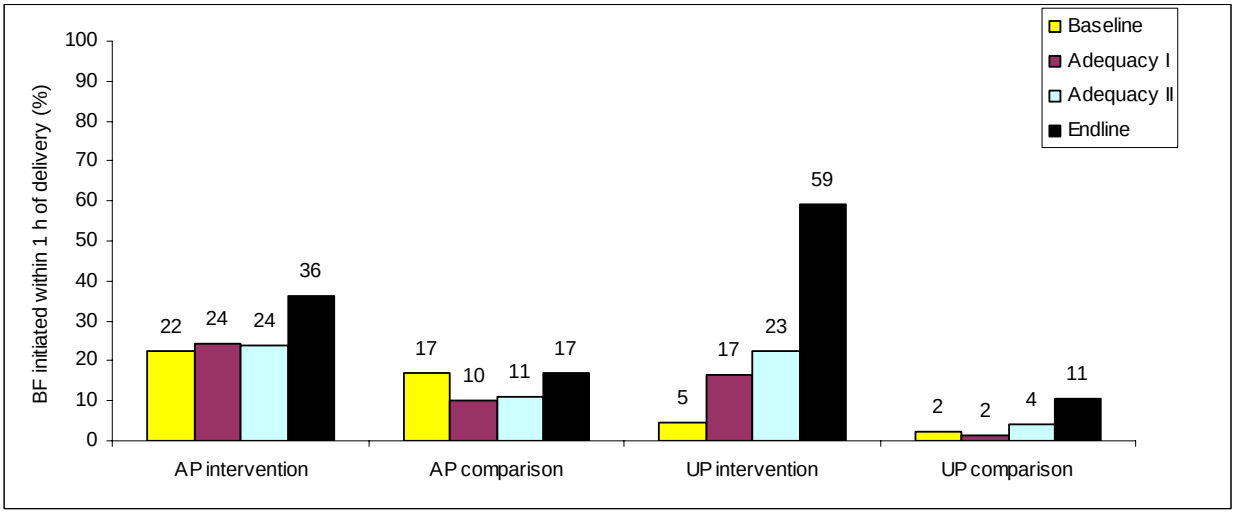


Figure 6.2 illustrates the pace of change over the evaluation period of this key indicator of early breastfeeding initiation. In the AP intervention district, changes in breastfeeding initiation practice did not take place until very late in the intervention period in late 2005 as little increase in this indicator was seen during the 2 adequacy surveys in early and mid-2005. By contrast, improvements in this practice appeared earlier in the UP intervention district, increasing progressively at each survey round. Nonetheless, the most dramatic increase was observed at the end of the intervention period in late 2005 when the proportion more than doubled from Adequacy II to endline.

Figure 6.2. Breastfeeding initiation within 1 hour of delivery among mothers of infants 0-5 months across all survey rounds



Prelacteal feeds

The proportion of mothers reporting prelacteal feeding of their newborn infants followed the same trend observed with timely initiation of breastfeeding (Table 6.2). The occurrence of this risky practice decreased significantly in the intervention relative to the comparison district in both states, but the intervention effect was much stronger in UP state. In the AP intervention district, only half of women reported this practice at endline compared to approximately two-thirds at baseline. In UP, virtually all mothers reported giving prelacteal feeds at baseline, but fewer than 50% of mothers reported following this practice at endline.

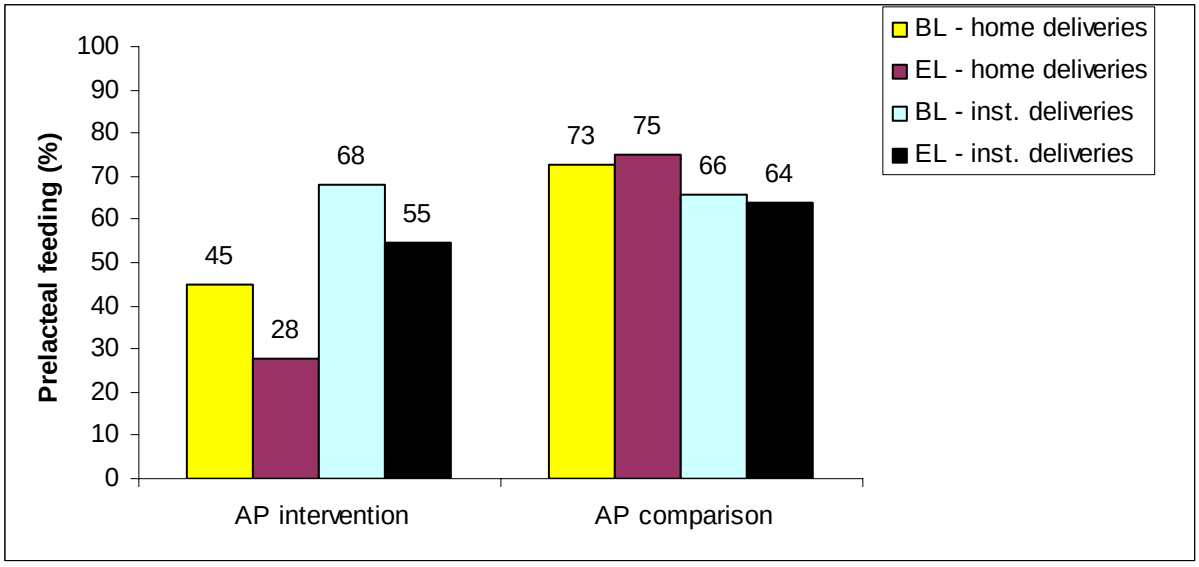
Table 6.2. Prelacteal feeds of newborn infants among mothers of infants 0-5 months

State	% Prelacteal feeds (n)						
	Intervention			Comparison			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Andhra Pradesh	61.7 (614)	49.2 (545)	-12.5	69.0 (591)	67.6 (611)	-1.4	-11.1*
Uttar Pradesh	91.8 (789)	44.4 (750)	-47.4	96.1 (711)	93.2 (661)	-2.9	-44.5*

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

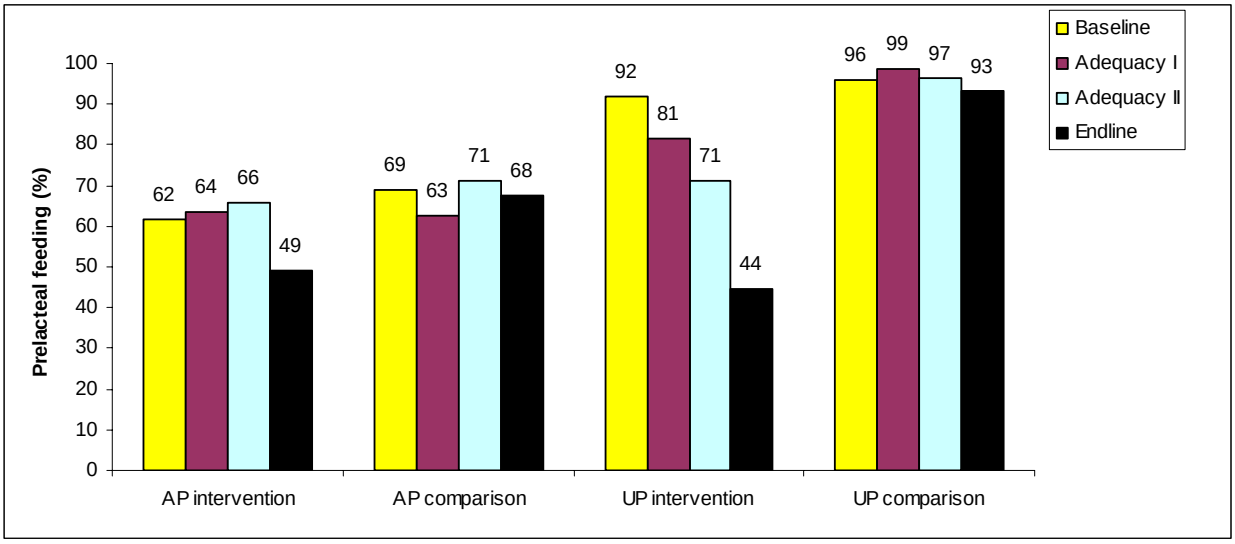
As with early initiation of breastfeeding, the data on prelacteal feeds were disaggregated by place of delivery in AP state because of the high proportion of institutional births there. The practice of giving prelacteal feeds to newborn infants was less common among mothers who delivered at home than in institutions in the intervention but not the comparison district (Figure 6.3). The INHP-II program was effective at reducing this practice among both groups of women in the intervention district, but the reduction was greater among those who delivered at home.

Figure 6.3. Prelacteal feeds of newborn infants among mothers of infants 0-5 months in Andhra Pradesh by place of delivery



The pace of change in the prelacteal feeds indicator across the 2-year evaluation period mirrored that of early initiation of breastfeeding (Figure 6.4). Prelacteal feeding remained at approximately the same level and did not decrease until late 2005 in the AP intervention district. By contrast, prelacteal feeding, almost universal at baseline, declined progressively across the evaluation period to less than 50% at endline in the UP intervention district.

Figure 6.4. Prelacteal feeds of newborn infants among mothers of infants 0-5 months across all survey rounds



The INHP-II program messages about newborn feeding practices were to initiate breastfeeding within 1 hour of delivery and avoid giving prelacteal feeds. These breastfeeding messages were given to mothers by service providers during contacts in late pregnancy and at the time of delivery. As was reported in Chapter 3, the program was successful in increasing antenatal contacts for pregnancy advice with both ANM and AWW in both states. Recently delivered mothers (of children 0-5 months) were more likely to report having received breastfeeding advice during pregnancy from service providers in the intervention than comparison districts in AP and UP states. However, the proportion of women receiving any breastfeeding advice during pregnancy home visits was still quite low overall (AP: 9-11%; UP: 14-20%). Furthermore, the presence of ANM and AWW at home deliveries remained low throughout the intervention period. Therefore, the dramatic improvements in these two newborn feeding practice indicators, particularly in UP state, may not be explained completely by advice given during these increased service provider contacts. The larger effect in UP state may also be explained in part by the simultaneous implementation of the newborn care intervention developed as part of INHP-II to reduce neonatal mortality and the Newborn Care Evaluation Research study in the same district.

Exclusive breastfeeding and early introduction of complementary foods

Mothers are advised to breastfeed their infants exclusively for the first 6 months of life. The ICDS program emphasizes this message during service provider contacts with pregnant and lactating women. The INHP-II intervention was expected to increase these contacts and increase the emphasis on infant feeding and other nutrition messages to improve exclusive breastfeeding in the first 6 months of life.

Extensive data on infant feeding practices in the first 6 months of life were collected from recently delivered mothers at all survey rounds, including feeding of breastmilk, and complementary liquids and solids in the past 24 hours and since birth. Current infant feeding status (exclusive breastfeeding and early introduction of complementary foods) was defined as intake in the previous 24 hours for the purpose of this evaluation to make the indicators used comparable to NFHS data and those used by CARE in their own data collection.

Andhra Pradesh. Over 75% of infants 0-5 months were exclusively breastfed at baseline in both districts (Table 6.3). The prevalence was close to 90% at 0-2 months, but dropped somewhat among infants 3-5 months. At endline, exclusive breastfeeding decreased in both AP districts, but more so in the comparison district, particularly at 3-5 months of age (Figure 6.5). However, the relative difference in these decreases in exclusive breastfeeding was not statistically significant. At endline, 71% of infants 0-5 months were breastfed exclusively in the intervention district.

Figure 6.5. Exclusive breastfeeding among children 0-11 months of age in Andhra Pradesh

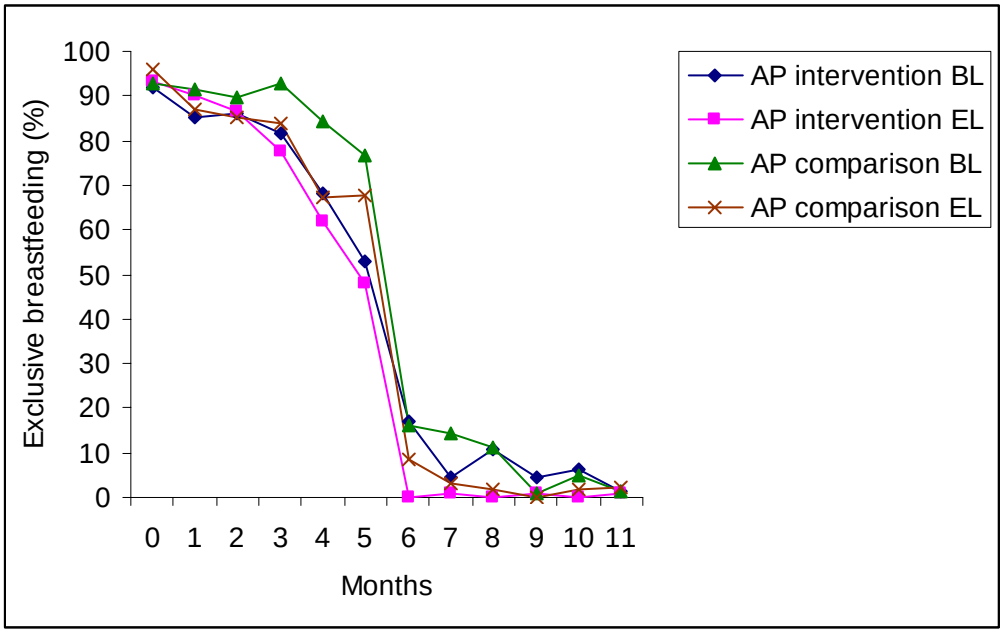


Table 6.3. Exclusive breastfeeding among infants 0-5 months of age in Andhra Pradesh

Infant age	Exclusive breastfeeding (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
0-2 months	87.0	87.4	0.4	91.0	89.3	-1.7	2.1
3-5 months	68.4	61.1	-7.3	84.6	69.8	-14.8	7.5
0-5 months	77.0	70.7	-6.3	86.8	77.0	-9.8	3.5
Total # of infants 0-5 mo	614	549		591	616		

Early introduction of complementary foods was reported among <15% of infants 0-5 months of age at baseline in the AP districts, but the problem was more common among infants 3-5 months

(Table 6.4). A significant decrease in the proportion of mothers reporting this practice at endline occurred in the intervention relative to the comparison district. The decrease was only 4 percentage points in the intervention district, but it represented a ~30% decrease because of the low baseline prevalence.

Table 6.4. Early introduction of complementary foods and liquids among infants 0-5 months of age in Andhra Pradesh

Proportion	Early introduction of complementary foods and liquids (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
0-2 months	8.1	4.0	-4.1	4	4.9	0.9	-5.0
3-5 months	21.6	14.9	-6.7	11.3	16.1	4.8	-11.5*
0-5 months	15.3	10.9	-4.4	8.8	12.0	3.2	-7.6*
Total # of infants 0-5 mo	614	549		591	616		

Trends in the provision of breastmilk and water were examined to further investigate the decline in exclusive breastfeeding in both AP districts. Fewer than 4% of mothers at baseline reported feeding breastmilk and water only to their infants 0-5 months of age in both AP districts. However, this practice was much more common at endline, increasing by 16 and 8 percentage points in the intervention and comparison districts, respectively (difference of differences between intervention and comparison district = 4.7%, $p<0.05$). It is not known what accounts for this dramatic increase in the practice of giving young infants water along with breastmilk as one of the key infant feeding messages promoted by the ICDS and INHP-II programs is to feed infants breastmilk only for the first 6 months of life. It may be that mothers in AP perceive that their infants need additional fluids because of the hot weather and address this need by providing supplemental water. The messages they receive about exclusive breastfeeding may not be sufficiently explicit about the exclusion of even water from the diet of young infants. CARE may want to investigate this issue further with local ICDS officials. Information provided by service providers to mothers about exclusive breastfeeding could be modified to more strongly emphasize the exclusion of all other liquids and solids from the diet during the first 6 months of life.

Uttar Pradesh. Approximately two-thirds of infants 0-5 months of age were breastfed exclusively in the UP districts at baseline (Table 6.5). Exclusive breastfeeding prevalence declined steadily across the first 6 months of life because of early introduction of complementary foods, particularly from 3 to 5 months of age (Figure 6.6). Unlike in the AP districts, exclusive breastfeeding increased from baseline to endline in both UP districts. The magnitude of the increase was twice as large in the intervention compared to the comparison district and this relative difference was statistically significant. Almost 80% of intervention district infants 0-5 months were exclusively breastfed at endline.

Figure 6.6. Exclusive breastfeeding among children 0-11 months of age in Uttar Pradesh

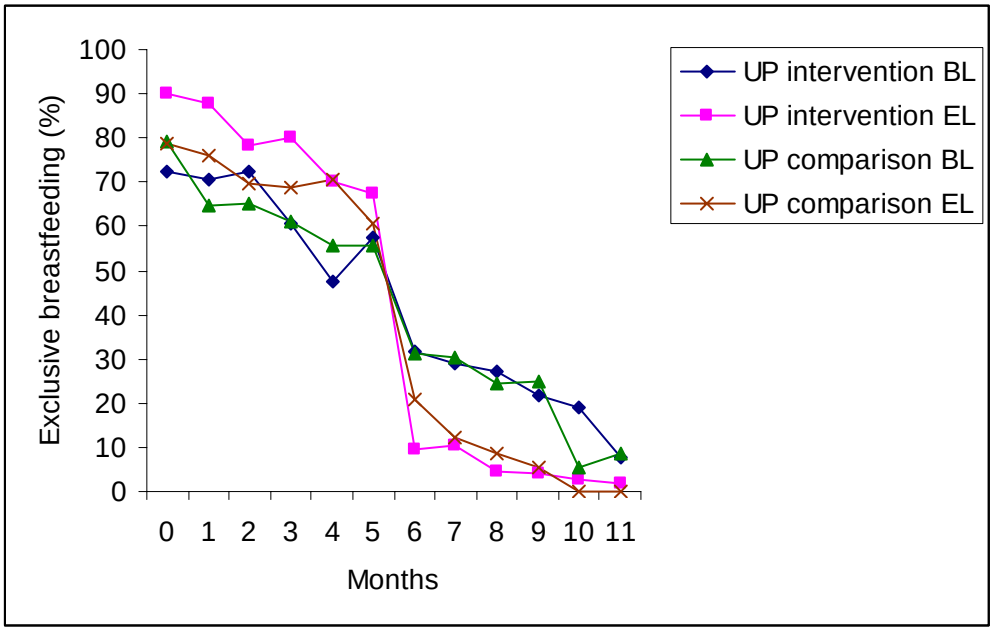


Table 6.5. Exclusive breastfeeding among infants 0-5 months of age in Uttar Pradesh

Infant age	Exclusive breastfeeding (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
0-2 months	71.9	84.5	12.6	69.6	74.7	5.1	7.5
3-5 months	55.0	73.1	18.1	57.5	67.4	9.9	8.2
0-5 months	63.5	78.5	15.0	62.8	70.7	7.9	7.1*
Total # of infants 0-5 mo	789	758		712	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Early introduction of complementary foods before 6 months of age was much more common in UP than AP state at baseline, and was reported by approximately 30% of mothers in the UP districts (Table 6.6). The proportion of mothers reporting this practice decreased in both UP districts by endline, but the decrease of ~50% was statistically significantly greater in the intervention relative to the comparison district.

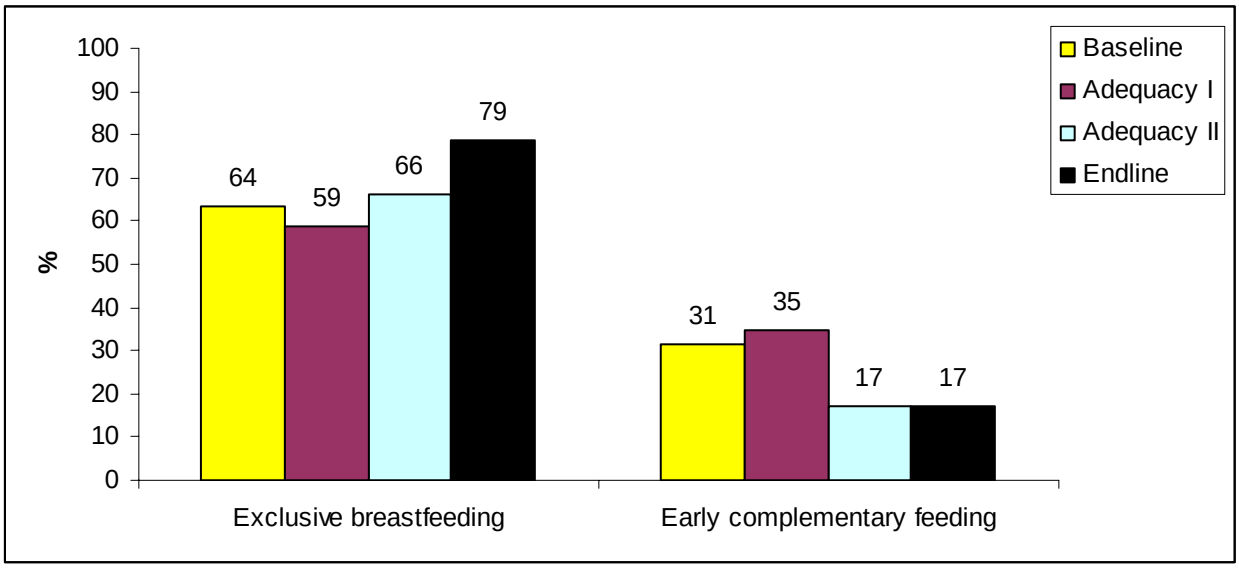
Table 6.6. Early introduction of complementary foods and liquids among infants 0-5 months of age in Uttar Pradesh

Proportion	Early introduction of complementary foods and liquids (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
0-2 months	23.4	12.1	-11.3	25.0	19.2	-5.8	-5.5
3-5 months	39.4	21.1	-18.3	37.3	27.8	-9.5	-8.8
0-5 months	31.3	16.9	-14.4	31.9	23.9	-8.0	-6.4*
Total # of infants 0-5 mo	789	758		712	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

The pace of change of these two key infant feeding indicators was not consistent across the 2-year evaluation period in the UP intervention district. Exclusive breastfeeding prevalence did not change demonstrably for the first 1 ½ years of the evaluation period, increasing significantly at the endline survey only (Figure 6.7). By contrast, the proportion of children given complementary foods and liquids before 6 months of age had decreased significantly by the Adequacy II survey in mid-2005. Given that these two early infant feeding messages were both supposed to be given to mothers of young infants, it is not clear why improvement was observed in one indicator before the other. It should be noted that these two indicators followed the same trend in the UP comparison district, suggesting that the infant feeding messages are being received by mothers through the regular ICDS services. It may be that success of the INHP-II program at increasing service provider contacts with women at home and elsewhere in communities has further increased exposure to these messages and/or the likelihood that mothers will act on this information to change their infant feeding behaviors.

Figure 6.7. Exclusive breastfeeding and early introduction of complementary foods and liquids among children 0-5 months of age in Uttar Pradesh across all survey rounds



Complementary Feeding

From six months of age, appropriate complementary feeding is recommended with continued breastfeeding up to 24 months. This involves important age-specific guidelines on food frequency, food quality (including energy and micronutrient levels), feeding during illness, hygienic practices, and methods of interaction and feeding the young child.

Introduction of solids

Mothers are advised to introduce solids to their infants starting at 6 months of age. Both early and delayed introduction of solids were observed in AP and UP states. To assess the effect of the intervention on the delayed introduction of complementary foods, two types of indicators were constructed from the evaluation data. First, all mothers of children 6-23 months of age were asked to recall when they first introduced solids to their children to identify the proportion who did so at 6-8 months of age. This indicator is comparable to the one constructed from CARE's RAPS data. The results for this indicator are reported below in Table 6.7.

In the intervention districts of both states, <30% of mothers at baseline introduced solids to their infants at 6-8 months, increasing to ~50% at endline. In AP, this increase was statistically significant relative to the more modest increase in the comparison district. In UP, the increases observed in both districts were very large (30 percentage points, a ~100% increase), but comparable, yielding no significant improvement in the intervention relative to the comparison district.

Table 6.7. Reported introduction of solids at 6-8 months among mothers of children 6-23 months of age

State	Introduction of solids at 6-8 months among mothers of 6-23 months olds (%)						
	Intervention			Comparison			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Andhra Pradesh	30.4 (1746)	49.5 (2012)	19.1	24.6 (1831)	35.7 (2034)	11.1	8.0*
Uttar Pradesh	22.1 (1643)	52.8 (1650)	30.7	26.8 (1666)	56.5 (1624)	29.7	1.0

* Statistical test result comparing change from baseline to endline in intervention and comparison districts, significant at $p<0.05$

The timing of introduction of solids can be assessed also through current dietary intake. This alternative approach avoids the problem of recall bias that can occur when persons have to recall an event that has occurred in the distant past. Dietary intake from 24-hour diet recall data can be used to determine the proportion of children 6-8 months of age who consumed any solids in the previous 24 hours. This indicator provides another measure of timely introduction of solids. These data are presented in the next section on dietary intake.

Dietary intake

Caregivers were asked what kinds of foods their child consumed in the previous 24 hours. Portion size information also was ascertained. These data were used to describe the content of children's diets as well as the quantity, quality, and frequency of feeds.

Andhra Pradesh. At baseline, cereal intake at all ages was much higher in the intervention than in the comparison district (Table 6.8a-c). The reason for this difference in the intake of solids by young children is not known. Cereal intake among children 6-11 months increased at endline by approximately the same amount in both districts. Among children 12-23 months, cereal intake increased significantly less in the intervention than in the comparison district, but this may be explained by the fact that baseline intake was already high (76%) and increased almost as much as it could to close to 100%. Since cereal intake in the comparison district at baseline was 26 percentage points lower, there was more room for improvement at endline (by 36 percentage points to 86%). Despite the fact that the evaluation analyses did not yield a positive intervention effect on cereal intake, it should be emphasized that cereal intake among children 6-23 months increased fairly consistently during the 2-year evaluation period to very high levels in the AP intervention district (Figure 6.8).

Table 6.8. Foods consumption in the past 24 hours among breastfeeding children 6-23 months of age in Andhra Pradesh

6.8a. 6-8 months

Food type	Food consumed in the past 24 hours (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All cereals	56.8	70.6	13.8	36.3	48.0	11.7	2.1
Legumes	2.3	4.6	2.3	2.8	1.0	-1.8	4.1*
All fruits and vegetables	12.2	9.5	-2.7	26.3	5.7	-20.6	17.9*
Eggs, meat, chicken and fish	2.9	0.6	-2.3	5.9	0.3	-5.6	3.3*
Total # of children 6-8 months	345	347		388	402		

6.8b. 9-11 months

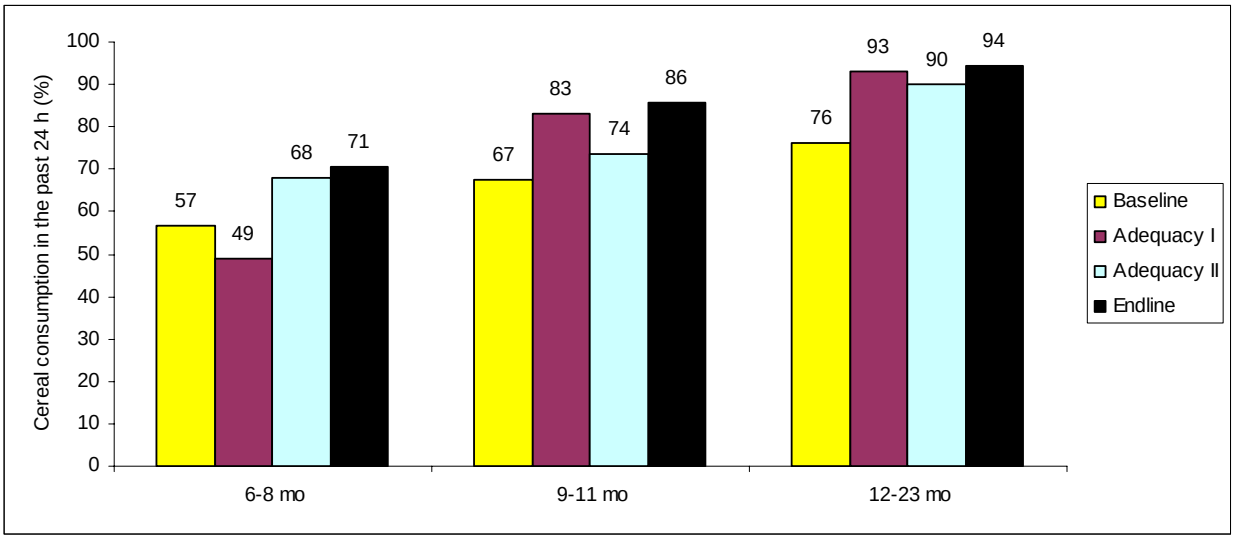
Food type	Food consumed in the past 24 hours (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All cereals	67.4	85.7	18.3	44.1	66.9	22.8	-4.5
Legumes	7.1	7.8	0.7	5.7	2.4	-3.3	4.0
All fruits and vegetables	17.7	15.3	-4.5	30.8	16.4	-14.4	9.9*
Eggs, meat, chicken and fish	4.8	4.2	-0.6	7.6	1.2	-6.4	5.8*
Total # of children 9-11 months	294	307		263	335		

6.8c. 12-23 months

Food type	Food consumed in the past 24 hours (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All cereals	76.3	94.3	18.0	49.7	87.7	38.0	-20.0*
Legumes	13.2	13.4	0.2	7.3	9.4	2.1	-1.9
All fruits and vegetables	23.7	21.6	-2.1	30	21.5	-8.5	6.4*
Eggs, meat, chicken and fish	4.6	4.4	-0.2	3.9	2.3	-1.6	1.4
Total # of children 12-23 months	990	1240		1060	1166		

*Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

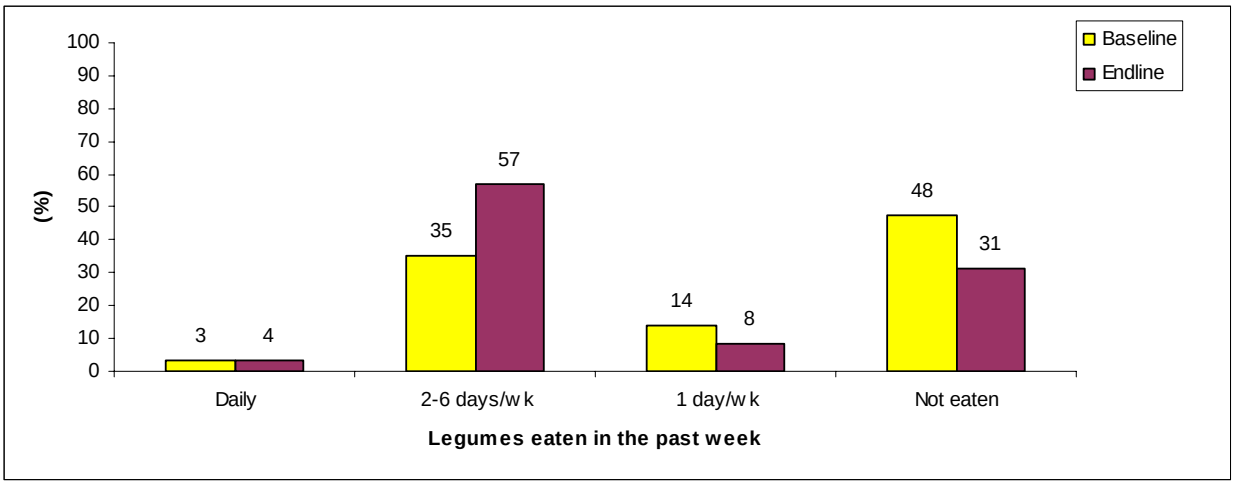
Figure 6.8. Cereal consumption during the past 24 hours among children 6-23 months in Andhra Pradesh intervention district (Karimnagar)



In contrast to cereal intake, fruit and vegetable intake was lower in the intervention (12-24%) than the comparison (26-31%) district at baseline (Table 6.8a-c). Unfortunately, fruit and vegetable intake decreased among all ages at endline, but the decreases were small in the intervention district and much larger in the comparison district, yielding a statistically significant relative difference between the 2 districts. Consumption of eggs and meat was low (<8%) in all age groups at baseline, and decreased in all but one group (children 12-23 months in the intervention district) at endline. However, the decreases followed the same trend as fruit and vegetable intake with small decreases in the intervention district and larger decreases in the comparison district yielding statistically significant relative differences.

Legume intake was low at baseline (2-13% across all age groups), and remained low at endline in both AP districts (Table 6.8). A review of 7-day food frequency data on legume consumption confirms the low daily intake, but indicates an increase in the proportion of children consuming legumes 2-6 times in the past week in the intervention relative to the comparison district (Figure 6.9). It should be noted that *idli* and *dosa*, two cereal-based foods commonly consumed in AP state, are a mixture of cereal grains and lentils (a legume). They were classified as "cereals" in these data, and this may have contributed somewhat to the low consumption levels of legumes reported. Therefore, if increased legume consumption in the AP intervention district involved increased intake of *idli* and *dosa* only, then this intervention effect may have been missed in these analyses. However, one of the key feeding messages given for introducing and feeding solids at 6-8 months of age was to mash legumes with rice or bread for an energy-dense complementary food. The AP data suggest that this feeding practice was not widely received, understood or practiced in this study population.

Figure 6.9. Legume consumption during the past week among children 6-23 months in Andhra Pradesh intervention district (Karimnagar)



Data on liquid intake in the past 24 hours were collected as well. Although the majority of women breastfeed their children until 2 years of age, it is common practice to supplement breastmilk intake with animal or powdered milk or infant formula. In AP districts, 20-30% of children 6-11 months consumed animal/powdered milk or infant formula at baseline (Table 6.9). This practice was much less common among older children 12-23 months with only 5-7% reporting animal/powdered milk or infant formula intake in the past 24 hours. Among children 6-8 months, this practice decreased by ~50% in the intervention district relative to a very small decrease in the comparison district. The changes were minimal in the older age groups.

Table 6.9. Animal/powdered milk and formula intake in the past 24 hours among breastfeeding children 6-23 months of age in Andhra Pradesh

Child age	Animal/powdered milk or formula consumed in the past 24 hours (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months	29.6	15.0	-14.6	21.9	18.4	-3.5	-11.1*
9-11 months	27.2	26.4	-0.8	25.1	22.1	-3.0	2.2
12-23 months	5.5	6.9	1.4	6.6	4.2	-2.4	3.8*
Total # of children 6-23 months	1629	1894		1711	1903		

Uttar Pradesh. Intake of solids was extraordinarily low at baseline (8-57%), particularly among children <1 year of age (Table 6.10a-c). Consumption of cereals and legumes increased dramatically at endline in both districts, but the increases were significantly greater in the intervention than in the comparison district for all age groups. Cereal intake in the previous 24 hours in the intervention district at endline had improved by 32 to 54 percentage points to 44%, 77%, and 89% among children ages 6-8, 9-11, and 12-23 months, respectively. The pace of improvement in cereal intake in the intervention district was fairly consistent across the evaluation period (Figure 6.10). Large increases were observed for children 9-23 months at the Adequacy I survey in early 2005. Improvements in cereal intake among children 6-8 months was

more modest at that time, but had increased dramatically by the time of the Adequacy II survey in mid-2005.

Table 6.10. Foods consumption in the past 24 hours among breastfeeding children 6-8 months of age in Uttar Pradesh

6.10a. 6-8 months

Food type	Food consumed in the past 24 hours (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All cereals	7.9	44.3	36.4	11.9	35.0	23.1	13.3*
Legumes	6.9	30.8	23.9	2.3	12.8	10.5	13.4*
All fruits and vegetables	4.0	16.9	12.9	3.2	16.3	13.1	-0.2
Eggs, meat, chicken and fish	0	0.8	0.8	0.3	0.7	0.4	0.4
Total # of children 6-23 months	277	237		346	306		

6.10b. 9-11 months

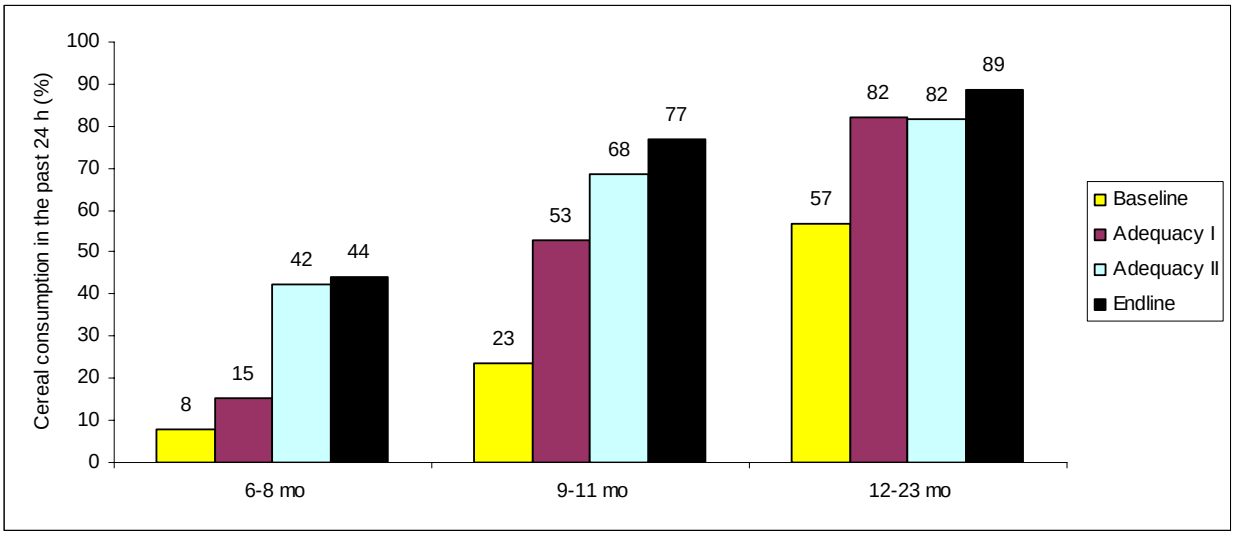
Food type	Food consumed in the past 24 hours (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All cereals	23.4	77.0	53.6	37.8	73.3	35.5	18.1*
Legumes	13.5	51.2	37.7	13.3	24.6	11.3	26.4*
All fruits and vegetables	12.0	31.6	19.6	17.4	43.1	25.7	-6.1
Eggs, meat, chicken and fish	0.5	0.5	0	0	1.0	1.0	-1.0
Total # of children 6-23 months	192	209		196	195		

6.10c. 12-23 months

Food type	Food consumed in the past 24 hours (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All cereals	56.6	88.7	32.1	71.7	89.5	17.8	13.3*
Legumes	31.1	65.2	34.1	25.1	31.4	6.3	27.8*
All fruits and vegetables	27.7	45.8	18.1	47.4	63.7	16.3	1.8
Eggs, meat, chicken and fish	0.7	2.3	1.6	1.0	1.3	0.3	1.3
Total # of children 6-23 months	995	1035		969	975		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

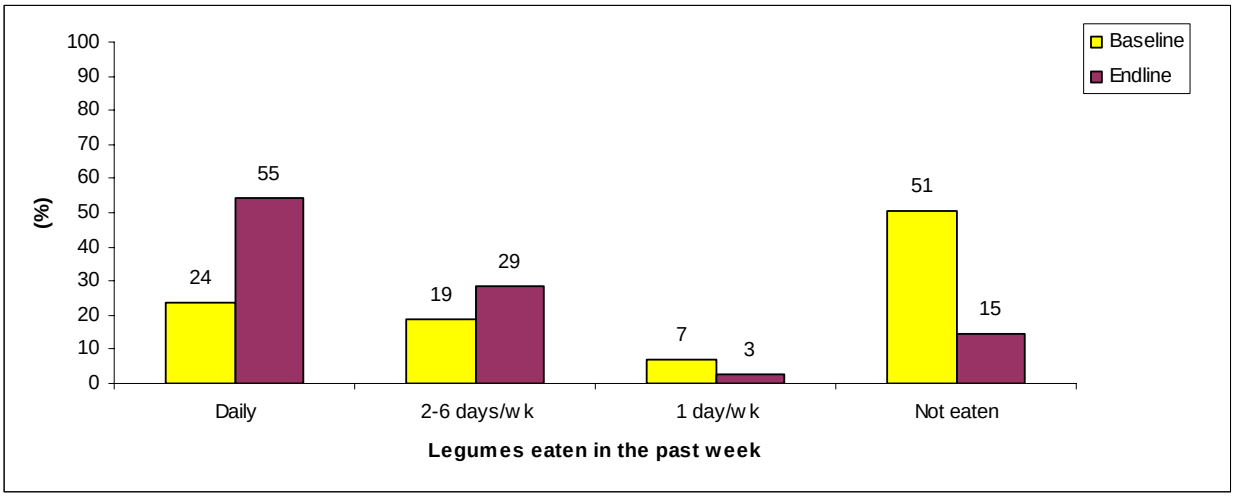
Figure 6.10. Cereal consumption during the past 24 hours among children 6-23 months in Uttar Pradesh intervention district (Barabanki)



Large increases of 13 to 20 percentage points were observed for fruit and vegetable intake in the intervention district, but they were matched or exceeded by comparable increases in the comparison district, so these increases cannot be attributed to the intervention (Table 6.10a-c). Intake of eggs and meat was virtually nonexistent at baseline and remained so at endline in both UP districts.

Increased consumption of legumes in the daily diet was particularly dramatic in the UP districts (Table 6.10a-c). Although legume intake increased among children 6-23 months in both districts, the increases in the intervention district were much more pronounced, ranging from 24 to 38 percentage points. By endline, one third of children 6-8 months, one half of children 9-11 months, and two-thirds of children 12-23 months consumed legumes in the previous 24 hours. The 7-day food frequency data provide further evidence of this strong shift to more frequent inclusion of legumes in the diets of young children (Figure 6.11). These data suggest that the feeding message to mash legumes with rice or bread for an energy-dense complementary food was effective in this study population.

Figure 6.11. Legume consumption during the past week among children 6-23 months in Uttar Pradesh intervention district (Barabanki)



Intake of animal and powdered milk and infant formula was slightly more common in UP than AP with close to one-third of children 6-23 months of age reporting intake during the previous 24 hours (Table 6.11). Unlike AP, consumption remained at the same level in the second year of life. Endline proportions were unchanged from baseline in all age groups in both districts, indicating that the practice of supplementing breastmilk with animal milk or infant formula intake was not influenced by the infant feeding counseling received by mothers.

Table 6.11. Animal/powdered milk and formula intake in the past 24 hours among breastfeeding children 6-23 months of age in Uttar Pradesh

Child age	Animal/powdered milk or formula consumed in the past 24 hours (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months	33.2	32.1	-1.1	27.2	25.8	1.4	-2.5
9-11 months	34.4	34.5	0.1	30.1	32.3	2.2	-2.1
12-23 months	29.9	32.2	2.3	31.1	29.1	-2	4.3
Total # of children 6-23 months	1464	1481		1511	1476		

Quantity of solids consumed

The World Health Organization (WHO) recommends a minimum of 200, 300 and 400 grams of solids per day for children 6-8, 9-11 and 12-23 months, respectively. Twenty-four hour recall data were used to calculate the quantity of solids per day consumed by children 6-23 months. Solids were defined as rice, bread and other grain products. Because the quantities of solids consumed in the study areas were very low, the indicator used for evaluation purposes was the proportion of children consuming *at least half* the recommended quantity of solids per day.

Andhra Pradesh. The proportion of children consuming at least half the recommended quantity of solids at baseline was higher in the intervention than comparison district for all ages (Table 6.12a). This proportion increased quite significantly by 12-25 percentage points at endline in all age groups, but the increase was comparable in the two districts, indicating that the intervention was not responsible for the improvement of this feeding practice.

Table 6.12. Consumption of at least half the recommended quantity of solids among children 6-23 months of age

6.12a. Andhra Pradesh

Age	Half the recommended quantity of solids (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months (100+ g)	26.7	43.2	16.5	16.0	27.6	11.6	4.9
9-11 months (150+ g)	18.0	36.6	18.6	8.3	23.2	13.9	4.7
12-23 months (200+ g)	20.1	44.8	24.7	10.3	35.7	25.4	0.7
Total # of children 6-23 months	1746	2012		1831	2034		

6.12b. Uttar Pradesh

Age	Half the recommended quantity of solids (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months (100+ g)	1.0	6.0	5.0	0.8	1.3	0.5	4.5*
9-11 months (150+ g)	0.5	6.0	5.5	2.4	1.0	-1.4	6.9*
12-23 months (200+ g)	1.5	6.9	5.4	2.1	3.2	1.1	4.3*
Total # of children 6-23 months	1643	1650		1666	1624		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. Virtually all children in the UP districts failed to consume at least half the recommended quantity of solids at baseline (Table 6.12b). There was a significant increase in this proportion at endline for all age groups in the intervention relative to the comparison district. However, the endline proportion did not exceed 6% for any category, suggesting that consumption of an insufficient quantity of solids constitutes a major problem for complementary feeding interventions in UP districts.

Frequency of solids consumed

The World Health Organization (WHO) recommends a minimum of 2 and 3 solid feeds per day for breastfeeding children 6-8 and 9-23 months, respectively. As with the quantity indicator, 24-hour recall data were used to calculate the number of solid feeds per day among children 6-23 months. A solid feed was defined as intake of rice, bread or other grain products. When children were reported to have consumed a given food more than once in the previous 24 hours, these feeds were recorded as separate episodes in the data collection instrument.

Andhra Pradesh. The proportion of children consuming the recommended minimum frequency of solids at baseline followed the same trends by age and district as the quantity indicator (Table 6.13a). The baseline proportions were higher in the intervention than comparison district and among the youngest children. Large increases of 15-30 percentage points were observed among

all age groups at endline, but these increases were comparable between the two districts so there were no significant intervention effects. At endline, over 50% of children 6-8 months were receiving at least 2 feeds per day, but the proportion was <30% for children 9-11 months who are expected to consume at least 3 feeds per day to meet their nutritional needs. Mothers were more successful at increasing the number of feeds to 3 per day for children in the second year of life, reaching over 40% in the intervention district.

Table 6.13. Minimum recommended frequency of solids consumed per day among breastfeeding children 6-23 months of age

6.13a. Andhra Pradesh

Age	Recommended complementary feeding frequency (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months (2+ times /d)	34.5	56.1	21.6	11.4	35.5	24.1	-3.5
9-11 months (3+ times/d)	12.9	28.3	15.4	7.6	17.3	9.7	5.7
12-23 months (3+ times/d)	15.5	42.4	26.9	9.6	40.9	31.3	-4.4
Total # of mothers	1620	1893		1702	1901		

6.13b. Uttar Pradesh

Age	Recommended complementary feeding frequency (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months (2+ times /d)	2.3	25.4	23.1	3.2	18.2	15.0	8.1*
9-11 months (3+ times/d)	3.1	23.9	20.8	4.6	11.3	6.7	14.1*
12-23 months (3+ times/d)	8.8	37.8	29.0	15.9	31.3	15.4	13.6*
Total # of mothers	1447	1476		1445	1473		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. The proportion of children consuming the minimum recommended frequency of solid feeds was low at baseline (2-16%), but was higher at older ages unlike in the AP districts (Table 6.13b). However, the proportion of children receiving the recommended number of feeds increased significantly at endline in all three age groups in the intervention relative to the comparison district. At least 24% of children 6-11 months and almost 40% of children 12-23 months consumed the minimum recommended frequency of solids at endline. Although these proportions remain too low, they represent a major improvement over the baseline and comparison district proportions.

Dietary diversity

In addition to the quantity and frequency of complementary foods consumed, the quality of the diet is an important characteristic to consider in complementary feeding interventions. CARE's child nutrition messages include recommendations to incorporate vegetables, fruits, and protein

sources into the weaning diet along with staple foods. Dietary diversity was characterized by the number of different food groups fed to a child in the previous 24 hours. These groups include 1) cereals, 2) legumes, 3) meat, chicken, fish and eggs, 4) vitamin A-rich fruits and vegetables, 5) other fruits and vegetables, 6) dairy (cheese, curd, animal milk, infant formula), and 7) butter, oil, and fat. Adequate dietary diversity was defined as intake of 3 or more of these food groups in the 24-hour recall data.

Andhra Pradesh. Few children had diverse diets at baseline, particularly those <12 months of age (Table 6.14a). The proportion of children 6-11 months with diverse diets increased by very little at endline in both districts. Among children 12-23 months of age, the proportion with diverse diets increased significantly less at endline in the intervention relative to the comparison district. Only 22% of intervention district children 12-23 months had a diverse diet at endline.

Table 6.14. Consumption of ≥3 food groups in the past 24 hours among children 6-23 months of age

6.14a. Andhra Pradesh

Age	Consumption of ≥3 food groups in the past 24 hours (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months	5.1	8.2	3.1	0.8	3.9	3.1	0
9-11 months	8.2	14.7	6.5	2.9	6.6	3.7	2.8
12-23 months	15	22.1	7.1	4.6	16.3	11.7	-4.6*
Total # of mothers	1746	2012		1831	2034		

6.14b. Uttar Pradesh

Age	Consumption of ≥3 food groups in the past 24 hours (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months	2.4	22.4	20	2.8	10.9	8.1	11.9*
9-11 months	9.4	39.2	29.8	14.4	32.9	18.5	11.3*
12-23 months	25.6	53.4	27.8	31.1	43.7	12.6	15.2*
Total # of mothers	1643	1650		1666	1624		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. At baseline, diverse diets were uncommon among children <12 months, but were reported among approximately one-quarter of children 12-23 months of age (Table 6.14b). The proportion of children with diverse diets increased at endline among all age groups in both districts, but the increases were significantly larger in the intervention (20-30 percentage points) relative to the comparison (8-18 percentage points) district. Over half of intervention district children 12-23 months had a diverse diet at endline.

The dietary diversity proportions in AP and UP pose an interesting contrast to the other child feeding indicators (quantity, frequency) and the 24-hour recall data. At baseline, children in AP districts were more likely than those in UP districts to consume solids (cereals), fruits, vegetables, eggs, and meat, and to consume food in recommended quantities and frequency. Nonetheless, the diversity in children's diets in AP was lower than in UP. This disparity became more apparent in the endline data where the success of the INHP-II intervention at improving the

diversity and frequency of dietary intake in the UP intervention district resulted in a vastly improved picture of children's diets at endline. However, the low dietary diversity among children in the AP districts remains difficult to explain. It appears that high proportions of AP children 6-23 months are receiving daily solid feeds of cereal grains, but very few other types of food are being added into their diets. The quantity and frequency of these solid feeds have improved in both districts, but remain inadequate for preventing malnutrition. In AP, the decrease in intake of other important dietary components such as fruits, vegetables, eggs, and meat is of concern as these are important sources of micronutrients.

Consumption of oil

Complementary feeding messages promoted by CARE in its training of service providers included a recommendation to add a small amount of oil to solid feeds for children 6-23 months. To assess this practice in the evaluation, an indicator was created to identify children who reported consumption of oil and ≥1 solid feed in the previous 24 hours.

Andhra Pradesh. Consumption of oil added to solids was <10% at baseline in the intervention district but only 1% in the comparison district (Table 6.15a). There were very small increases (0-4%) in this practice at endline in both districts.

Table 6.15. Consumption of oil added to solids among breastfeeding children 6-23 months

6.15a. Andhra Pradesh

Child age	Oil added to solids (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months	8.9	10.1	1.2	0	3.5	3.5	-2.3
9-11 months	5.1	7.8	2.7	1.1	4.8	3.7	-1.0
12-23 months	3.1	5.5	2.4	0.9	3.9	3.0	-0.6
Total # of mothers	1620	1677		1702	1656		

6.15b. Uttar Pradesh

Child age	Oil added to solids (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
6-8 months	0	4.2	4.2	0	1.0	1.0	3.2*
9-11 months	1.7	10.1	8.4	0	5.1	5.1	3.3
12-23 months	1.4	7.4	6.0	1.6	7.6	6.0	0
Total # of mothers	1447	1476		1445	1473		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. There was virtually no consumption of oil added to solids at baseline in the UP districts (Table 6.15b). Oil intake with solids increased at endline by 1 to 8 percentage points in both districts, so that 4-8% of children reported oil intake in the intervention district. However, a significant increase in the intervention relative to the comparison district was observed among children 6-8 months only.

It appears that the feeding message from service providers to mothers about the addition of oil to solid feeds for young children was not received, understood, or followed in either state. A better understanding of how often this advice was given and how it was understood by mothers may come from examination of the questions on infant and child feeding advice in the cohort data.

Supplementary Nutrition

INHP-II supports the distribution of supplementary nutrition commodities to ICDS beneficiaries including children 6 months to 6 years of age. This evaluation examined receipt and consumption of SN among children 6-23 months of age. Unfortunately, these data were collected only at the Adequacy II survey in mid-2005 and the endline survey in early 2006. Therefore, it is most illustrative to compare the proportion of children who received and consumed SN at endline to determine whether the INHP-II program increased the effectiveness of this component of the ICDS. However, the intervention effect between the Adequacy II and endline surveys (~6 months) is presented also to examine short-term trends in program implementation.

Andhra Pradesh. Receipt and consumption of SN among children 6-23 months of age was significantly higher in the intervention relative to the comparison district at both the Adequacy II and endline surveys (Table 6.16). In the intervention district, almost three-quarters of children had ever received SN, almost half had received it at least once in the past 3 months, and more than one-third had consumed it at least once in the same time period. However, there were significant decreases in the proportion of children who received or consumed SN 6 months later at endline in the intervention relative to the comparison district. The cause of this decline is not clear as the period in question at the endline survey did not include the transition period from CSB to locally available foods in late 2002 when SN availability was an issue.

Table 6.16. Receipt and consumption of Supplementary Nutrition by children 6-23 months of age in Andhra Pradesh

	Supplementary Nutrition receipt/consumption among children 6-23 months (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Adequacy II	Endline	Δ	Adequacy II	Endline	Δ	
Ever received SN	72.9	46.5	-26.4	29.6	33.3	3.7	-30.1*
Received SN in the past 3 mo	45.6	38.3	-7.3	23.8	26.3	2.5	-9.8*
Consumed SN in the past 3 mo	38.4	33.8	-4.6	17.9	21.3	3.4	-8.0*
Total # children 6-23 months	380	2012		453	2034		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Despite reports that the state government in Andhra Pradesh had switched its SN distribution to spot feeding at AWC rather than providing SN to take home, data from both survey rounds suggest that most SN is still distributed as take-home rations in the program. Among children who ever received SN, 76-80% received it as take-home rations only.

Uttar Pradesh. As in AP state, receipt and consumption of SN among children 6-23 months was significantly higher in the intervention than comparison district at the Adequacy II and endline

survey rounds (Table 6.17). The proportion of children who received SN (ever or in the past 3 months) was more than twice as high in the intervention (EL: 46-50%) compared to the comparison (19-20%) district at endline. The proportion of children who had consumed SN in the past 3 months was also more than double in the intervention district at endline. Within the ~6 month period between the Adequacy II and endline surveys, the proportion of children who had recently received or consumed SN increased significantly in the intervention relative to the comparison district. Virtually all SN distributed in the UP districts (98%) was in the form of take-home rations.

Table 6.17. Receipt and consumption of Supplementary Nutrition by children 6-23 months of age in Uttar Pradesh

	Supplementary Nutrition receipt/consumption among children 6-23 months (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Adequacy II	Endline	Δ	Adequacy II	Endline	Δ	
Ever received SN	46.2	49.7	3.5	17.7	20.3	2.6	0.9
Received SN in the past 3 mo	32.7	45.8	13.1	13.2	19.3	6.1	7.0*
Consumed SN in the past 3 mo	18.8	32.5	13.7	7.8	12.6	4.8	8.9*
Total # children 6-23 months	437	1650		408	1624		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Caregiver feeding practices

Caregiving practices involving feeding are an essential component to appropriate complementary feeding to improve the nutritional status of young children. Such practices are intended to ensure that young children consume adequate amounts of the foods offered at a meal. For example, plate sharing with other household members may decrease the likelihood that children receive sufficient quantities of food. Different caregivers assisting the child to eat may also influence the diet. There is some evidence that children fed by their mothers are more likely to consume adequate nutrient intakes.

Caregiver feeding

Andhra Pradesh. In the AP baseline data, 50-75% of children were usually fed by their mothers and this proportion did not vary greatly by age (Table 6.18a). Feeding by mothers increased in all groups and in both districts at endline. The increase in this proportion among children 9-23 months was significantly larger in the intervention relative to the comparison district. The negative relative difference among children 6-8 months in the intervention district is explained by the higher baseline proportion in that group that leaves less room for improvement.

Table 6.18. Child feeding by mothers among children 6-23 months of age

6.18a. Andhra Pradesh

Age	Usually fed by mother (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
6-8 months	66.8	86.1	19.3	51.7	78.1	26.4	-7.1*
9-11 months	71.2	85.4	14.2	73.9	82.2	8.3	5.9*
12-23 months	64.3	78.8	14.5	63.5	69.0	5.5	9.0*
Total # children 6-23 months	1746	2012		1831	2034		

6.18b. Uttar Pradesh

Age	Usually fed by mother (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
6-8 months	14.0	56.8	42.8	17.1	44.9	27.8	15.0*
9-11 months	30.7	71.4	40.7	34.6	64.8	30.2	10.5*
12-23 months	32.7	51.7	19.0	37.6	45.1	7.5	11.5*
Total # children 6-23 months	1643	1650		1666	1624		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. Children of all ages in UP were less likely to be fed by their mothers than in AP. Only 14-17% of children 6-8 months and 30-38% of children 9-23 months were fed usually by their mothers at baseline (Table 6.18b). However, these proportions increased dramatically at endline, particularly among children 6-11 months, and the increases were significantly larger in the intervention relative to the comparison district. By endline, over 50% of intervention district children were reported to be fed usually by their mothers.

Plate sharing

Andhra Pradesh. Plate sharing was relatively uncommon in AP at baseline as the majority of children were fed from a separate plate (Table 6.19a). There were small positive increases in the proportion of children eating from their own plate at endline in both districts, so there was not an intervention effect on this feeding practice. However, the relative difference between the intervention and comparison districts was negative for children 6-8 months possibly because the baseline proportion in the comparison district was half of that in the intervention district (61 vs 38%).

Table 6.19. Feeding from a separate plate among children 6-23 months

6.19a. Andhra Pradesh

Age	Fed from a separate plate (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
6-8 months	61.1	67.6	6.5	38.2	52.2	14.0	-7.5*
9-11 months	75.5	81.9	6.4	63.0	69.9	6.9	-0.5
12-23 months	77.8	81.4	3.6	70.4	74.4	4	-0.4
Total # children 6-23 months	1746	2012		1831	2034		

6.19b. Uttar Pradesh

Age	Fed from a separate plate (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
6-8 months	5.1	41.2	36.1	7.4	21.8	14.4	21.7*
9-11 months	19.8	44.7	24.9	19.2	26.7	7.5	17.4*
12-23 months	37.0	57.8	20.8	45.4	49.9	4.5	16.3*
Total # children 6-23 months	1643	1650		1666	1624		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh. In UP districts, eating from a separate plate was quite rare among the youngest children at baseline, but was more common among older children, particularly those 12-23 months of age (Table 6.19b). These low numbers most likely reflect the small proportion of children 6-11 months who consumed solids and other foods in the previous 24 hours at baseline (see Table 5.10). However, the proportion of children feeding from a separate plate increased dramatically at endline in the intervention relative to the comparison district. Among children 6-11 months, approximately twice as many fed from a separate plate in the intervention (41-45%) relative to the comparison (22-27%) district. These findings suggest that infant and child feeding advice by service providers most likely included messages about caregiver feeding behaviors in addition to recommendations about dietary intake quantity, frequency, and quality.

Summary

Newborn feeding practices associated with initiation of breastfeeding improved significantly in both districts. The intervention effect on these practices was particularly dramatic in UP state.

Improvements in breastfeeding practices during the first 6 months of life were also observed. Exclusive breastfeeding among children 0-5 months of age was >70% in both states at endline. However, the trends differed in the 2 states. In UP, exclusive breastfeeding increased significantly in the intervention relative to the comparison district, but in AP, the proportion decreased in both districts. Nonetheless, the intervention was modestly effective in both states at reducing the practice of early introduction of complementary foods and liquids before 6 months of age.

Evaluation of the intervention effect on the timely introduction of complementary foods varies depending on the indicator used. Using the indicator based on maternal recall of child age at the

time of introduction, the intervention was modestly effective in AP, but not in UP, where large increases in timely introduction of solids were observed in both districts. At endline, ~50% of mothers reported introducing solids to their infants at 6-8 months of age. By contrast, the 24-hour recall data yielded a somewhat different picture. Among children 6-8 months of age, cereal intake increased by ~10 percentage points in AP districts and 22 to 36 percentage points in UP districts. However, the relative increase in the intervention district was significant in UP only.

The trends in cereal intake among older children mirror those observed among the children 6-8 months of age. In UP, the intervention was effective at increasing intake of cereals and legumes among all children. The increased consumption of legumes in the intervention district was particularly impressive. However, increased consumption of a lesser magnitude occurred in the comparison district as well, suggesting positive effects of the ICDS program on child feeding practices. In AP, cereal intake increased equally in both districts and legume intake remained very low among all age groups. For fruit and vegetable intake, there was no intervention effect in either state, but the trends by state diverged also. Fruit and vegetable intake increased in UP districts, but decreased in AP districts.

CARE's INHP-II program was effective at improving distribution and consumption of SN among children 6-23 months of age in both states. However, data from the Adequacy II and endline surveys revealed a decline in the coverage and utilization of this program component in the last 6 months of the evaluation period in AP intervention district. The reasons for this recent decline are unknown, but do not appear to include a switch from the use of THR to spot feeding.

Complementary feeding indicators of diet quantity, quality and feeding frequency improved over the intervention period in all study districts. However, there were no intervention effects in AP whereas the increases for all 3 indicators in UP were significantly larger in the intervention relative to the comparison district. Surprisingly, dietary diversity was much less of a problem in UP than AP, where fewer than half as many children in each age group had diverse diets. However, it is important to note that consumption of adequate quantity and quality of complementary foods and adequate frequency of feeds remain major problems in both states, but particularly in UP. Fewer than 6% of children in UP were consuming at least *half* the recommended minimum quantity of complementary foods and <25% of children 6-11 months received the minimum recommended frequency of solid feeds at endline. These figures indicate that improving the quantity and frequency of solids consumed must be a major priority of future complementary feeding interventions if they hope to demonstrate any effect on nutritional status. Improving the micronutrient content of weaning diets also remains a concern as intake of micronutrient-rich foods did not improve significantly as a result of the intervention. The added contribution of these nutrients to children's diets may be important for improved physical growth as well.

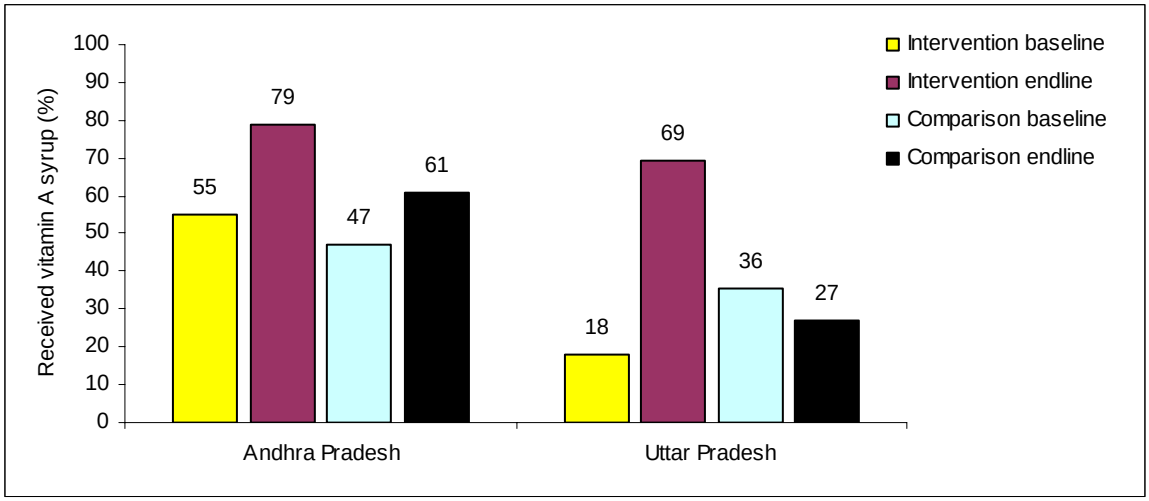
CHAPTER 7: MICRONUTRIENT SUPPLEMENTATION AMONG CHILDREN

Vitamin A supplementation

Micronutrient supplementation was evaluated among children 12-23 months of age at each survey round. Children should receive their first vitamin A dose at 9 months of age and subsequent doses at 6 month intervals thereafter. Receipt of at least one dose of vitamin A was compiled from both immunization cards (if available) and by mother's report.

The INHP II program was effective at increasing the vitamin A supplementation coverage in both states, but particularly in UP where coverage increased approximately four-fold to 69% in the intervention district relative to a slight decrease in the comparison district (Figure 7.1). In AP state, coverage was ~50% at baseline, and increased by approximately half in the intervention district to 79% at endline.

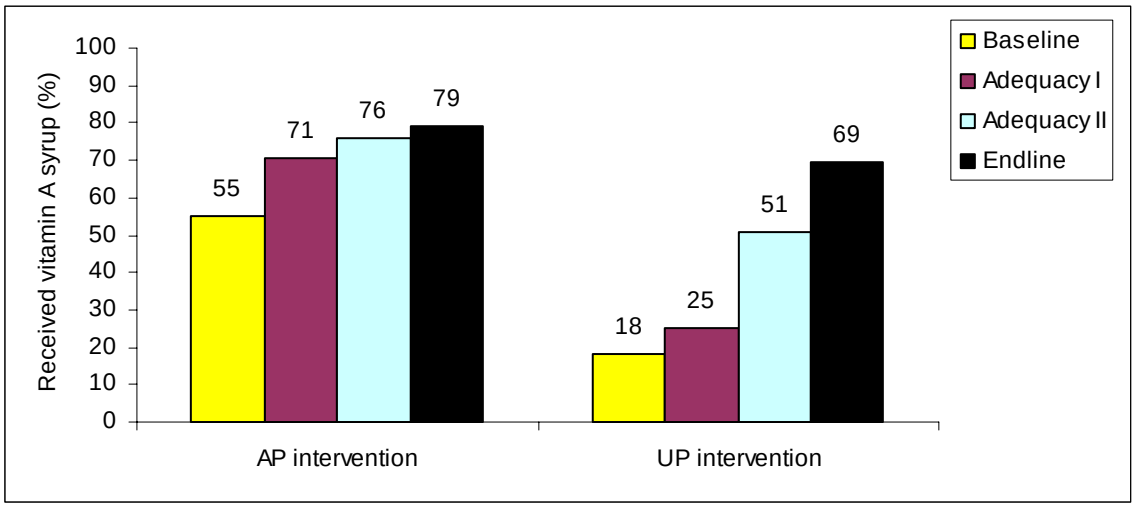
Figure 7.1. Vitamin A supplementation among children 12-23 months of age



*Difference of differences comparing change from baseline to endline in intervention and control districts was 60% in UP and 10% in AP, significant at $p<0.05$ for both states

The effect of the intervention on vitamin A supplementation coverage was fairly consistent across the 2-year intervention period in both states (Figure 7.2). In AP, the coverage increased most dramatically in the first year and then continued to increase more modestly in the second year of the evaluation period. In UP, where baseline coverage was only a third of AP, the initial increase in coverage was slow after the first year, but shot up thereafter, doubling between early and mid-2005, and then increasing by another 18 percentage points by early 2006. It appears that the post-MTR strategy was particularly beneficial for this component of ICDS services in the UP intervention district.

Figure 7.2. Vitamin A supplementation among children 12-23 months of age by survey round in Andhra Pradesh and Uttar Pradesh intervention districts

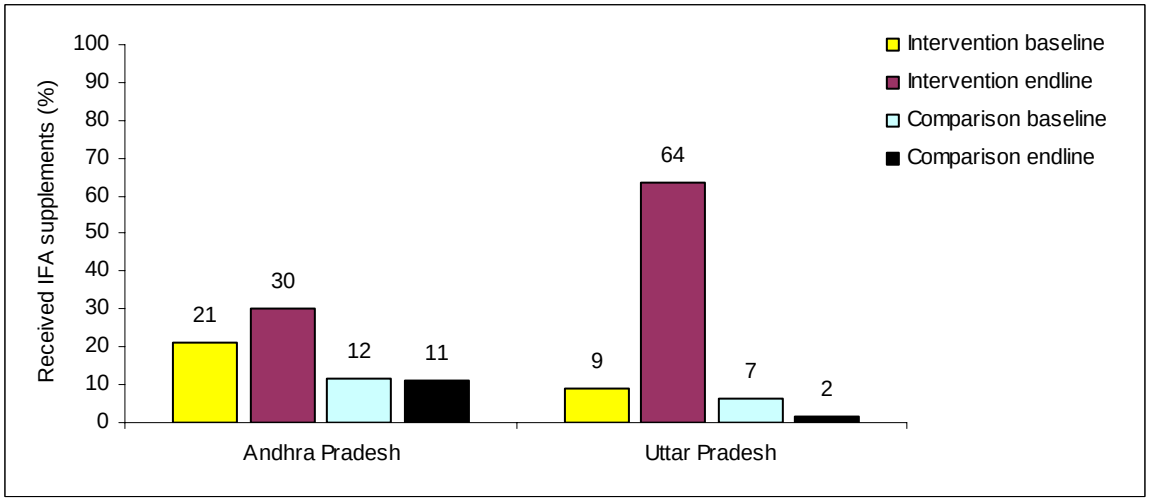


Pediatric iron supplementation

The GOI provides daily pediatric iron-folic acid (IFA) supplements for children beginning at 12 months up to 5 years of age. The pediatric IFA supplements provide a daily dose of 20 mg of iron and the program target is to provide all eligible children at least 100 tablets per year. These supplements are supposed to be distributed by the ANM and AWW in communities.

Coverage at baseline was very low and remained so in the comparison districts at endline in both states (Figure 7.3). As was observed with pediatric vitamin A supplementation, the intervention significantly increased the proportion of children who received IFA supplements in both states. However, the increase was dramatic in UP (a seven-fold increase) and more modest in AP.

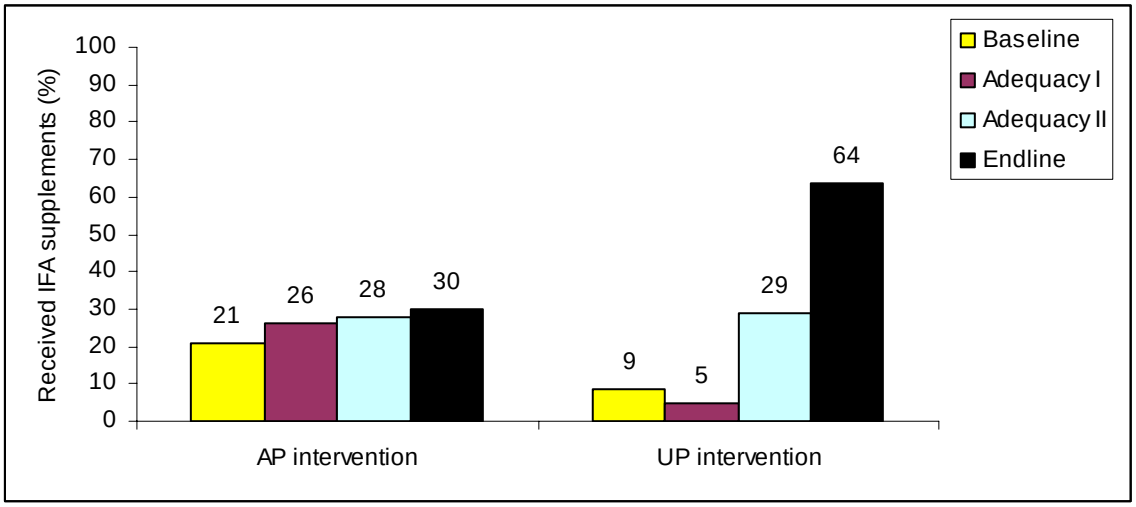
Figure 7.3. Pediatric iron-folic acid (IFA) supplementation among children 12-23 months of age



*Difference of differences comparing change from baseline to endline in intervention and control districts was 60% in UP and 10% in AP, significant at $p<0.05$ for both states

The pace of the intervention for increasing the coverage of pediatric IFA supplement distribution varied in the two states. In AP, the coverage increased very modestly across the entire evaluation period, increasing by ~50% from 21% at baseline in early 2004 to 30% at endline in early 2006 (Figure 7.4). The pace of implementation of this program component was quite different in UP state. The coverage remained very low at 5% at the Adequacy I survey after the first year of the evaluation period, but increased dramatically during the year 2005, increasing six-fold to 29% by the Adequacy II survey and more than doubling again to 64% by the endline survey in early 2006.

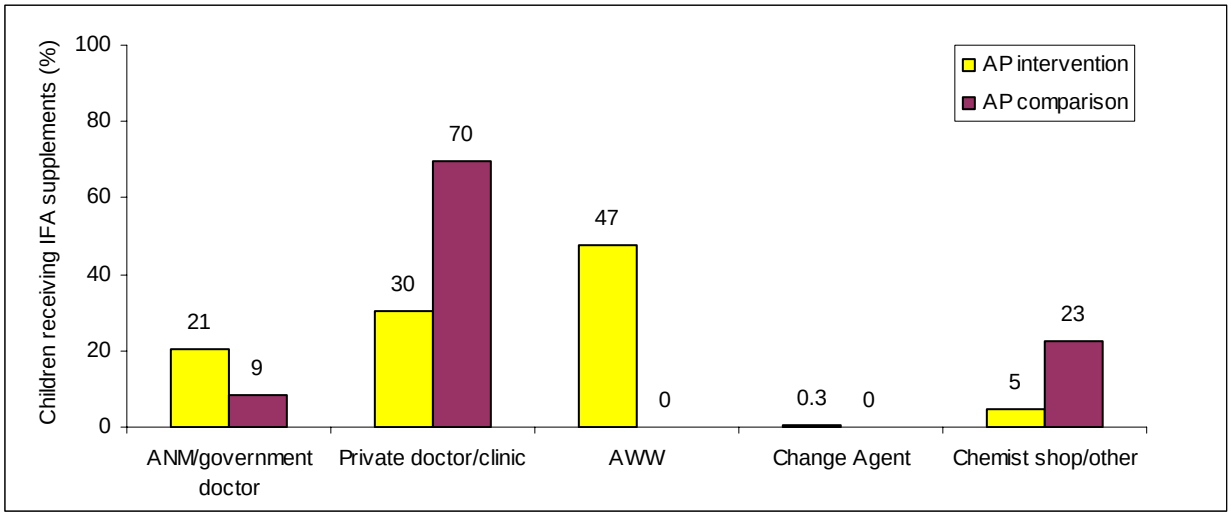
Figure 7.4. Pediatric iron-folic acid (IFA) supplementation among children 12-23 months of age by survey round in Andhra Pradesh and Uttar Pradesh intervention districts



Source of IFA supplements

Andhra Pradesh. Children in the intervention district were most likely to receive IFA supplements from the AWW, but the ANM and private doctors and clinics were also significant sources for these supplements (Figure 7.5). In the comparison district, over 90% of children given any IFA supplements received them from the private sector. It is not known whether the supplements sold by the private sector were comparable to the pediatric IFA supplements distributed by the government services. The difference in the pattern of service providers as a source for pediatric IFA supplements suggests that the INHP-II program was effective at stimulating the ANM and AWW to distribute the supplements to eligible children in accordance with GOI policy.

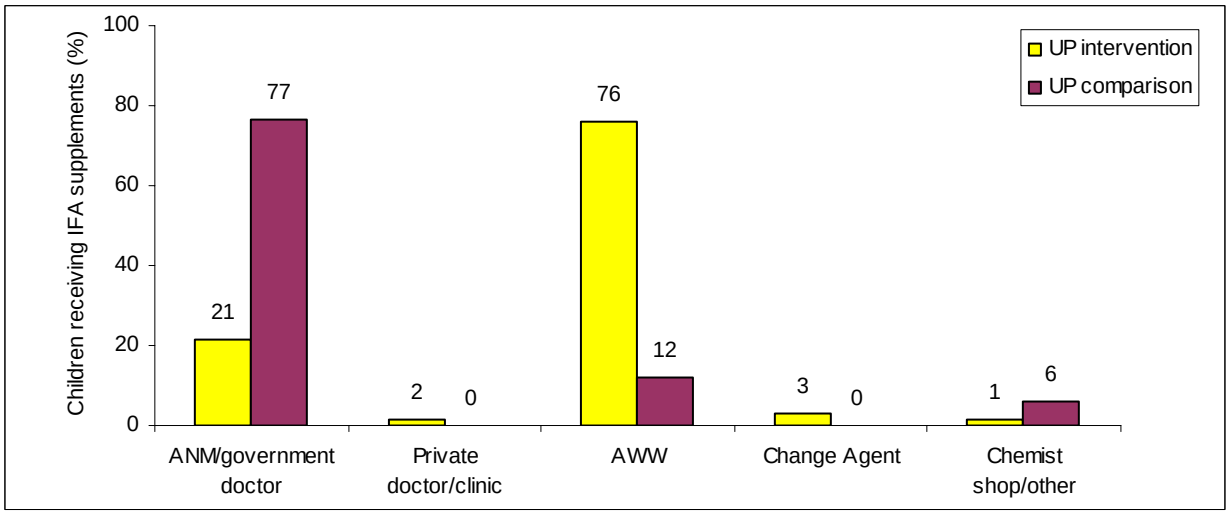
Figure 7.5. Iron-folic acid supplementation by type of service provider among children 12-23 months of age who received IFA supplements in Andhra Pradesh[1]



[1]Number of children who received pediatric IFA supplements, AP intervention: n=403, AP comparison: n=142.

Uttar Pradesh. The pattern of distribution source for pediatric IFA supplements in the intervention district was very distinct with three-quarters of children 12-23 months receiving their supplements from the AWW in their communities (Figure 7.6). Another 20% received supplements from the ANM. Efforts by CARE to train AWW in the community-based distribution of these supplements were clearly effective. Only 17 children (2% of all eligible children) in the comparison district received pediatric IFA supplements at endline, so it is not very meaningful to interpret the service provider distribution statistics in this case.

Figure 7.6. Iron-folic acid supplementation by type of service provider among children 12-23 months of age who received IFA supplements in Uttar Pradesh[1]



[1]Number of children who received pediatric IFA supplements, UP intervention: n=752, AP comparison: n=17.

Receipt and consumption of IFA supplements

Children in the intervention district in both states received a greater quantity of IFA supplements than those in the comparison district (Table 7.1). At least 30 supplements were received by 39%

and 68% of intervention district children who received any supplements in AP and UP states, respectively. In UP, at least 60 supplements were received by 28% of children who received any IFA supplements. Among mothers who reported their children 12-23 months had received any IFA supplements, large proportions in both AP districts (AP intervention = 29.8%, AP comparison=88.7%) could not estimate the number of supplements received. The reasons for this are unclear as a similar problem was not observed in the UP survey.

Table 7.1. Number of IFA supplements received by children 12-23 months of age at endline

Number of supplements	IFA supplements received (%)			
	Andhra Pradesh		Uttar Pradesh	
	Intervention	Comparison	Intervention	Comparison
<10	3.2	4.9	4.0	29.4
10-29	27.5	4.2	24.7	41.2
30-59	33.1	0.7	38.0	17.7
≥60	6.2	1.4	28.1	5.9
Don't know	29.8	88.7	4.8	5.9
Total # of children 12-23 mo who ever received IFA	403	142	748	17

The recommended dosage for pediatric IFA supplements is one supplement per day. Information was collected on the number of days IFA supplements were consumed. The extent of supplement intake was lower than the number of supplements received in all districts (Table 7.2). This could reflect incomplete compliance with IFA supplementation or the fact that many children received their supplements recently and still have a supply for consumption. Overall intake was quite low in the intervention district of both states. Pediatric IFA supplements were consumed for at least 30 days by 15% and 21% of children who received supplements in the intervention district of AP and UP, respectively. The low total amount of iron consumed most likely explains why there was little decrease in the prevalence of anemia as a result of the intervention despite the large increase in IFA supplement coverage, particularly in UP.

Table 7.2. Number of days IFA supplements consumed by children 12-23 months of age at endline

Number of days	IFA supplements consumed (%)			
	Andhra Pradesh		Uttar Pradesh	
	Intervention	Comparison	Intervention	Comparison
0	6.2	0.7	10.6	17.7
<10	23.1	4.2	34.4	41.2
10-29	25.4	2.1	25.1	23.6
≥30	14.7	0.7	20.9	11.8
Don't know	30.8	92.3	8.9	5.9
Total # of children 12-23 mo who ever received IFA	403	142	752	17

Mothers were asked whether their children 12-23 months were currently consuming pediatric IFA supplements at the time of the endline survey. Table 7.3 shows that approximately one-quarter of children receiving supplements in the AP intervention district and one half in the UP intervention district continue to consume IFA supplements. Whether these low levels of compliance are a result of inadequate supplies, poor distribution systems, or compliance issues is

unknown. To have a significant impact on the high prevalence of child anemia, further investigation of these aspects of the pediatric IFA supplementation program is needed.

Table 7.3. Current consumption of IFA supplements among children 12-23 months of age at endline

Number of days	IFA supplements currently consumed (%)			
	Andhra Pradesh		Uttar Pradesh	
	Intervention	Comparison	Intervention	Comparison
Yes	26.8	0.7	47.3	17.7
No	42.4	5.6	51.7	76.5
Don't know	30.8	93.7	0.9	5.9
Total # of children 12-23 mo who ever received IFA	403[a]	142 [a]	752[a]	17[a]

[a] Did not report current consumption of IFA supplements: AP (intervention)=31%, AP (comparison)=94%, UP (intervention)= 1%, UP (comparison)=6%.

Summary

CARE's INHP-II program was clearly effective at increasing coverage of both vitamin A and IFA supplementation distribution offered as part of the ICDS program. Distribution of vitamin A syrup to children starting at 9 months of age is coordinated with routine immunization activities and receipt is recorded on immunization cards given each child. Reflective of the coverage of immunization services in the 2 states, more than one half of children 12-23 months in the AP intervention district, but only one-fifth of children in the UP intervention district had received at least 1 dose of vitamin A syrup at baseline. The coverage increased significantly in both states over the 2-year evaluation period mirroring simultaneous improvements in immunization coverage as well. However, the increases in vitamin A supplementation in UP were particularly dramatic (a four-fold increase) and even exceeded the coverage of the immunization program to which it is linked.

The impact of the INHP-II intervention on pediatric IFA supplementation followed the same trends observed with vitamin A supplementation in the two states; the coverage increased more modestly in the AP intervention district and more dramatically in the UP intervention district. However, the delayed increase in implementation of this program component, particularly in UP state, helps to explain the small proportion of children who received and consumed more than a small number of supplements. In both states, only 15-20% of children receiving any IFA supplements consumed at least one month's supply. These details of program coverage help explain the lack of program impact on anemia among this target group (see chapter 7 results).

Discussions with CARE staff about implementation of INHP-II support activities for the pediatric IFA supplementation distribution help with interpretation of the observed changes in the program. In general, CARE reported that their initial efforts during the evaluation period were more focused on established ICDS program elements, such as utilization of antenatal care services, promotion of breastfeeding, and immunization. Within ICDS, the pediatric IFA supplementation component had received little attention as evidenced by the very low coverage reported at baseline in early 2004. CARE reported that pediatric IFA supplies were available generally, but there was a lack of knowledge among service providers in both the health system and ICDS about the appropriate distribution system and target groups for the supplements. Distribution of the supplements was meant to be coordinated between the ANM and AWW.

There were many anecdotal reports that service providers were aware of pediatric IFA distribution for older children (3-6 years) only.

In the UP intervention district, CARE initially focused on improving coverage by discussing the pediatric IFA supplementation distribution with local doctors, ANM, and ICDS supervisors. It was envisioned that supervisors would disseminate this information to AWW. One important area of clarification was that the program's target group included children starting at 1 year of age. After the terrible pediatric IFA supplement coverage reported from the Adequacy I survey in early 2005 and RACHNA's mid-term review (MTR), CARE shifted its strategy to a sector-strengthening approach where CARE's district team and local NGOs met with local service providers to deliver information on the supplement distribution program directly at monthly PHC and sector meetings. At the PHC meetings, ANM were encouraged to coordinate with the AWW in their assigned communities to distribute IFA supplements to children 12-23 months of age. At ICDS sector meetings, INHP-II staff worked with AWW to list out children eligible for pediatric IFA supplements and to brainstorm about strategies for encouraging consumption. Individual AWW progress with pediatric IFA supplementation was tracked at subsequent meetings to identify barriers to program implementation. These recent programmatic efforts resulted in dramatically increased coverage by early 2006.

In the AP intervention district, initial coverage of supplement distribution was not as low, but only modest progress was evident after one year into the evaluation period. The same post-MTR strategy shift described above for the UP intervention district took place in the AP intervention district as well in mid-2005. In September 2005, the District Medical Health Officer (DMHO) issued an order to all medical officers to review pediatric IFA and vitamin A distribution with ANM at monthly PHC meetings. Although some further progress in coverage was observed in the endline data, the overall coverage remained low overall, reaching less than one-third of eligible children in the district.

The INHP-II intervention made appreciable progress in focusing attention and encouraging action on the pediatric IFA supplementation distribution, particularly during the last year of the evaluation period. However, the data presented in this report indicate that further efforts are required to ensure that more children receive and consume daily IFA supplements starting at 12 months of age in an effort to lower the very high prevalence of anemia among young children.

CHAPTER 8: CHILD NUTRITIONAL STATUS AND ANEMIA

Child Nutritional Status

Children 0-23 months of age were weighed and their height measured as length lying down at the time of the survey interview at baseline and endline. Child nutritional status was characterized using three indices: weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ). Weight-for-age is a composite measure of acute and chronic malnutrition, and reflects the extent to which a child is underweight. The height-for-age index is a measure of stunting, also reflecting chronic malnutrition, while the weight-for-height index reflects wasting as a measure of acute malnutrition. The 3 nutritional status indices are expressed as Z-scores relative to the median of a standard reference population (WHO, 1979) reflecting normal size at a given age. Children whose heights and weights were more than 2 standard deviations from the median reference population are considered to be undernourished. Those who were more than 3 standard deviations from the reference population are considered to be severely undernourished. All values outside the range -5 to 5 standard deviations of each z-score were excluded from these analyses.

Underweight

Andhra Pradesh. The mean WAZ, and the proportion of underweight and severe underweight among all children did not change significantly in the intervention relative to the comparison district (Tables 8.1-8.3). There were no significant differences by child sex also, although there was a worsening trend observed among boys, but not girls. The strong trend of underweight prevalence increasing dramatically with age remained at endline, but there were no differences between districts. However, severe underweight among children 6-17 months and mean WAZ among children 12-17 months were significantly worse in the intervention compared to the comparison district. Nevertheless, this age-specific trend did not carry through to the oldest age group of children 18-23 months where mean WAZ and underweight prevalence were unchanged between baseline and endline in the intervention district and slightly worse in the comparison district.

Table 8.1. Mean weight-for-age Z-score (WAZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	Mean WAZ						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	-1.20	-1.34	-0.14	-1.25	-1.31	-0.06	-0.08
Sex							
All boys	-1.27	-1.42	-0.15	-1.31	-1.34	-0.03	-0.12
All girls	-1.13	-1.26	-0.13	-1.20	-1.27	-0.07	-0.06
Age groups							
0-5 months	-0.28	-0.43	-0.15	-0.16	-0.18	-0.02	-0.13
6-11 months	-1.14	-1.15	-0.01	-1.14	-1.22	-0.08	0.07
12-17 months	-1.66	-1.82	-0.16	-1.88	-1.85	0.03	-0.19*
18-23 months	-1.87	-1.82	0.05	-1.92	-1.96	-0.04	0.09
Total # of children	2232	2556		2280	2633		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.2. Underweight (<-2SD WAZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	WAZ <-2SD (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	25.7	29.2	3.5	28.5	30.0	1.5	2.0
Sex							
All boys	27.5	32.6	5.1	31.0	31.6	0.6	4.5
All girls	23.9	25.6	1.7	25.8	28.4	2.6	-0.9
Age groups							
0-5 months	4.1	7.2	3.1	4.0	4.9	0.9	2.2
6-11 months	21.5	20.0	-1.5	21.3	20.4	-0.9	-0.6
12-17 months	37	42.1	5.1	44.3	45.7	1.4	3.7
18-23 months	44.7	43.5	-1.2	47.3	50.6	2.8	4.0
Total # of children	2232	2556		2280	2633		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

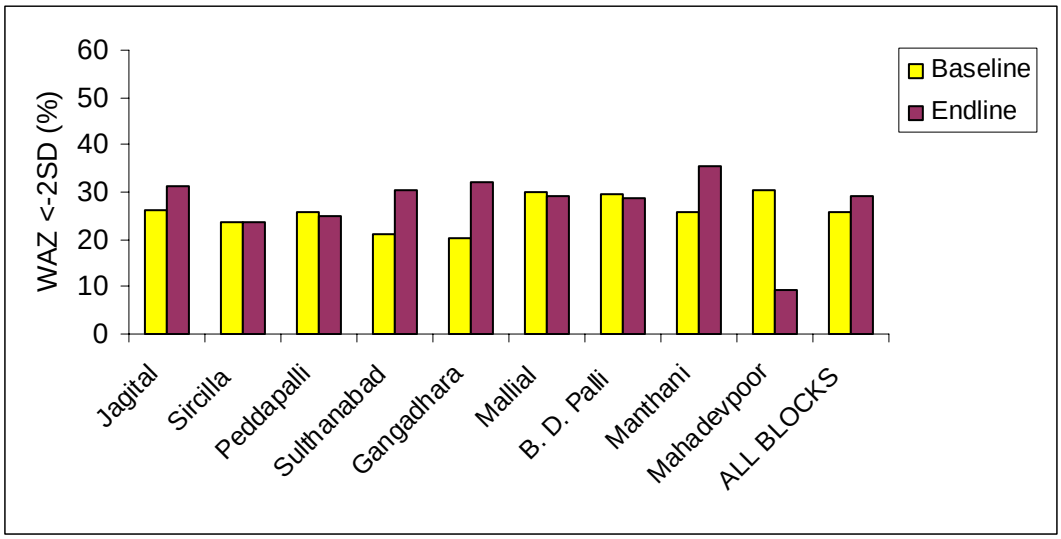
Table 8.3: Severe underweight (<-3SD WAZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	WAZ <-3SD						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	4.4	6.5	2.1	5.5	6.6	1.1	1
Sex							
All boys	5.2	7.8	2.6	5.9	6.9	1	1.6
All girls	3.4	5.2	1.8	5.1	6.3	1.2	0.6
Age groups							
0-5 months	1.2	1.1	-0.1	0.7	1.6	0.9	-1
6-11 months	2.3	5.7	3.4	3.2	3.6	-0.4	4*
12-17 months	6.4	10.2	3.8	10.7	9.8	-0.9	4.7*
18-23 months	8.6	8.1	-0.5	7.9	11.9	4	-4.5
Total # of children	2232	2556		2280	2633		

*Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Although there was a small, non-significant increase in underweight prevalence overall in the AP intervention district, a disaggregation of the baseline and endline data by geographical block reveals considerable heterogeneity. Four blocks had an increased prevalence, four were essentially unchanged, and one had a dramatically decreased prevalence. Clearly, the decrease in Mahadevpoor served to somewhat offset the large increases in underweight prevalence in Sulthanabad, Gangadhara, and Manthani Blocks. The reasons for this variability in findings by geographical area are unknown, but it could be that the samples in the poorest performing blocks had more boys or children 12-17 months of age at endline, i.e. groups that tended to be more underweight. Alternatively, local disease outbreaks, food shortages, or specific local socio-political events that were not documented in the evaluation surveys may have contributed to this variability.

Figure 8.1. Underweight (<-2 SD WAZ) among children 0-23 months by geographical block in Andhra Pradesh intervention district (Karimnagar)



Uttar Pradesh. As in AP district, there was no significant change in the proportion of underweight and severe underweight among all children in the intervention relative to the comparison district (Tables 8.4-8.6). However, underweight and mean WAZ were significantly worse among girls, but not boys. Underweight prevalence among children <1 year of age did not differ between districts, but was worse among children 12-23 months. The mean WAZ among children 12-23 months dropped significantly in the intervention district.

Table 8.4. Mean weight-for-age Z-score (WAZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	Mean WAZ						
	Intervention (Barabanki)			Comparison (Unnao)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
All children	-1.49	-1.58	-0.09	-1.49	-1.57	-0.08	-0.01
Sex							
All boys	-1.54	-1.53	0.01	-1.49	-1.62	-0.13	0.14
All girls	-1.44	-1.63	-0.19	-1.49	-1.51	-0.02	-0.17*
Age groups							
0-5 months	-0.54	-0.57	-0.03	-0.57	-0.73	-0.16	0.13
6-11 months	-1.56	-1.60	-0.04	-1.53	-1.63	-0.1	0.06
12-17 months	-2.00	-2.20	-0.2	-2.09	-2.10	-0.01	-0.19 *
18-23 months	-2.08	-2.18	-0.1	-2.13	-1.96	0.17	-0.27 *
Total # of children	1738	2137		2067	2059		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.5. Underweight (<-2SD WAZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	WAZ <-2SD (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	36.0	41.0	5.0	35.8	38.4	2.6	2.4
Sex							
All boys	37.8	39.7	1.9	35.1	39.1	4	-2.1
All girls	34.1	42.3	8.2	36.5	37.6	1.1	7.1 *
Age groups							
0-5 months	10.1	12.0	1.9	10.5	14.3	3.8	-1.9
6-11 months	34.1	36.4	2.3	31.2	35.4	4.2	-1.9
12-17 months	51.7	60.9	9.2	53.5	55.7	2.2	7.0
18-23 months	54.5	60.0	5.5	58.7	53.3	-5.4	10.9 *
Total # of children	1738	2124		2067	2039		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

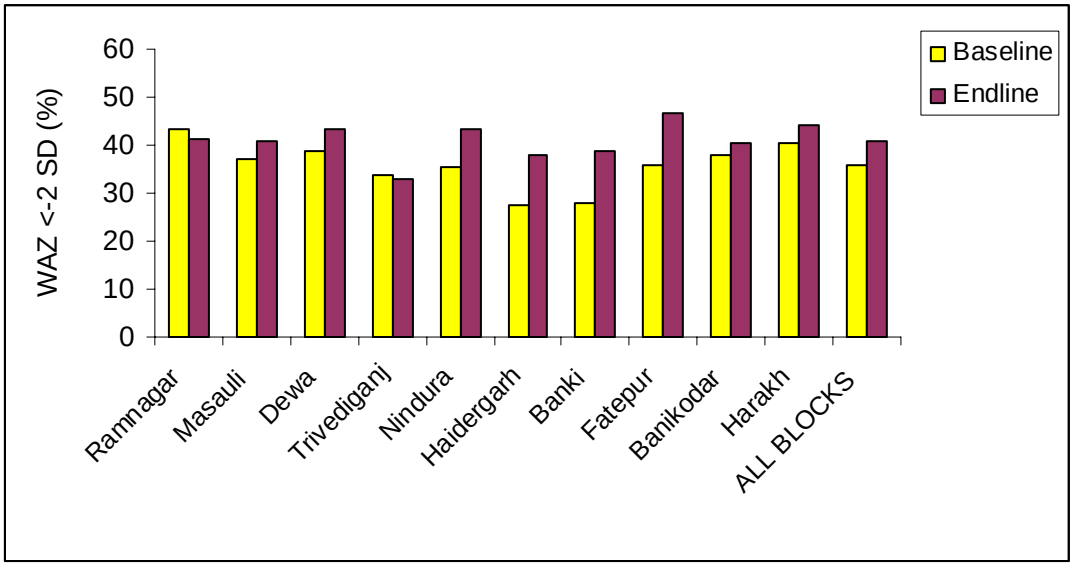
Table 8.6. Severe underweight (<-3SD WAZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	WAZ <-3SD (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	9.2	12.4	3.2	8.0	12.5	4.5	-1.3
Sex							
All boys	9.9	13.0	3.1	7.5	13.9	6.4	-3.3
All girls	8.3	11.8	3.5	8.5	10.9	2.4	1.1
Age groups							
0-5 months	0.6	2.9	2.3	1.6	3.8	2.2	0.1
6-11 months	7.7	10.5	2.8	6.3	11.9	5.6	-2.8
12-17 months	17.1	19.4	2.3	13.9	18.5	4.6	-2.3
18-23 months	12.1	18.6	6.5	12.7	17.3	4.6	1.9
Total # of children	1738	2124		2067	2039		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Disaggregation of the underweight data by geographic block in the UP intervention district revealed that the small increase in overall prevalence from baseline to endline matched the trend observed in 8 of the 10 blocks. In fact, 4 of those 8 blocks had increases in underweight prevalence that exceeded the increase reported for the entire district. The other 2 blocks, Ramnagar and Trivediganj, reported very small decreases in underweight prevalence. Therefore, the aggregated data reported above appears to reflect the general trend in underweight across the 10 blocks surveyed in the district.

Figure 8.2. Underweight (<-2 SD WAZ) among children 0-23 months by geographical block in Uttar Pradesh intervention district (Barabanki)



Stunting

Andhra Pradesh. The prevalence of stunting and severe stunting among all children and stratified by age did not vary from baseline to endline between the 2 districts (Tables 8.8-8.9). However, intervention effects differed by sex with significantly increased stunting among boys, but not girls. The mean HAZ was significantly worse overall and among children 12-17 months in the intervention relative to the control district (Table 8.7).

Table 8.7. Mean height-for-age Z-score (HAZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	Mean HAZ						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	-1.04	-1.17	-0.13	-1.13	-1.12	0.01	-0.14*
Sex							
All boys	-1.07	-1.20	-0.13	-1.19	-1.16	0.03	-0.16*
All girls	-1.00	-1.13	-0.13	-1.07	-1.08	-0.01	-0.12
Age groups							
0-5 months	-0.36	-0.58	-0.22	-0.25	-0.33	-0.08	-0.14
6-11 months	-0.90	-0.90	0	-0.93	-0.94	-0.01	0.01
12-17 months	-1.32	-1.42	-0.10	-1.58	-1.44	0.14	-0.24*
18-23 months	-1.73	-1.68	0.05	-1.88	-1.84	0.04	0.01
Total # of children	2192	2513		2267	2605		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.8. Stunting (<-2SD HAZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	HAZ <-2SD (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	22.8	23.3	0.5	25.8	23.2	-2.4	2.9
Sex							
All boys	22.9	25.0	2.1	27.4	24.8	-2.6	4.7
All girls	22.7	21.5	-1.2	24.2	21.5	-2.7	1.5
Age groups							
0-5 months	9.7	12.8	3.1	9.3	8.1	-1.2	4.3
6-11 months	20.1	13.4	-6.7	18.4	14.6	-3.8	-2.9
12-17 months	27.2	29.8	2.6	35.3	32.1	-3.2	5.8
18-23 months	38.1	35.7	-2.4	43.7	40.4	-3.3	0.9
Total # of children	2192	2513		2267	2605		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.9. Severe stunting (<-3SD HAZ) among children 0-23 months by sex and age in Andhra Pradesh

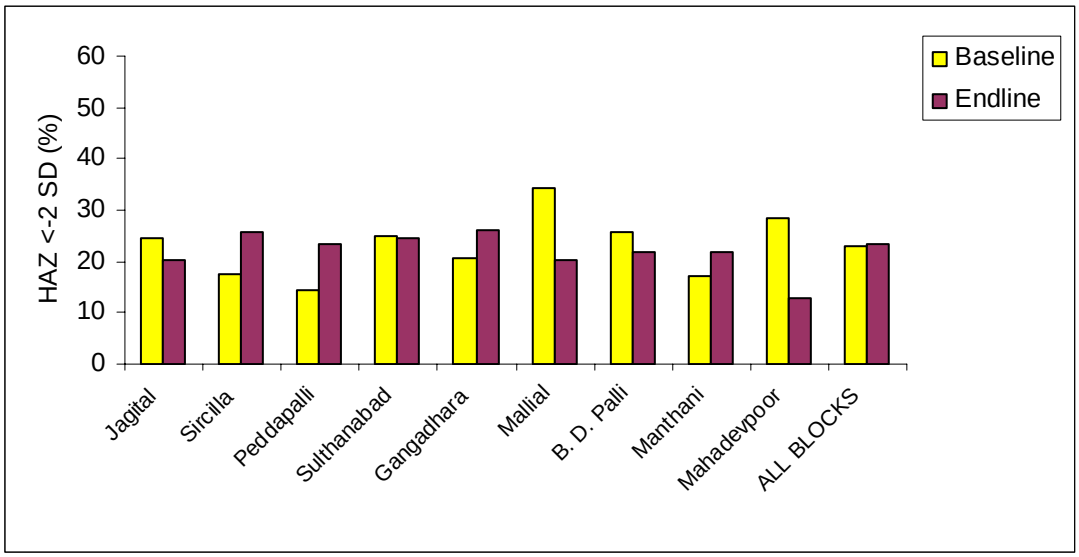
Proportion	HAZ <-3 SD (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	6.6	7.0	0.4	7.5	6.2	-1.3	1.7
Sex							
All boys	7.4	7.7	0.3	7.7	6.7	-1	1.3
All girls	5.7	6.2	0.5	7.2	5.6	-1.6	2.1
Age groups							
0-5 months	3.1	3.6	0.5	3.3	2.3	-1	1.5
6-11 months	4	4.1	0.1	2.7	2.3	-0.4	0.5
12-17 months	7.5	7.6	0.1	11.2	7.4	-3.8	3.9
18-23 months	13.7	12.1	-1.6	14.1	14.5	0.4	-2
Total # of children	2192	2513		2267	2605		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Disaggregation of the AP intervention district stunting data revealed a considerable amount of heterogeneity in the prevalence by geographical block (Figure 8.3). The overall prevalence of stunting was essentially unchanged from baseline to endline, but only one of the 9 blocks, Sulthanabad, followed that same pattern. Stunting prevalence increased in 4 blocks and decreased in another 4 blocks. In 2 of the 4 blocks with a decreasing trend, Mallial and Mahadevpoor, stunting prevalence decreased by approximately half. Sircilla and Peddapalli had

the largest increases in stunting. Mahadevpoor block was the same block where underweight prevalence decreased significantly. The same possible reasons for the heterogeneity of underweight prevalence may also explain the variation in stunting observed in the AP intervention district.

Figure 8.3. Stunting (<-2 SD HAZ) among children 0-23 months by geographical block in Andhra Pradesh intervention district (Karimnagar)



Uttar Pradesh. Stunting and severe stunting prevalence did not differ overall or by sex between the districts (Tables 8.11-8.12). The only age-specific differences were among children 18-23 months where stunting prevalence was unchanged in the intervention district, but was reduced significantly in the comparison district. Mean HAZ followed this same trend among children in the second year of life (Table 8.10). Mean HAZ was significantly worse among girls only in the comparison relative to the comparison district.

Table 8.10. Mean height-for-age Z-score (HAZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	Mean HAZ						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	-1.75	-1.74	0.01	-1.71	-1.65	0.06	-0.05
Sex							
All boys	-1.83	-1.72	0.11	-1.72	-1.70	0.02	0.09
All girls	-1.66	-1.76	-0.1	-1.69	-1.60	0.09	-0.19 *
Age groups							
0-5 months	-0.74	-0.76	-0.02	-0.71	-0.74	-0.03	0.01
6-11 months	-1.68	-1.62	0.06	-1.60	-1.46	0.14	-0.08
12-17 months	-2.30	-2.30	0	-2.28	-2.13	0.15	-0.15
18-23 months	-2.58	-2.55	0.03	-2.71	-2.51	0.2	-0.17
Total # of children	1603	2056		2030	1957		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.11. Stunting (<-2SD HAZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	HAZ <-2SD (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	43.4	43.9	0.5	43.6	42.5	-1.1	1.6
Sex							
All boys	45.0	43.1	-1.9	45.3	43.9	-1.4	-0.5
All girls	41.5	44.7	3.2	41.9	41.0	-0.9	4.1
Age groups							
0-5 months	12.7	16.2	3.5	13.6	18.9	5.3	-1.8
6-11 months	39.5	35.4	-4.1	34.6	33.5	-1.1	-3.0
12-17 months	59.8	60.8	1.0	62.0	55.8	-6.2	7.2
18-23 months	70.9	70.5	-0.4	79.4	68.3	-11.1	10.7 *
Total # of children	1603	2056		2030	1957		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.12. Severe stunting (<-3SD HAZ) among children 0-23 months by sex and age in Uttar Pradesh

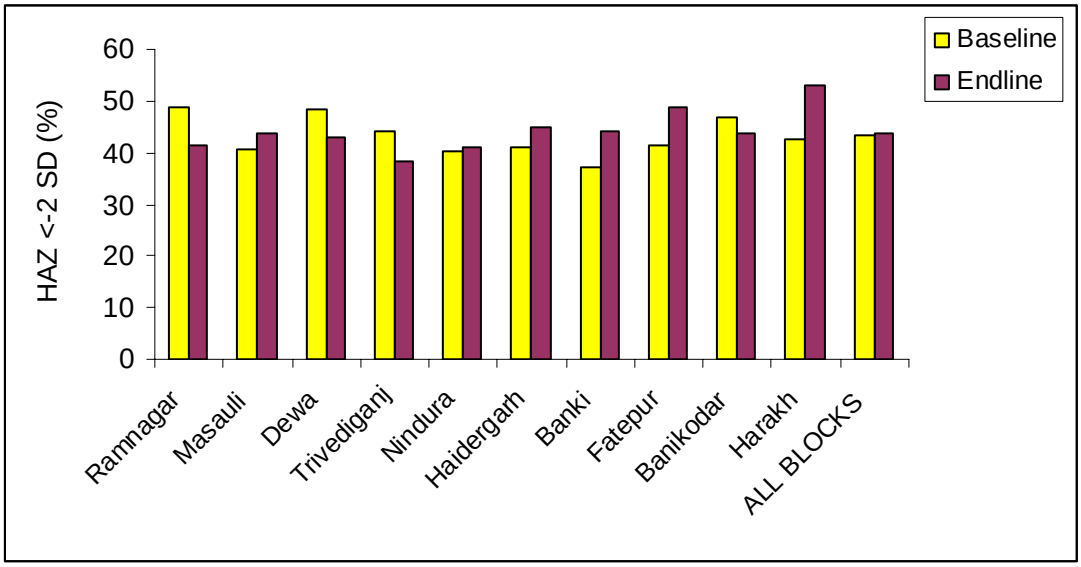
Proportion	HAZ <-3SD						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	19.0	19.1	0.1	17.6	19.2	1.6	-1.5
Sex							
All boys	20.0	19.7	-0.3	17.9	21.1	3.2	-3.5
All girls	18.0	18.4	0.4	17.3	17.0	-0.3	0.7
Age groups							
0-5 months	3.9	5.1	1.2	3.0	7.6	4.6	-3.4
6-11 months	13.1	13.7	0.6	11.3	12.9	1.6	-1.0
12-17 months	28.1	27.0	-1.1	25.1	24.6	-0.5	-0.6
18-23 months	36.5	34.6	-1.9	39.2	35.4	-3.8	1.9
Total # of children	1603	2056		2030	1957		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Although the overall prevalence of stunting in the UP intervention district was unchanged from baseline to endline, changes in prevalence at the block level did not match this trend. Stunting prevalence decreased modestly in 4 blocks and increased in another 6 blocks (Figure 8.4). The largest increases in stunting were observed in Banki, Fatepur, and Harakh blocks. Banki and Fatepur blocks also reported large increases in underweight prevalence from baseline to endline. It is not known what trends in the data or events may have contributed to these local increases.

The mean HAZ score was significantly lower among girls and the prevalence of stunting increased among children <6 months in the intervention district, so larger proportions of either of these sub-groups in a block level sample could have contributed to the observed results.

Figure 8.4. Stunting (<-2 SD HAZ) among children 0-23 months by geographical block in Uttar Pradesh intervention district (Barabanki)



Wasting

Andhra Pradesh. Wasting prevalence overall and by sex increased by a similar magnitude from baseline to endline in the intervention and comparison districts. This trend was observed among children of all ages except 0-5 months where wasting prevalence doubled in the intervention district relative to a ~50% decrease in the comparison district. Boys were more likely to be wasted than girls in the sample. By contrast, severe wasting was significantly worse among all children, boys, and children 6-17 months in the intervention relative to the control district. Mean WHZ did not differ between districts.

Table 8.13. Mean weight-for-height Z-score (WHZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	Mean WHZ						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	-0.70	-0.78	-0.08	-0.72	-0.79	-0.07	-0.01
Sex							
All boys	-0.78	-0.86	-0.08	-0.77	-0.81	-0.04	-0.04
All girls	-0.62	-0.69	-0.07	-0.68	-0.78	-0.10	0.03
Age groups							
0-5 months	-0.08	-0.08	0	-0.03	-0.05	-0.02	0.02
6-11 months	-0.53	-0.58	-0.05	-0.53	-0.62	-0.09	0.04
12-17 months	-1.04	-1.13	-0.09	-1.15	-1.20	-0.05	-0.04
18-23 months	-1.29	-1.17	0.12	-1.25	-1.30	-0.05	0.17
Total # of children	2160	2498		2245	2584		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.14. Wasting (<-2SD WHZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	WHZ <-2SD (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	12.1	16.0	4.1	10.9	13.1	2.2	1.9
Sex							
All boys	13.3	17.3	4.0	12.5	13.7	1.2	2.8
All girls	10.8	14.6	3.8	9.3	12.6	3.3	0.5
Age groups							
0-5 months	3.8	8.5	4.7	3.5	2.2	-1.3	6.0*
6-11 months	8.8	11.4	2.6	6.5	8.2	1.7	0.9
12-17 months	16.8	19.1	2.3	15.7	19.1	3.4	-1.1
18-23 months	20.8	23.4	2.6	19.6	23.9	4.3	-1.7
Total # of children	2160	2498		2245	2584		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

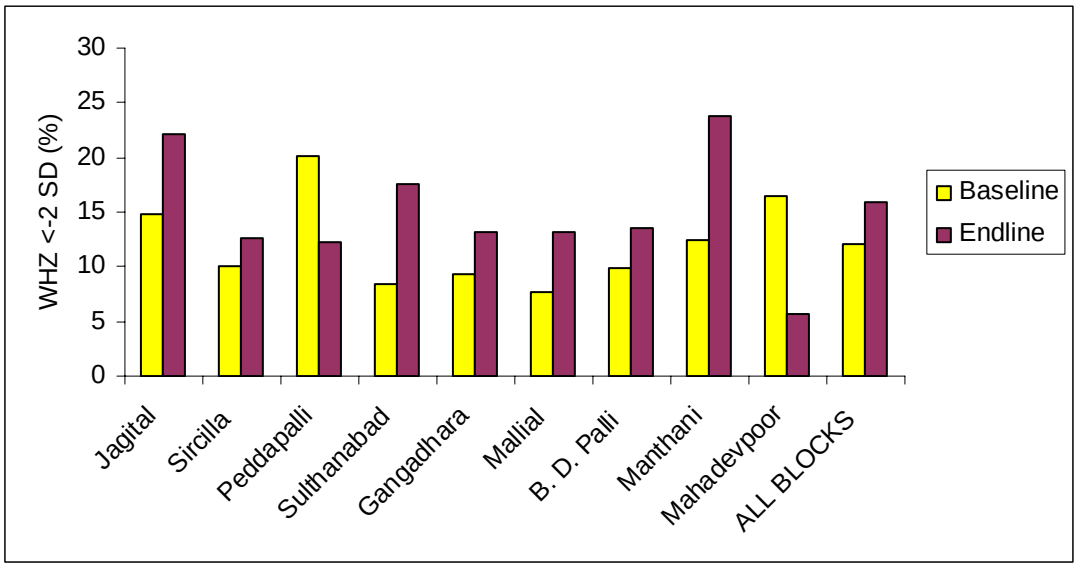
Table 8.15. Severe wasting (<-3SD WHZ) among children 0-23 months by sex and age in Andhra Pradesh

Proportion	WHZ <-3SD (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	2.1	3.0	0.9	2.1	1.7	-0.4	1.3*
Sex							
All boys	2.2	3.5	1.3	2.1	1.9	-0.2	1.5
All girls	1.9	2.4	0.5	2	1.6	-0.4	0.9
Age groups							
0-5 months	1.6	2.5	0.9	0.6	1.0	0.4	0.5
6-11 months	1.2	3.0	1.8	1.9	1.2	-0.7	2.5*
12-17 months	2.1	3.4	1.3	3.4	2.4	-1.0	2.3
18-23 months	3.9	2.8	-0.9	2.3	2.4	0.1	-1.0
Total # of children	2160	2498		2245	2584		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

The disaggregated wasting data from the AP intervention district were more homogenous than was seen with underweight and stunting prevalence in the same blocks. The overall prevalence of wasting increased by ~30% (4 percentage points) from baseline to endline, and 7 of 9 blocks followed this same pattern (Figure 8.5). Wasting prevalence increased most dramatically (by ~50%) in Sulthanabad and Manthani blocks. However, 2 blocks, Peddapalli and Mahadevpoor, went against the dominant trend with very large decreases in prevalence at endline. The latter block was the only one in the AP intervention district to report decreases in all 3 child malnutrition indicators.

Figure 8.5. Wasting (<-2 SD WHZ) among children 0-23 months by geographical block in Andhra Pradesh intervention district (Karimnagar)



Uttar Pradesh. As in AP districts, the prevalence of wasting and severe wasting increased from baseline to endline in both districts (Tables 8.17-8.18). However, the increase among all children and by sex was significantly greater in the comparison relative to the intervention district. This same trend was observed for all ages except children 17-23 months. Mean WHZ did not differ significantly between districts (Table 8.16).

Table 8.16. Mean weight-for-height Z-score (WHZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	Mean WHZ						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
All children	-0.43	-0.55	-0.12	-0.51	-0.63	-0.12	0
Sex							
All boys	-0.46	-0.55	-0.09	-0.52	-0.68	-0.16	0.07
All girls	-0.40	-0.56	-0.16	-0.51	-0.58	-0.07	-0.09
Age groups							
0-5 months	0.04	-0.06	-0.1	-0.10	-0.37	-0.27	0.17
6-11 months	-0.31	-0.37	-0.06	-0.37	-0.56	-0.19	0.13
12-17 months	-0.69	-0.88	-0.19	-0.85	-0.86	-0.01	-0.18
18-23 months	-0.92	-0.94	-0.02	-0.89	-0.72	0.17	-0.19
Total # of children	1581	2042		1983	1931		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table 8.17. Wasting (<-2SD WHZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	WHZ <-2SD (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
All children	4.9	8.5	3.6	6.7	13.8	7.1	-3.5*
Sex							
All boys	5.4	8.4	3.0	7.1	14.3	7.2	-4.2*
All girls	4.5	8.5	4.0	6.3	13.3	7.0	-3.0
Age groups							
0-5 months	2.0	3.9	1.9	3.0	9.8	6.8	-4.9*
6-11 months	4.6	4.6	0	4.8	10.9	6.1	-6.1*
12-17 months	6.5	10.4	3.9	9.6	17.9	8.3	-4.4
18-23 months	7.5	16.0	8.5	11.1	16.5	5.4	3.1
Total # of children	1581	2042		1983	1931		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

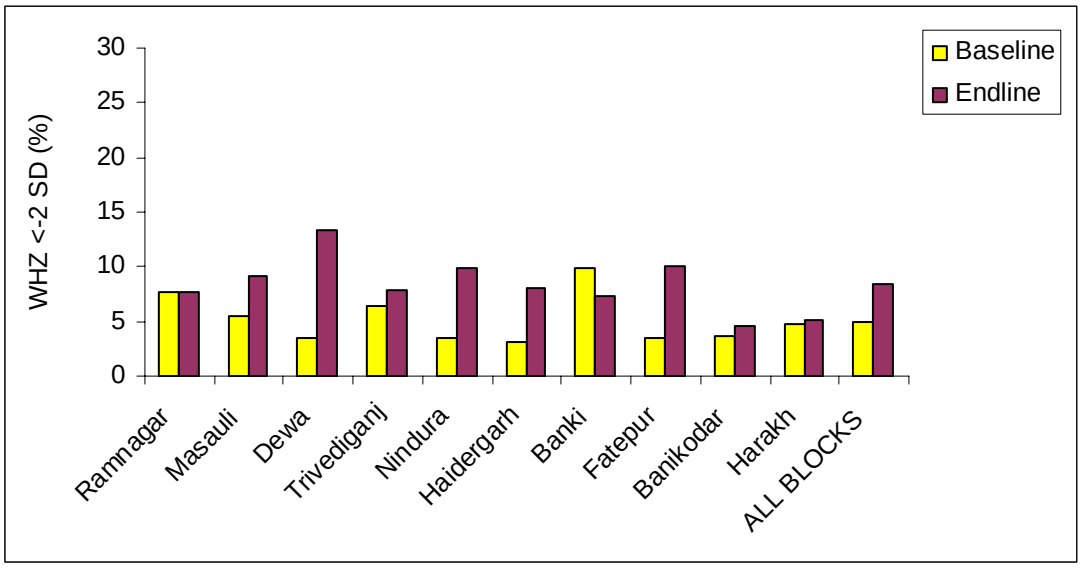
Table 8.18. Severe wasting (<-3SD WHZ) among children 0-23 months by sex and age in Uttar Pradesh

Proportion	WHZ <-3SD (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
All children	0.6	1.2	0.6	1.2	4.3	3.1	-2.5*
Sex							
All boys	0.6	1.5	0.9	1.2	4.1	2.9	-2.0*
All girls	0.7	0.8	0.1	1.1	4.6	3.5	-3.4*
Age groups							
0-5 months	0.7	1.4	0.7	1.0	4.7	3.7	-3.0*
6-11 months	1.3	0.7	-0.6	1.0	4.2	3.2	-3.8*
12-17 months	0.4	1.0	0.6	1.2	4.3	3.1	-2.5*
18-23 months	0	1.7	1.7	1.5	3.9	2.4	-0.7
Total # of children	1581	2042		1983	1931		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Wasting prevalence in 8 of 10 blocks in the UP intervention district followed the overall trend of increasing from baseline to endline. Dewa and Fatepur blocks reported the largest increases. In one block (Ramnagar), the prevalence remained unchanged, while it decreased modestly in another (Banki). Nonetheless, the trend in the disaggregated data indicates that it is represented quite well by the summary measure among all blocks.

Figure 8.6. Wasting (<-2 SD WHZ) among children 0-23 months by geographical block in Uttar Pradesh intervention district (Barabanki)



Anemia

Anemia is defined as a low hemoglobin concentration in blood. The most common cause of anemia is iron deficiency, although other micronutrient deficiencies and infections such as malaria also contribute to the problem. Infants are born with iron stores, but they are depleted by rapid growth in the first few months of life and the hematological changes that accompany the transition to the extrauterine environment. Breast milk provides sufficient iron during the first 6 months of life, but additional iron is required from 6-24 months of age to prevent the development of iron deficiency anemia. Iron deficiency anemia during the first 2 years of life leads to deficits in cognitive and motor development. Additional iron can be obtained from iron-fortified complementary foods or iron supplements. The Government of India policy is that all children 12 months of age and older should receive daily pediatric iron supplements. Anemia among children <2 years is defined as hemoglobin concentration < 11 g/dL. Mild, moderate and severe anemia are defined as 10.0-10.9, 7.0-9.9, and <7.0 g/dL, respectively.

Hemoglobin concentration was assessed in all children 12-23 months of age from a single drop of blood collected by fingerstick and assessed on site using the Hemocue method. Mothers were informed of their child's hemoglobin measurement, and in the case of severe anemia, were referred to the local health center.

Andhra Pradesh. Anemia prevalence among children 12-23 months dropped slightly from baseline to endline, but remained at ~85% in both districts (Table 8.19). Mean hemoglobin increased and the severity of anemia was reduced at endline, but the changes were comparable in the two districts.

Table 8.19. Anemia among children 12-23 months of age in Andhra Pradesh

Proportion	Child anemia (%), mean hemoglobin						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any anemia (Hb<11 g/dL)	88.0	85.8	-2.2	92.3	86.6	-5.7	3.5
Moderate-severe anemia (Hb<10 g/dL)	68.2	61.6	-6.6	73.4	63.3	-10.1	3.5
Severe anemia (Hb<7 g/dL)	7.1	3.7	-3.4	8.9	5.6	-3.3	-0.1
Mean Hemoglobin (g/dL)	9.21	9.51	0.30	9.00	9.43	0.43	-0.13
Total # of children	996	1288		1052	1171		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Uttar Pradesh. Anemia prevalence among children 12-23 months was significantly reduced in the intervention relative to the comparison district due to increased prevalence at endline in the latter area. However, child anemia prevalence remained alarmingly high at 87% overall. In contrast to AP districts, the severity of anemia increased and mean hemoglobin concentration decreased approximately equally in both UP districts.

Table 8.20. Anemia among children 12-23 months of age in Uttar Pradesh

Proportion	Child anemia (%), mean hemoglobin						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any anemia (Hb<11 g/dL)	88.6	86.7	-1.9	83.1	87.4	4.3	-6.2 *
Moderate-severe anemia (Hb<10 g/dL)	65.5	67.1	1.6	53.1	58.3	5.2	-3.6
Severe anemia (Hb<7 g/dL)	4.0	8.3	4.3	3.6	5.5	1.9	2.4
Mean Hemoglobin (g/dL)	9.30	9.12	-0.18	9.74	9.39	-0.35	0.17
Total # of children	699	867		755	867		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Summary

Child nutritional status

The lack of a positive intervention effect on malnutrition is not entirely surprising in light of the changes observed in infant and child feeding practices in both states. In AP, cereal intake was somewhat prevalent, but increases in the intervention district were matched or exceeded in the

comparison district. Indicators of the quantity and frequency of dietary intake also increased by similar proportions in both AP districts. Intake of legumes, fruits, and vegetables remained low or decreased over the intervention period and dietary diversity was poor, suggesting that children's diets contained inadequate amounts of micronutrients that might inhibit growth. However, these trends in feeding practices in AP do not explain the decline in the mean HAZ score and severe wasting overall or the increased stunting among boys in the intervention relative to the comparison district. Multivariate adjustment for a variety of sociodemographic characteristics did not alter the results significantly. It is possible that atypical local events such as disease outbreaks may have occurred in the program district during the intervention period that may have adversely affected children's nutritional status.

In UP, intervention effects on many complementary feeding practices were evident from the endline data, including significantly increased intake of cereals and legumes, and increased quantity, frequency, and diversity of dietary intake. However, fruit and vegetable intake did not improve, and the prevalence of complementary feeding indicators remained quite low in absolute terms, particularly for intake of solids in the past 24 hours and quantity and frequency of dietary intake. The demonstrated improvements in feeding practices in the UP intervention district might be expected to yield reductions in malnutrition prevalence. However, underweight prevalence and mean HAZ score were worse among girls and among children 12-23 months in the intervention relative to the comparison district. This suggests that dietary improvements demonstrated thus far in the UP intervention district were insufficient to yield improvements in nutritional status.

Child anemia

The GOI policy of daily iron supplementation for children starting at 12 months of age is meant to address the imbalance between high iron requirements and low dietary iron intake of children 6-24 months. Clearly, the extraordinarily high prevalence of child anemia in both states indicates that initiating this supplementation protocol at 12 months of age is too late in these populations. Data on receipt of pediatric IFA supplements demonstrates that the intervention was effective at increasing supplement distribution, particularly in UP state. However, the detailed data collected at endline on IFA supplementation revealed that most children exposed to this component of the program intervention received and consumed an inadequate quantity of IFA supplements. In AP state, this is explained by a low coverage level of only 30% by endline. In UP, two-thirds of eligible children were receiving IFA supplements by endline, but the increase in coverage occurred in the last months of the intervention period only, so exposure to this intervention component was most likely insufficient to impact iron status. Therefore, the lack of an intervention effect on anemia prevalence is not surprising.

The dramatic increase in the prevalence of severe anemia in UP is a cause for concern. If increased program coverage was accompanied by increased intensity of the intervention (i.e. more IFA supplements consumed per child), one could expect a reduction in the severity of anemia at a minimum. However, the current prevention protocol may be insufficient to impact the high prevalence and severity of anemia in this population. Additional strategies that address treatment of severe anemia should be considered.

SECTION II: COHORT STUDY IN UTTAR PRADESH STATE

CHAPTER 9: METHODOLOGY AND DATA COLLECTION FOR THE COHORT STUDY

Rationale for the Cohort Study Design

A longitudinal, cohort study was conducted in conjunction with the cross-sectional surveys to further assess INHP-II program effectiveness to improve infant feeding practices and reduce malnutrition among children less than 2 years of age in Uttar Pradesh state. Pregnant women were enrolled in the cohort and they and their infants were followed from delivery through 18 months of age. The cohort study design allowed for collection of more detailed data on intervention exposures and dietary intakes, and repeated follow-up of children to assess nutritional outcomes, including child growth, over time. However, the cohort sample size was not designed to provide the primary means of assessing the program's impact on child nutritional status and growth as this was provided by the cross-sectional evaluation.

Cohort Study Design

The cohort study was conducted in Uttar Pradesh state only. An INHP-II district was selected as the intervention area (Barabanki) and a similar non-INHP-II (with an ICDS program) district was chosen as the comparison area (Unnao). Although the cross-sectional and cohort components of the study were both conducted in the same UP districts, there was limited overlap between the women and their children recruited into the cohort and those enrolled in the cross-sectional evaluation because of the multi-stage sampling design. Enrollment information and measurements were collected from pregnant mothers during the third trimester (6-9 mo gestation) on socio-demographic factors, antenatal advice and services received, birth preparedness, diet, rest and workload, and anthropometry. Additional information and measurements were collected subsequently on utilization of health services and advice received that comprised the program intervention, as well as maternal and infant diet, infant feeding practices, and nutritional status at 7 days, and 3, 6, 9, 12, 15, and 18 months postpartum.

Cohort Sampling Design

Sample size

Sample size was calculated to detect differences in infant dietary intake outcomes between the intervention and comparison districts. The statistical power used for the calculations was 80% to detect a difference of 50 kcal/day in energy intakes from complementary foods at 7-10 months and 12-15 months of age at a significance level of 95% (alpha = 0.05). This sample size would allow us to detect differences in nutritional status of about 0.2 Z between groups in cross-sectional comparisons, with smaller differences in growth (about 0.1 Z) detectable given the longitudinal nature of this evaluation component. Primary outcomes were breastfeeding initiation and duration, and infant feeding practices. Secondary outcomes included energy intake from complementary foods and growth. Thus, it was estimated that approximately 400 mother/child pairs in each district were required to detect the differences expected. Using data from the study's baseline cross-sectional survey, it was estimated that there were 12.2 pregnant women per AWC area, of whom 5 (~40%) would be in their third trimester of pregnancy. Thus, to enroll 400 pregnant women in each district, women from 81 AWC areas were recruited.

Cohort Sample Selection

A multi-stage sampling strategy similar to the cross-sectional evaluation was used in the cohort component also. The sample of pregnant women was enrolled from AWCs chosen from selected sectors within the blocks selected for the cohort in each district. Each rural block in the districts contained 5-7 sectors, an area with 15-25 AWC and an estimated population of 20,000-25,000 persons. The sampling universe for the intervention district sample selection included only those sectors and AWC areas that were participating in CARE's INHP-II program as replication sites. All sectors in the selected blocks had AWC areas participating in the intervention. In the comparison district, the sampling universe included all areas with a functioning AWC from all sectors of the selected blocks in the district.

Three rural blocks from each district were purposively selected for the cohort: Nindura, Banki, and Fatehpur blocks in Barabanki District; and Nawabganj, Hasanganj, and Asoha blocks in Unnao District. The block selection criteria for both districts were: 1) accessibility of the district town; 2) physical proximity to other selected blocks; and 3) absence of other known MCH nutrition and health projects. Block population size and number of AWC were also considered in selecting comparable blocks in the 2 districts.

Four sectors were selected randomly from each of the 3 blocks for both districts. There were 135 and 192 AWCs in the selected blocks from the intervention and comparison districts, respectively. Within each sector, 6-7 AWCs were selected randomly to yield a total of 81 AWCs per district. This number of AWCs was expected to yield at least 400 pregnancies per district.

Cohort Data Collection

The cohort study was conducted from May 2004 to June 2006. Enrollment data were collected from pregnant women at 6-9 months gestation, and follow-up of women and their infants was conducted at 7 days, and 3, 6, 9, 12, 15, and 18 months postpartum. These time points coincided with critical periods when services were to be provided and advice delivered. The data collection activities were carried out by staff employed locally by Johns Hopkins.

Personnel

Eight field interviewers were employed by Johns Hopkins for data collection for the duration of the cohort study. The interview teams consisted of 2 interviewers; the four teams worked in both Barabanki and Unnao Districts. Field teams were coordinated and supervised by the Nutrition Project Coordinator with assistance from the Field Coordinator. Dr. VK Srivastava and his colleagues at KGMU provided technical assistance to the Project Coordinator and the cohort field team.

Household listing and eligibility criteria

A household listing operation was conducted in all the sampled AWC areas. The purpose of the household listing was to identify households with eligible pregnant women. Women were considered eligible if:

(a) They were at least 24 weeks (6 months completed) pregnant on the day of household listing. Gestational age was assessed by recall of the date of the last menstrual period (LMP) and by inquiring about the number of completed months of pregnancy.

(b) They intended to remain in the program area (same village) for the duration of the study. Women visiting their parents' home were excluded unless it was determined that their permanent residence was also within the cohort sample area. Women reporting that they intended to visit their parents' home for delivery or during the postpartum period were enrolled if the visit was not greater than 3 months and there was a willing family member reporting on the birth regardless of the woman's location.
(c) They were permanently residing (greater than one year) with their parents.

Enrollment

Once eligibility of a pregnant woman was determined, informed consent was taken and she was invited to enroll in the study. All eligible women from sampled AWC areas were recruited for the cohort. If more than one eligible pregnant woman was identified in a household, both were enrolled. Thus, actual cohort sample recruitment was not limited by the target sample size, but included all eligible, consenting pregnant women in the sampled areas.

Cohort follow-up

Enrolled pregnant women were asked to inform the study office within 24 hours of delivery. A calendar with project office phone numbers was provided to each study participant to facilitate this process. Follow-up visits were scheduled for critical periods immediately after programmatic exposure occurred. The first postpartum visit was scheduled for 7 days after delivery, and subsequent visits were scheduled for 3, 6, 9, 12, 15 and 18 months postpartum.

Data collected

During the pregnancy visit (6-9 months gestation) at the time of enrollment, mothers were interviewed about socio-demographic information and birth preparedness, and anthropometric measures of weight and height were taken. Mothers were asked during this interview and again at 7 days postpartum about the health advice received and health service utilization throughout pregnancy. Information on current maternal diet and rest and workload was collected during the pregnancy visit, and again at 3, 6, and 9 months postpartum. At the 7-day postpartum visit, data were collected on the delivery experience and breastfeeding initiation, and in the case of the latter repeated in month 3. During post-partum visits, infant anthropometric measures of weight and length/height were taken, and mothers were asked about immunizations, infant feeding practices, feeding and care during illness, and the health advice received. A 24-hr dietary recall was conducted on a sub-sample of 10% of the mothers (n=96) during in months 12 and 18 to estimate within-subject variation in dietary intakes.

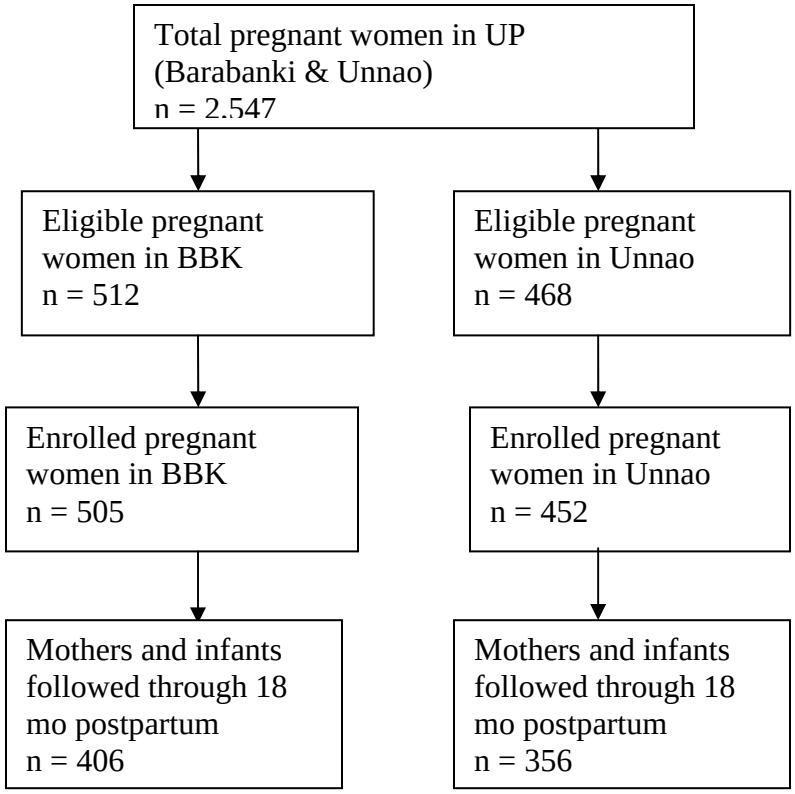
Cohort Data Management

All data collection instruments for enrollment and follow-up visits were edited in the field and brought to the main project office in Lucknow for further editing and data entry by local Johns Hopkins staff. The quality of data was checked and validated for completion, range check, skip-pattern matching, heaping and consistency. In the case of discrepancies, data were cross-checked with the paper questionnaires for immediate resolution. Statistical analyses were conducted at JHU in Baltimore, Maryland.

Cohort Sample Coverage

Nearly all eligible pregnant women were enrolled in the cohort study (Figure 9.1). Of the 2,547 pregnant women identified in the sampled areas in both districts, 980 were considered eligible for the study. Enrollment coverage was greater than 95% in both districts (Barabanki = 98.6%, Unnao=96.6%). The main reason for non-response was failure to find women at home despite 3 re-visits for all eligible survey respondents.

Figure 9.1. Cohort Study Profile



Statistical Methods

After assessing the data for quality, frequency distributions of the sample characteristics were examined with descriptive statistics. We compared the similarity in the characteristics of sample distribution between intervention and comparison arms with Student's t-test and Pearson's chi-square for metric (continuous) and non-metric (categorical) variables, respectively.

Statistical comparisons of intervention and comparison arms

For cross-sectional outcomes examined among cohort infants at specific ages from 0 to 20 months, indicators were compared between the intervention and comparison districts using the Student's t-test for continuous and Pearson's chi-square for categorical variables.

Analysis of the intervention effect on physical growth was based on a latent growth model (Diggle, 1994) in which the outcome examined was the change in nutritional status over a one month period in combination with or in biostatistical terms, in interaction with, the district of

residence. Longitudinal regression modeling was carried out to investigate the effect of the intervention over the entire follow-up period - adjusting for intra-subject correlations in measured outcomes at each time point. The mixed-effect multiple linear regression model applied in the analyses specified the correlation structure among subjects with use of a random effects assumption. As well, regression modeling permitted investigators to consider confounding factors among the sociodemographic and economic characteristics of the sample. Age was modeled with quadratic and cubic terms to take into consideration the declining rate of growth from 6 to 18 months followed by an increase thereafter from 18-24 months of age. Estimates of the intervention effect summed the interaction terms and multiplied by 12 to obtain an average one-year effect: [(age * district) + (age2 * district)] * 12.

All analyses were conducted with STATA 8.0 (Stata Corp, TX).

CHAPTER 10: SOCIODEMOGRAPHIC CHARACTERISTICS IN THE COHORT STUDY

The sociodemographic and economic characteristics of the cohort sample are presented in this chapter. To investigate for potential confounding factors in the intervention effect, the distribution of these characteristics were compared by district. We also present the baseline sociodemographic data collected from the currently pregnant women in the cross sectional study for the purpose of making overall comparisons across the two studies in Uttar Pradesh. Again, as stated in Chapter 3, the large sample size increased the likelihood of statistical significance in even very small differences among characteristics. This should not necessarily be construed as a meaningful difference for the evaluation results.

Maternal Age

The mean age of mothers at enrollment into the cohort study in the intervention district was 25.2 (±5.9) yr, significantly higher than the mean age in the comparison district, 24.1 yr (±5.3) (P=0.003). In both districts, greater than one-third of the mothers fell into the 20-24 year old range (Table 10.1). There was a difference of 4.6% points in the percentage of adolescent mothers between the districts, with the comparison group showing the higher value. Generally, mothers tended to fall in the older age ranges for the intervention. In the cross-sectional study, trends were similar with higher percentages of younger mothers observed in the comparison district; these differences, albeit small, were statistically significant.

Table 10.1. Age distribution among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

	Cohort study		Cross sectional study	
	Intervention	Comparison *	Intervention	Comparison *
< 20	15.9	20.5	23.9	25.5
20-24	36.3	37.1	34.1	36.5
25-29	24.6	26.3	22.7	23.2
30-34	14.1	11.9	12.1	11.2
35+	8.4	4.2	7.4	3.5
Total no. of pregnant women	453	504	746	706

* Statistical test comparing distributions between districts, significant at p<0.05

Religion

The majority of respondents in both districts were Hindu, though the proportion in various categories did differ significantly (Table 10.2). The intervention district had a larger percentage (23.8%) of mothers reporting Muslim religion compared to the comparison district (5.5%). These differences by district were again reduced in the cross sectional study where the percentage of those reporting adherence to the Hindu religion in the intervention district was nearly 7% percentage points higher.

Table 10.2. Religion among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

	Cohort study		Cross sectional study	
Religion	Intervention	Comparison *	Intervention	Comparison *
Hindu	76.2	94.5	83.1	91.4
Muslim	23.8	5.5	16.9	8.1
Total no. of pregnant women	504	453	746	706

* Statistical test between districts, significant at $p<0.05$

Caste

One half of the cohort respondents fell into the other backward caste category in the intervention district, followed by approximately one-third in the scheduled caste (Table 10.3). There was a more even distribution in the comparison district among these two categories. Few women from either district reported belonging to a scheduled tribe. There were comparable differences between the districts in the cross-sectional study that also demonstrated statistical significance.

Table 10.3. Caste among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

	Cohort study		Cross sectional study	
Caste groups	Intervention	Comparison *	Intervention	Comparison *
Scheduled caste	36.3	42.6	33.1	37.3
Scheduled tribe	0.6	0.4	0.1	0.4
Other backward caste	50.0	40.6	37.0	41.2
Other castes	13.1	15.0	12.9	13.0
Not applicable[#]	0	1.3	16.9	8.1
Total no. of pregnant women	504	453	746	706

* Statistical test between districts, significant at $p<0.05$

[#]Includes women who do not belong to any caste or belong to a religion with no caste system.

Education

The number of school years completed by mothers using the categories from the NFHS II survey was considered the education level attained (Table 10.4). There were no statistical differences by district in education levels among the pregnant women in the cohort study. Illiteracy was highly prevalent among the women, with greater than two-thirds reporting no education in both intervention and comparison districts. Only 7.7% and 6.0% in the intervention and comparison, respectively, completed any high school education. In the cross sectional study among the currently pregnant women, there was slightly more variation among categories between the districts that reached statistical significance, though percentages followed similar trends to the cohort study and showed the predominant education level to be illiteracy.

Table 10.4. Education level among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

Education level (years)	Cohort study		Cross sectional study	
	Intervention	Comparison	Intervention	Comparison *
No education/illiterate	67.9	69.0	68.0	61.5
1-7	15.3	13.3	15.6	19.0
8-9	9.1	11.3	8.9	12.6
10+	7.7	6.0	7.6	6.9
Total no. of pregnant women	504	453	746	706

* Statistical test between districts, significant at $p<0.05$

Parity

Parity is often found to be an important covariate in modeling growth outcomes. Differences in parity were not apparent between the cohort and cross-sectional pregnancy samples or between the intervention and comparison districts in each sample (Table 10.5). The highest proportion of live births fell in the 2-3 range in all districts.

Table 10.5. Number of live births (parity) among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

Number of live births	Cohort study		Cross sectional study	
	Intervention	Comparison	Intervention	Comparison
0	20.8	19.9	22.9	23.5
1	16.9	19.9	19.8	20.4
2-3	32.1	35.3	30.6	32.4
4-5	19.6	14.6	18.0	14.3
6+	10.5	10.4	8.7	9.4
Total no. of pregnant women	504	453	746	706

* Statistical test between districts, significant at $p<0.05$

Inter-Birth Interval

Women were asked to report the number of months between the birth of their last child and the current birth. Approximately 20% of mothers in both cohort districts reported an interval of less than 24 months, but there were small but significant differences in the categories 24-47 and ≥48 months between cohort intervention and comparison mothers (Table 10.6). The distribution of inter-birth intervals was comparable in the cross-sectional study and did not differ between districts.

Table 10.6. Inter-pregnancy birth intervals among pregnant mothers in the cohort and cross sectional studies, Uttar Pradesh

Inter-Birth interval (months)	Cohort study		Cross sectional study	
	Intervention	Comparison *	Intervention	Comparison
<24 months	19.1	20.1	18.6	17.4
24-47 months	36.1	30.5	29.5	30.6
48+ months	6.9	9.5	8.7	7.1
N/A	37.9	40.0	43.2	44.9
Total no. of pregnant women	504	453	746	706

* Statistical test between districts within a state, significant at $p<0.05$

Household Toilet Facilities

Most women in both intervention and comparison districts reported having no toilet facility; in the comparison, this was overwhelmingly the case, in 94.3% of mothers. Flush toilets were more

common in the intervention district than in the comparison district as were open, shared, or public toilets. Statistically significant differences across these categories were found among districts for both the cohort and cross sectional studies.

Table 10.7. Household toilet facilities among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

	Cohort study		Cross sectional study	
Type of toilet facility	Intervention	Comparison *	Intervention	Comparison *
Flush toilet	7.7	4.4	7.8	6.4
Open/shared/public Toilet	4.6	1.1	1.9	0.7
No facility	85.9	94.3	89.3	92.8
Other	1.6	0.2	1.1	0.1
Total no. of pregnant women	504	453	746	706

* Statistical test between districts, significant at $p<0.05$

Drinking Water Source

With the exception of the ~10% difference by district in mothers reporting household water coming from a public well, similar percentages were observed across other categories of drinking water source (Table 10.8). Greater than 80% of the pregnant women in the cohort study had access to piped water, either from a public tap or within their residence. Differences between intervention and comparison districts were significant in both the cohort and cross sectional studies.

Other variables related to sanitation and hygiene beyond drinking water source and toilet type were considered in comparing the study samples. For example, the number of persons living in households differed significantly between districts –7.0 (±4.0) in the intervention district versus 6.2 (±3.0) in the comparison district (P=0.001), though there was large variation in both districts.

Table 10.8. Household drinking water source among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

Drinking water source type	Cohort study		Cross sectional study	
	Intervention	Comparison *	Intervention	Comparison *
Piped water in residence	46.8	39.1	40.6	33.7
Piped water in public tap	44.8	42.2	48.4	50.6
Well water in residence	1.8	1.3	0.8	1.0
Public Well	6.4	16.3	10.2	14.5
Natural water/other	0	1.1	0	0.3
Total no. of pregnant women	504	453	746	706

* Statistical test between districts, significant at $p<0.05$

Child Care for Mothers who Work Outside the Home

At least two-thirds of pregnant women sampled in either study did not work outside the home, and this question did not have relevance for them (Table 10.9). Among the minority of women who did work outside the home, similar proportions in the cohort districts reported that their older children, mothers-in-law, or other relatives or neighbors took care of their youngest child for them. However, women in the comparison district were twice as likely to take their child to work with them compared to those in the intervention district. The trends in child care arrangements were similar in the cross-sectional study. Overall, the child care arrangements for women working outside the home were found to differ significantly between intervention and comparison in both the cohort and cross sectional groups, although the differences were not dramatic.

Table 10.9. Child care arrangements among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

Child care arrangements	Cohort study		Cross sectional study	
	Intervention	Comparison *	Intervention	Comparison *
Take child to work	5.0	11.9	6.7	11.5
Husband	0.2	0.2	0.3	0
Mother in law	7.1	5.5	6.3	5.7
Older children	13.3	13.0	10.9	7.5
Other relatives/ neighbor	3.6	3.8	2.4	4.7
No children yet	70.8	65.6	73.5	70.7
Total no. of pregnant women	504	453	746	706

* Statistical test between districts, significant at $p<0.05$

Socioeconomic Status Index

As described for the cross-sectional study, the socioeconomic status index was derived using a principal components analysis (PCA) from data collected on household assets and possessions. This index may be a more optimal marker of the economic viability of households in developing countries than income data that is often difficult to collect accurately and can vary greatly over time. Monthly income from the past 6 months was ascertained in the cohort study, however, with no significant differences noted between districts (P=0.14). Respondents were stratified into terciles according to the SES index, and the distributions compared between intervention and comparison districts. Again, the lowest tercile indicates the poorest group and the highest tercile indicates the richest group.

In the cohort sample, a lower proportion (~6 percentage points) of pregnant women were classified in the low index level and a higher proportion in the high index level in the intervention relative to the comparison district (Table 10.10). This difference in the distribution of the index between the districts was statistically significant. A similar difference in the distributions of the cross-sectional sample across the index was observed for the medium and high index levels, but the difference was not statistically significant in this case.

Table 10.10. Socioeconomic Status (SES) Index among pregnant women in the cohort and cross sectional studies, Uttar Pradesh

SES Index level	Cohort study		Cross sectional study	
	Intervention	Comparison *	Intervention	Comparison
Low	30.4	36.6	33.4	33.3
Medium	32.8	34.0	31.0	36.0
High	36.8	29.4	35.7	30.7
Total no. of pregnant women	453	504	746	706

* Statistical test between districts, significant at $p<0.05$

Summary

Although the distributions of numerous sociodemographic characteristics were statistically significantly different between the intervention and comparison districts in the cohort sample, most of these differences were quite small in fact. The large sample sizes led to even small differences yielding statistical significance. Evaluation analyses in the cohort data were run with and without multivariate adjustment for potential confounders. However, because this adjustment was not found to change the results, unadjusted statistical results are presented in the two chapters that follow.

This chapter also provided a comparison of the sociodemographic characteristics of the cohort and cross-sectional samples of currently pregnant women from Uttar Pradesh. The results presented here demonstrate that the more geographically limited cohort sample is comparable to the more comprehensive community sample selected for the cross-sectional evaluation. Therefore, any results reported from the cohort sample should not be discounted because that sample is less representative of the population from which it was drawn.

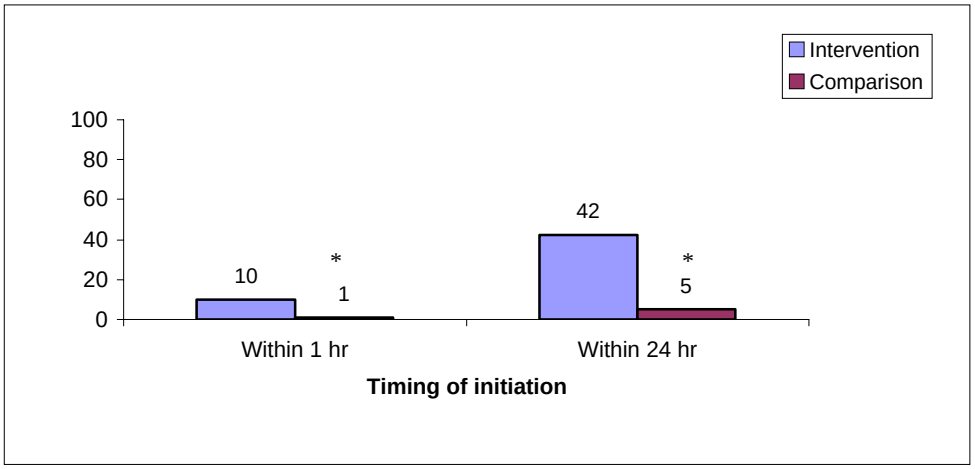
CHAPTER 11: INFANT FEEDING IN THE COHORT STUDY

Breastfeeding

Early initiation of breastfeeding

Mothers are advised to initiate breastfeeding within one hour of birth to protect against infection and hypothermia, but as well, to ensure early bonding and latching on for the newborn. This message is communicated during service provider contacts with mothers during the 3rd trimester of pregnancy and at delivery within the INHP-II basic package of nutrition interventions. Despite the fact that this exposure occurred early in the project's intervention period for the cohort sample, there was significant improvement in timely initiation of breastfeeding. Mothers of infants less than one month of age were asked about the timing of initiation of breastfeeding relative to birth. There was a significant positive difference of 9 percentage points in mothers initiating breastfeeding within one hour, and a 37% difference for breastfeeding initiation within one day of birth in the intervention district compared to the comparison district (Figure 11.1).

Figure 11.1. Breastfeeding initiation among mothers of children in the cohort sample, by district



* Statistical test for differences by district, significant at p<0.05

Prelacteal feeds

Related to the timely initiation of breastfeeding, mothers were also advised against giving prelacteal feeds to their newborns, a common and risky practice in resource-poor settings. Mothers of infants less than one month were asked whether their infants were given any other liquids or solids before initiation of breastfeeding. Mothers were significantly less likely to give their infants prelacteal feeds in the intervention (79.8%) than in the comparison (98.0%) district, where this practice was nearly universal in the sampled population.

Current breastfeeding

No differences were found between districts for percentages of mothers reporting any breastfeeding at each follow-up visit in the cohort. During the first 12 months of life, ≥95% of mothers reported currently breastfeeding their infant. This proportion dropped to 90% among infants 12-17 months of age in both districts. By 18 months, 82.4% of mothers in the

intervention district and 85.3% of mothers in the comparison district reported still breastfeeding, with no statistically significant differences by districts noted.

Exclusive breastfeeding and early introduction of complementary foods

Table 11.1 provides details on current breastfeeding practices by age and district. For infants at less than one month of age, mothers were asked about breastfeeding practices since the time of birth; at all subsequent follow-up visits, the information presented is based on recall of feeding practices in the previous 24 hours. Exclusive breastfeeding is recommended until 6 months of age, a behavior that could have been encouraged and reinforced through the INHP-II package in 6 or more contacts throughout this period. At 3-5 months of age, there was a significantly higher percentage of exclusively breastfed infants in the intervention compared to the comparison district. Also striking was the high numbers of infants in both districts who were still receiving only breast milk at 6-8 months of age (to be discussed below).

Table 11. 1 Current breastfeeding status among children in the cohort sample 0-20 months of age, by district

	Exclusive breastfeeding		Breastfeeding & water		Breastfeeding & other liquids/solids		No Breastfeeding	
Age[1]	Inter.	Comp.	Inter.	Comp.	Inter.	Comp.	Inter.	Comp.
< 1 mo	70.3	65.0	5.5	8.8	23.7	25.3	0.6	1.0
3-5 mo	58.1	46.8*	8.8	13.3	31.2	37.2	1.9	2.7
6-8 mo	22.5	18.2	14.4	20.9*	59.6	58.0	3.5	3.0
9-11 mo	0.3	0.6	15.2	15.0	79.5	81.2	5.1	3.2
12-14 mo	0.0	0.8	8.8	4.9	84.5	86.9	6.7	7.4
15-17 mo	0.0	0.5	4.5	2.3	87.2	87.4	8.3	9.9
18-20 mo	0.3	0.0	2.4	0.8	79.7	84.5	17.6	14.7

[1]Based on 24 hr recall for at all ages, except at <1 mo when mothers reported breastfeeding status since birth.
*Statistical test for differences by district, significant at $p<0.05$

At 0-6 months, there were no significant differences in the percentages of infants receiving water, or other liquids and solids in addition to breast milk. However, there was a trend towards smaller percentages of mothers reporting these feeding practices in the intervention district.

Early introduction of complementary foods results in increased risks of infectious disease and growth faltering during this the first half of infancy. During the first month of life, approximately one-quarter of the infants were reported to have already received other liquids and solids along with breast milk in both districts. This proportion increased to approximately one-third of infants at 3-5 months of age. Other cultural and economic barriers to the acceptance of the exclusive breastfeeding behavior in this population should be explored and incorporated into programming for improved nutrition in early infancy.

Complementary Feeding

At least one contact with mothers was expected in the INHP-II program for delivering nutrition interventions in each of the infancy periods of 6-8 months and 9-11 months, and two or more were expected during the period when children were 12-24 months of age. Messages based on age-specific complementary feeding guidelines were conveyed concerning quantity, frequency, variety, and feeding behaviors. Children ages 6-24 months living in resource-poor settings are most vulnerable to diarrheal and other infectious diseases morbidities together with the growth deficits associated with inadequate complementary feeding practices. It is a critically important period that has tremendous complexities for programming based on differences across settings for cultural practices, food availabilities, and economic conditions.

Introduction of solids

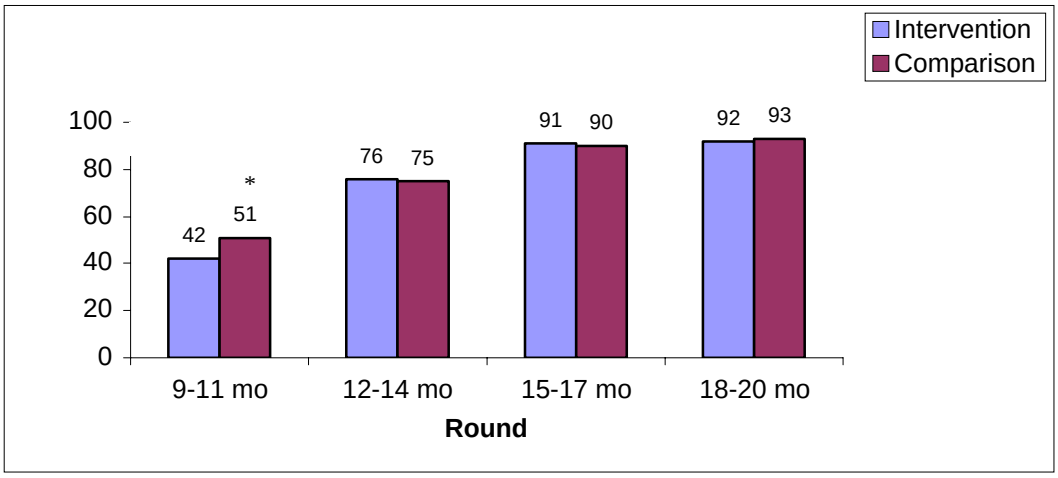
At 6 months, breastmilk is insufficient in the infant diet in terms of both energy and particular nutrients to fulfill daily requirements for the breastfeeding baby – thus necessitating the introduction of complementary foods. The timing of this introduction was evaluated in two ways in our data: by report of current intake of solids at the 6 month follow-up visit and by recall at the subsequent 9-month visit. Among the infants at 6-8 months, 42.0% in the intervention and 37.1% in the comparison district reported that their infant had received solids in the previous day. By contrast, 69.4% of mothers in the intervention and 72.2% in the comparison district reported at the 9-month visit that they introduced solids to their infant between 6 and 8 months of age. This discrepancy between recall of the timing of introduction of solids and reported current intake was observed in the cross-sectional survey data as well.

Dietary intakes by 24 hour recall

Information was collected on the dietary intakes of cohort infants using 24-hr recall methods beginning at the 9-month and all subsequent follow-up visits. Mothers were asked to report what their child had consumed in the previous one-day period. The type of food consumed, as well as the frequency of its consumption and portion sizes were recorded.

At 9-11 months of age, only 40-50% of breastfed infants had consumed cereals (rice, bread, or other grains) in the previous 24 hours, and the proportion was significantly smaller in the intervention than the comparison district (Figure 11.2). By one year of age, three-quarters of infants had consumed cereal in the previous 24-hour period, and by 15-17 months, cereal intake was approximately 90% in both districts.

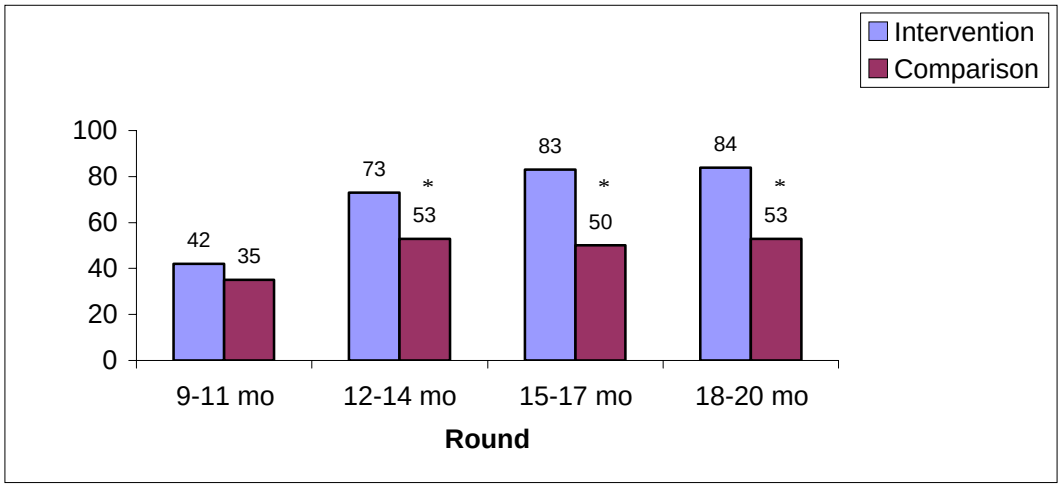
Figure 11.2. Cereal consumption in the past 24 hours among breastfeeding children in the cohort sample from 9 to 20 months, by district



* Statistical test for differences by district, significant at p<0.05

The INHP-II promoted the addition and increase of legumes in the diets of infants and young children to improve both energy and nutrition content of primarily cereal-based diets. The cohort data suggest that this infant feeding message was received and followed by mothers in the intervention district. There was an increasing disparity in the proportion of children consuming legumes between the districts through 18-20 months of age. At 9-11 months, a greater percentage of the intervention infants than the comparison infants had received legumes with this difference growing and becoming more significant by 12-14 months and continuing through 18-20 months.

Figure 11.3. Legume consumption in the past 24 hours among breastfeeding children in the cohort sample from 9 to 20 months, by district

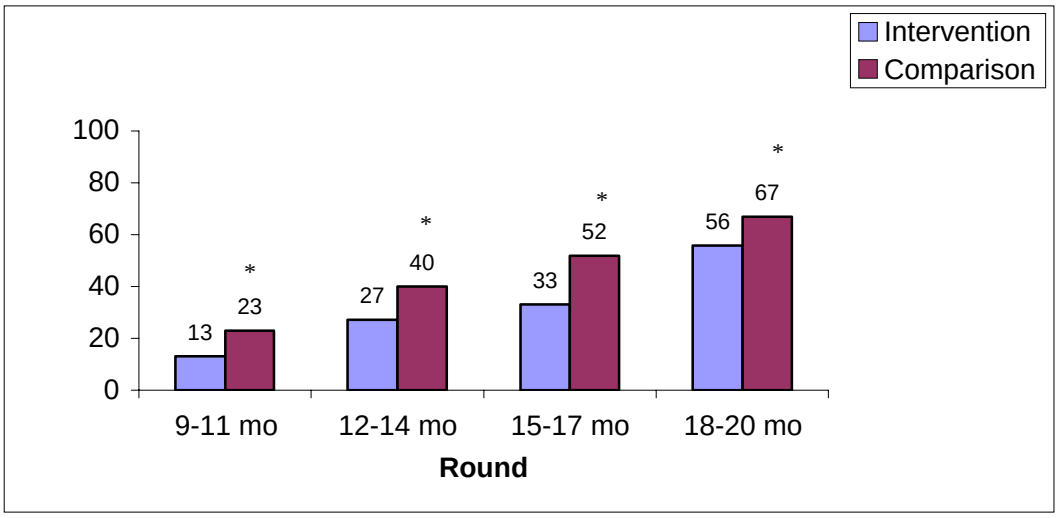


* Statistical test for differences by district, significant at p<0.05

Consumption of fruits and vegetables is encouraged to improve the quality of diets in terms of micronutrients such as vitamin A. At all four follow-up visits from 9-18 months of age when 24-hour dietary recall data were collected, intake of fruits and vegetables was significantly greater

among children in the comparison district (Figure 11.4). It is unclear whether this difference reflects food availability or dietary preferences.

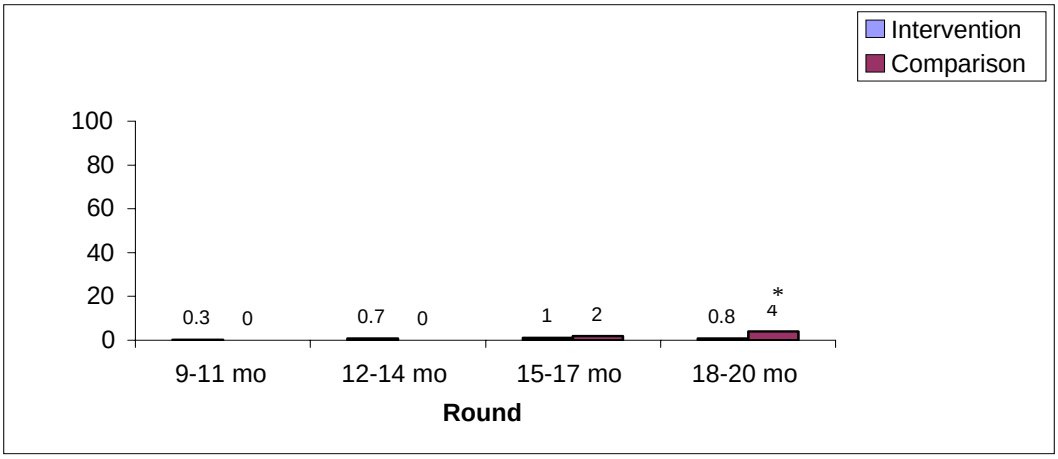
Figure 11.4. Fruit and vegetable consumption in the past 24 hours among breastfeeding children in the cohort sample from 9 to 20 months, by district



* Statistical test for differences by district, significant at p<0.05

A very small number of children from both districts were reported to have consumed eggs, meat, chicken, or fish (Figure 11.5). By 15-17 months, the percentage reached 1% in both districts and by 18-20 months, this percentage declined again slightly in the intervention district and increased to 3.7% in the comparison district, attaining a significant difference. Breastmilk continues to be an important source of both energy and micronutrients from 6-20 months, but particular nutrients have been singled out as problem nutrients due to their low availability in breastmilk and local diets. Iron and zinc, for example, are both found in higher concentrations and in more bioavailable forms in meats and fish when compared to other plant-based foods.

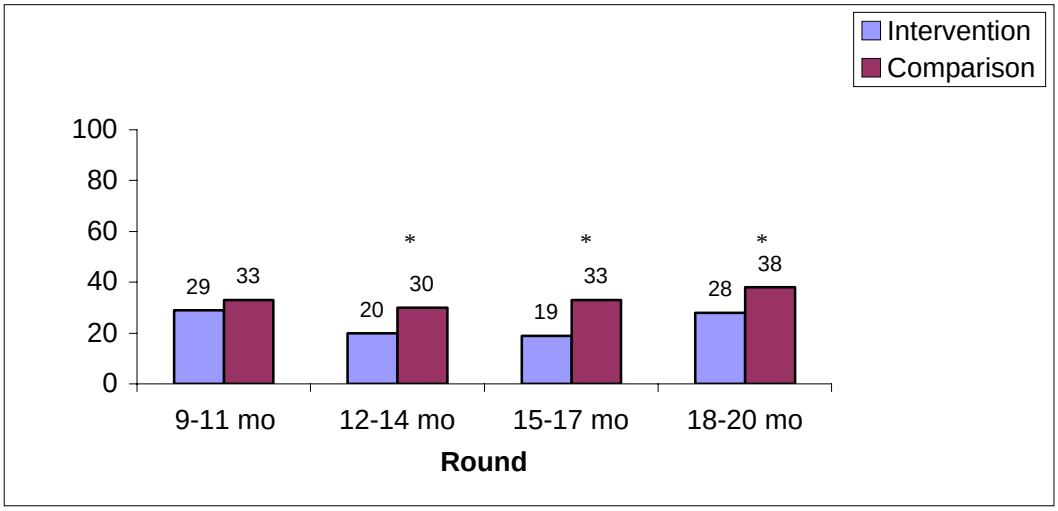
Figure 11.5. Consumption of eggs, meat, chicken or fish in the previous 24 hours among breastfeeding children in the cohort sample from 9 to 20 months, district



* Statistical test for differences by district, significant at p<0.05

Although most children are breastfed for the first 2 years of life, it is a common practice to supplement breastmilk with animal or powdered milk or infant formula. Mothers received advice from service providers to continue breastfeeding and limit this practice. Approximately 30% of breastfed children consumed other milks at 9-11 months of age in both districts (Figure 11.6). However, this proportion decreased among children in the intervention at subsequent visits in the second year of life and was statistically lower than the proportion among children in the comparison district at these visits.

Figure 11.6. Animal/powdered milk and formula intake in the past 24 hours among breastfeeding children in the cohort sample 9 to 20 months of age, by district



* Statistical test for differences by district, significant at p<0.05

Quantity of solids consumed

WHO provides an estimated minimum quantity of solids recommended for the breastfeeding young child as follows: 200 g/d for infants 6-8 mo; 300 g/d for infants 9-11 mo; and 400 g/d for children 12-23 months of age. Analyses for the cohort study, similar to the cross-sectional analysis, defined solids as rice, bread, and grain products – observed to be the primary sources of energy in the infant and young child diet. Because so few children were found to consume adequate amounts, the definition was refined to be the "proportion who consumed *at least half* the recommended quantity of solids per day." Table 2 gives the percentage of breastfeeding children meeting the requirements of 150 or more grams per day for 9-11 months, and 200 or more grams per day for those in the second year of life – one-half of requirements. Less than 3% of children across all age categories were found to meet this very minimal level of solids consumption. There were no differences between intervention and comparison groups.

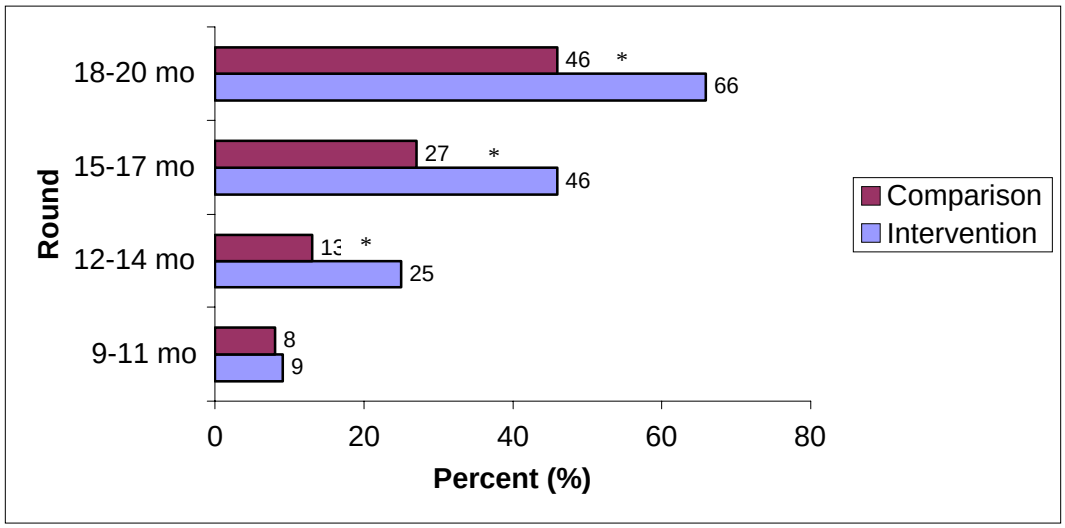
Table 11.2. Consumption of at least half the recommended quantity of solids among children in the cohort sample at follow-up from 9 to 20 months of age, by district

Age (months)	Half the recommended quantity of solids (%)	
	Intervention	Comparison
9-11 (150+ g)	0.8	1.0
12-14 (200+ g)	0.3	0
15-17 (200+ g)	1.7	1.4
18-20 (200+ g)	2.4	2.8

Frequency of solids consumed

The WHO recommendation on feeding frequency was also examined in the cohort study. Using the 24-hour recall, the number of times solids – similarly defined to include rice, bread, and grain products – was calculated and summarized as the percentages of breastfeeding children meeting the WHO recommendations (Figure 7). A minimum of 2 solid feeds per day is specified for children 6-8 months and 3 solid feeds per day for children 9-23 months. The intervention district was shown to be significantly higher than the comparison district across all ages, significant after 12 months.

Figure 11.7. Minimum recommended frequency of solids consumed per day among breastfeeding children in the cohort sample at follow-up from 9 to 20 months of age, by district



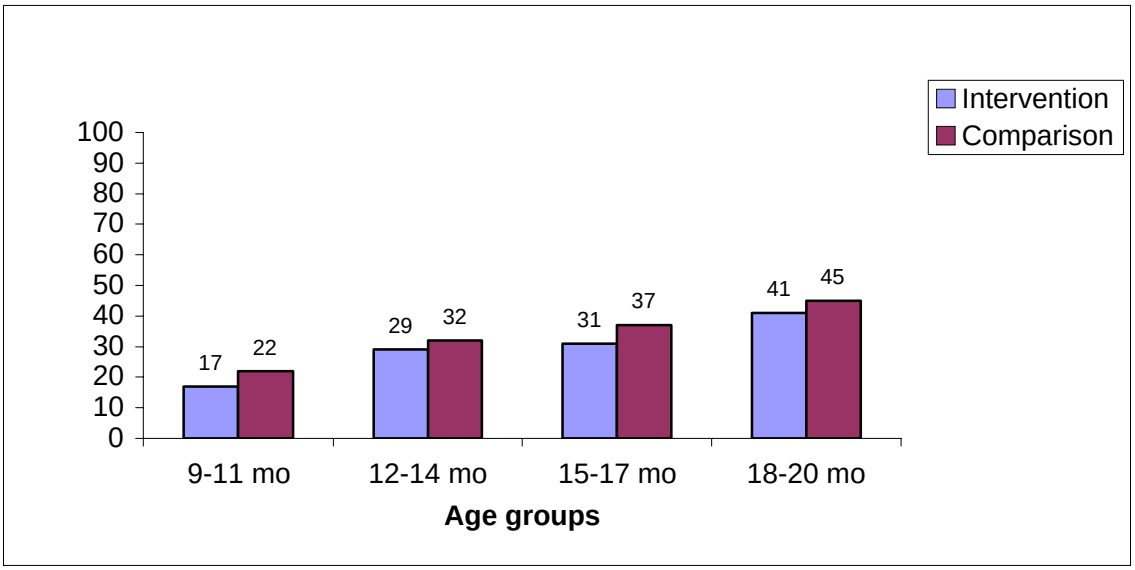
* Statistical test for differences by district, significant at p<0.05

Dietary diversity

Increasing the variety of foods in an infant diet is generally recommended to improve the quality or micronutrient content. Dietary diversity was described by first defining food groups and quantifying the number of groups a child consumed in the previous 24 hours. Foods were grouped as: cereals; legumes; meat and eggs; vitamin-A rich fruits and vegetables; other fruit and vegetables; dairy foods; and butter, oil, and fats. Adequate dietary diversity was defined as 3

or more food groups consumed in the previous 24 hours. While the percent of breastfeeding children found to have adequate dietary diversity was higher in the comparison district at all age categories, no significant differences between intervention and comparison groups were found.

Figure 11.8. Consumption of ≥3 food groups in the past 24 hours among children in the cohort sample at follow-up from 9 to 20 months of age, by district



To increase energy density of foods and the bioavailability of particular micronutrients, consumption of oil with solids is recommended in young children. The percentages of breastfeeding children reported receiving oil with one or more solid foods in this study was low in both intervention and comparison districts (Table 11.3). In the 18-20 month age group, a statistically significant difference of 10 percentage points was found between the intervention and comparison district, with a greater proportion of children receiving oil with solids in the latter.

Table 11.3. Consumption of oil added to solids among breastfeeding children in the cohort sample at follow-up from 9 to 20 months of age, by district

	Oil added to solids (%)	
Age (months)	Intervention	Comparison
9-11	1.2	0.3
12-14	0.3	1.3
15-17	3.0	6.5
18-20	1.7	11.7*

* Statistical test for differences by district, significant at $p<0.05$

Supplementary Nutrition

There were large differences between intervention and comparison districts noted in the reporting of supplementary nutrition, AWC food, ever received (Table 11.4). Those in the intervention district were far more likely ever to have received supplementary nutrition in the past than in the comparison district. There appeared to be greater proportions receiving the supplementary nutrition earlier in the second year of life in the intervention district - with smaller incremental changes in the 15-17 months and 18-20 months periods. In the comparison district, a larger increase was observed later in the 18-20 age group.

Table 11.4. Receipt of Supplementary Nutrition among children in the cohort sample at follow-up from 12 to 20 months of age, by district

Age (months)	Receipt of Supplementary Nutrition (%)	
	Intervention	Comparison
12-14	45.0	5.3*
15-17	51.2	6.4*
18-20	56.1	23.9*

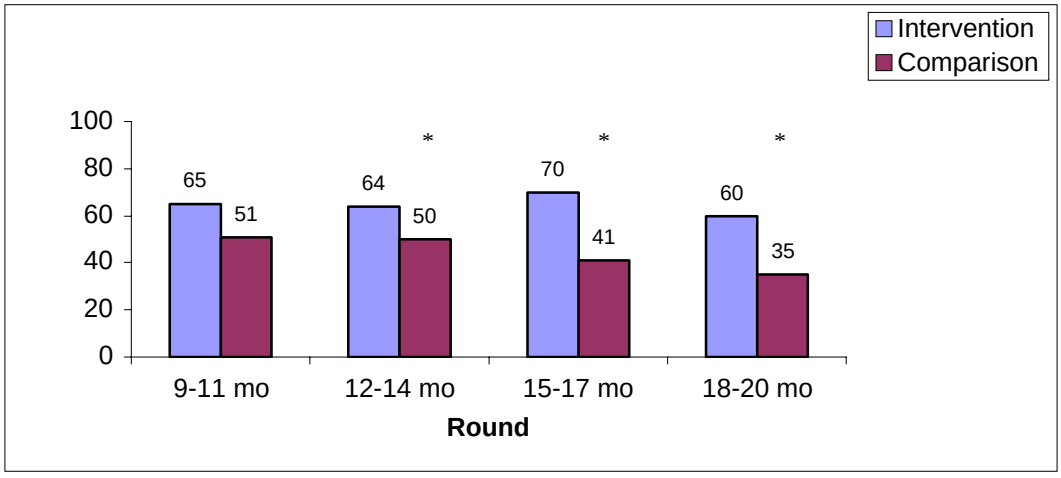
* Statistical test for differences by district, significant at p<0.05

Caregiver feeding practices

Caregiver feeding

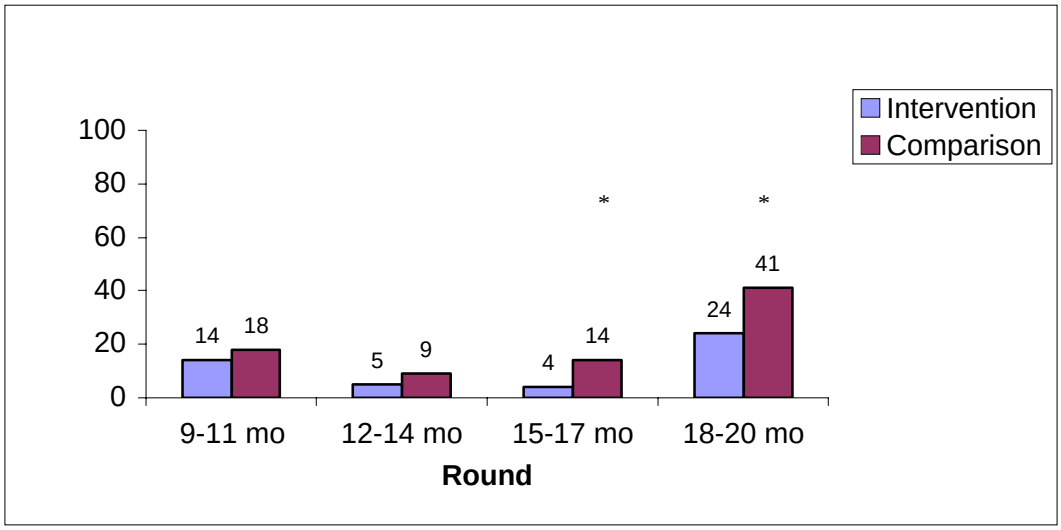
Caregiving practices are considered important determinants in infant and young child growth. Variability in nutritional outcomes might be expected based on who is actually feeding the child. For this study, the percentage of children fed by mother, as a positive practice for promoting growth, was investigated (Figure 11.9). The proportion of children usually fed by the mother was greater in the intervention than the comparison district at follow-up visits from 9 to 18 months. By contrast, higher percentages of children in the comparison district had no feeding assistance at all, considered a riskier practice for promoting growth (Figure 11.10).

Figure 11.9. Child feeding by mothers among children in the cohort sample at follow-up from 9 to 20 months of age, by district



* Statistical test for differences by district, Pearson chi-square significant at p<0.05

Figure 11.10. Child feeding without assistance among children in the cohort sample at follow-up from 9 to 20 months of age, by district



* Statistical test for differences by district, Pearson chi-square significant at p<0.05

Plate sharing

Children fed from a separate platter may be protected against inadequate food intakes resulting from competition for foods with older siblings or caregivers. Infants and young children receiving food from a shared platter may be incapable of taking adequate quantities or potentially benefit because of the attendance of a caregiver to its needs while the family eats. Interestingly, greater percentages of infants were fed from a separate platter in the comparison district compared to the intervention district despite the messages communicated by INHP-II during contacts from 6-24 months to feed the child from a separate plate (Table 11.5). Except in the 9-11 month age group, significantly lower proportions of mothers in the intervention district reported following this practice of feeding from a separate platter.

Table 11.5. Plate sharing practices among children in the cohort sample at follow-up from 9 to 20 months, by district

	Fed from a separate plate (%)		Fed from a shared plate (%)	
Age (months)	Intervention	Comparison	Intervention	Comparison
9-11	18.7	13.6	68.5	71.7
12-14	7.6	26.5*	90.2	70.6*
15-17	9.3	30.9*	90.7	69.1*
18-20	30.5	53.2*	69.5	46.8*

* Statistical test for differences by district, significant at p<0.05

Summary

Despite the occurrence of cohort deliveries relatively early on in the 2-year INHP-II intervention period, advice about desired newborn feeding practices appears to have been moderately effective at improving indicators of these practices in the cohort intervention district. Both an increase in early initiation of breastfeeding and a decrease in use of prelacteal feeds were observed among intervention district mothers.

Improvements in breastfeeding practices during the first 6 months of life were limited. Exclusive breastfeeding was significantly more prevalent among children at 3-5 months of age in the intervention than comparison district. However, there was no reduction in early introduction of complementary foods that was reported in both districts by approximately one-third of mothers when their children were 3-5 months of age.

There were limited improvements in dietary intake and complementary feeding indicators in the cohort sample. Timely introduction of solids did not differ in the two districts when assessed by recall or by current intake. Consumption of cereals, fruits and vegetables increased from 9 to 18 months, but the increases were comparable in the intervention and comparison districts. This finding suggests that the ICDS program's efforts to improve child feeding practices may be having some success. By contrast, legume intake approximately doubled from 9 to 15 months in the intervention district, and was significantly greater than in the comparison district at 12 through 18 months of age. Further, intake of powdered/animal milk and infant formula reduced from 9 to 12 months in the intervention district and was significantly lower than in the comparison district from 12 to 18 months of age. These positive changes in specific child feeding practices indicate that the INHP-II intervention has likely been successful at communicating clear, specific messages about increasing legume intake and reducing animal/powdered milk intake during the weaning period.

Among indicators of complementary feeding, there was significant improvement only in the proportion of children consuming the minimum recommended number of solid feeds per day. There was an 8-fold increase in this proportion among intervention district children relative to a less dramatic increase among comparison district children from 9 to 18 months of age. Nonetheless, <25% of children at 12 months and <50% at 15 months received the minimum recommended number of feeds. Indicators of adequate quantity and variety of intake did not differ between the districts, and the proportion consuming at least half the recommended minimum quantity was less than 3% at all ages in the study cohort. Although the positive intervention effects on child feeding practices observed in the cohort sample are encouraging, the low proportions of children who consume adequate quantity and quality of complementary foods with sufficient frequency in this population indicate that further dietary improvements are needed before an impact on malnutrition prevalence can be expected.

CHAPTER 12: CHILD NUTRITIONAL STATUS AND PHYSICAL GROWTH IN THE COHORT STUDY

Children were weighed and measured prostrate for length at each follow-up visit from 7 days postpartum through 18 months of age in the cohort study. Anthropometric data from cohort children reported for each age represents that age plus and minus one month, e.g. 3 month data represents data from children at 2-4 months of age. The exception is data from the initial postpartum visit that includes data from infants <1 month of age only. Data on weight and length were used to calculate the indices of weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ). The Z-scores represent standardized distances from a reference median (WHO, 1979). While length measures may be referred to as *length*-for-age or weight-for-*length*, for consistency purposes, they are hereafter referred to as *height*. Undernutrition is defined as WAZ<-2 SD, stunting as HAZ<-2 SD, and wasting as WHZ<-2 SD. Children with Z scores less than -3 SD for each of the indices were considered severely underweight, stunted, and wasted respectively. Those with Z scores less than -5 SD were excluded from these analyses.

Underweight

Weight-for-age Z score reflects a combined effect of both short-term, acute undernutrition and longer-term, chronic undernutrition in infants and young children. This index does not incorporate consideration of height and may produce bias if not also used in combination with the indices of HAZ and WHZ. In population surveys, WAZ, HAZ, and WHZ generally follow a normal distribution. This was the case with the children in the cohort sample, and therefore, the Z scores are presented as mean values.

A significantly higher mean WAZ was found in the intervention district relative to the comparison district at 6 and 9 months of age (Table 12.1). In all other rounds, children from the intervention district showed a non-significant trend for higher Z scores than the comparison district. When stratified by sex, the same trend was observed among both girls and boys, but the WAZ differed significantly between districts for boys only at 9 months of age. In the cross-sectional study, boys from the intervention district also appeared to have a slight advantage in maintaining WAZ compared to boys from the comparison district and girls in both districts.

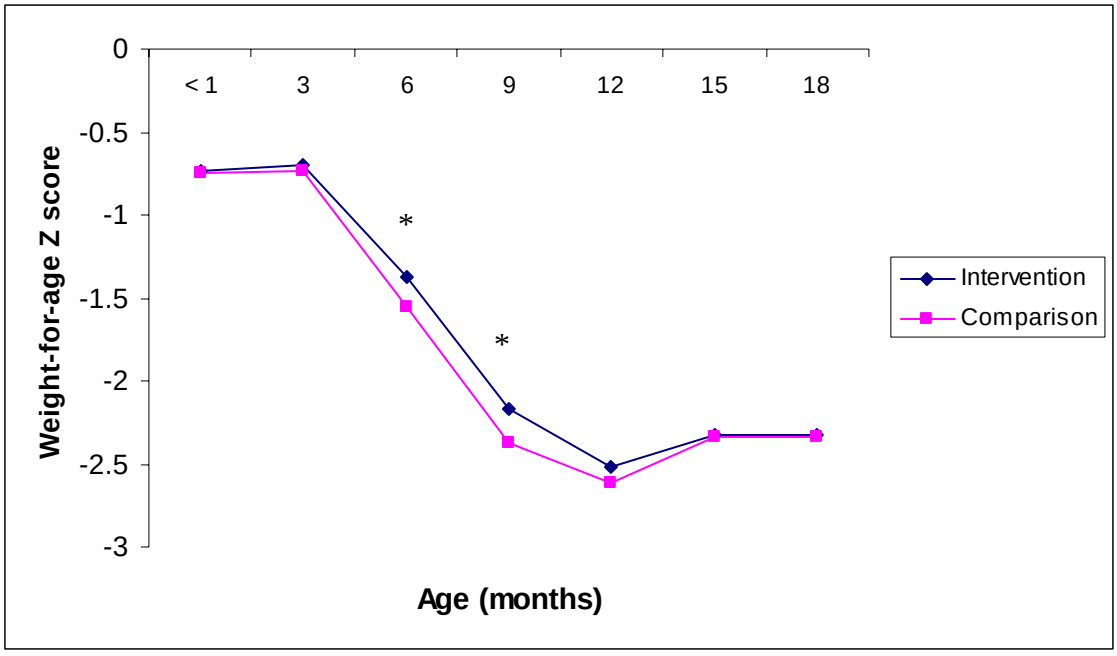
Table 12.1. Mean weight-for-age Z score (WAZ) among children in the cohort sample at follow-up from 0-18 months, by district

	Mean WAZ					
	All children		Boys		Girls	
Age (mo)	Intervention	Comparison	Intervention	Comparison	Intervention	Comparison
<1	- 0.73	-0.75	-0.78	-0.87	-0.66	-0.61
3	-0.70	-0.73	-0.73	-0.69	-0.66	-0.77
6	-1.37*	-1.56*	-1.57	-1.39	-1.35	-1.55
9	-2.17*	-2.37*	-2.24*	-2.46*	-2.10	-2.25
12	-2.52	-2.62	-2.62	-2.66	-2.42	-2.57
15	-2.32	-2.34	-2.34	-2.36	-2.30	-2.31
18	-2.33	-2.34	-2.35	-2.34	-2.31	-2.34

* Student t test comparing means by district, significant at p<0.05.

Figure 12.1 illustrates the divergence of mean WAZ between the districts. A very small increase in WAZ was observed in both districts from the initial postpartum visit to the subsequent visit at 3 months. From 3 to 12 months, mean WAZ in the comparison district declined slightly more precipitously than in the intervention district. From 12 to 15 months of age, the trend reverses direction, giving slightly improved WAZ in both districts. By the final follow-up visit at 18 months of age, mean WAZ were nearly equal in the 2 districts. It is important to note that the mean WAZ did not rise above -0.5 in either district for the entire cohort study period.

Figure 12.1. Mean WAZ among children in the cohort sample at follow-up from 0-18 months, by district



* Student t test comparing means by district, significant at p<0.05.

Table 12.2 gives the proportion of children who were classified as underweight (WAZ <-2 SD). During the first 6 months postpartum, the prevalence of underweight was more modest, but more than half of the children in both districts were underweight after 6 months of age. The proportion underweight was lower in the intervention than the comparison district from 3 through 12 months, but the difference was statistically significant at 6 months only. This same trend was observed for both boys ($p<0.05$ at 6 mo) and girls ($p<0.05$ at 12 mo). Underweight prevalence peaked at nearly 80% at 12 months and then dropped back to ~65% at 15-18 months in the comparison district.

Table 12.2. Underweight (% <-2SD WAZ) among children in the cohort sample at follow-up from 0-18 months, by district

	WAZ < -2SD (%)					
	All children		Boys		Girls	
Age (mo)	Intervention	Comparison	Intervention	Comparison	Intervention	Comparison
<1	12.3	13.6	15.7	20.4	8.4	5.1
3	6.0	8.9	4.9	8.7	7.3	9.0
6	21.1	29.5*	21.0	30.1*	21.3	28.7
9	62.1	65.1	66.7	68.3	57.3	61.2
12	72.7	78.0	77.9	77.3	67.6	78.9*
15	68.8	65.2	71.0	67.3	66.4	62.8
18	63.6	63.0	66.9	62.9	60.1	63.1

* Pearson X^2, significant at $p<0.05$

The 6-12 month period - when complementary foods are needed to optimize growth and infectious diseases associated with malnutrition (e.g. diarrhea) are highly prevalent - is known to be a particularly vulnerable phase for growth faltering. In both districts of the cohort study, there were very large increases in the proportion underweight from 6 to 12 months worth noting. Nonetheless, there was some evidence of a protective effect of the intervention on underweight during this period.

Stunting

The height-for-age index is used as a marker of linear growth and thought to reflect longer-term nutritional exposures. Similar to the findings from the cross sectional analysis, little or no intervention impact was demonstrated for improving height or diminishing losses in linear growth (Table 12.3). However, at the first postpartum visit during the neonatal period, children in the intervention district were significantly shorter than those in the comparison district. The reason for this initial difference is unclear, but it was erased by the subsequent follow-up visit at 3 months of age and no further height differences were observed for the duration of the study follow-up.

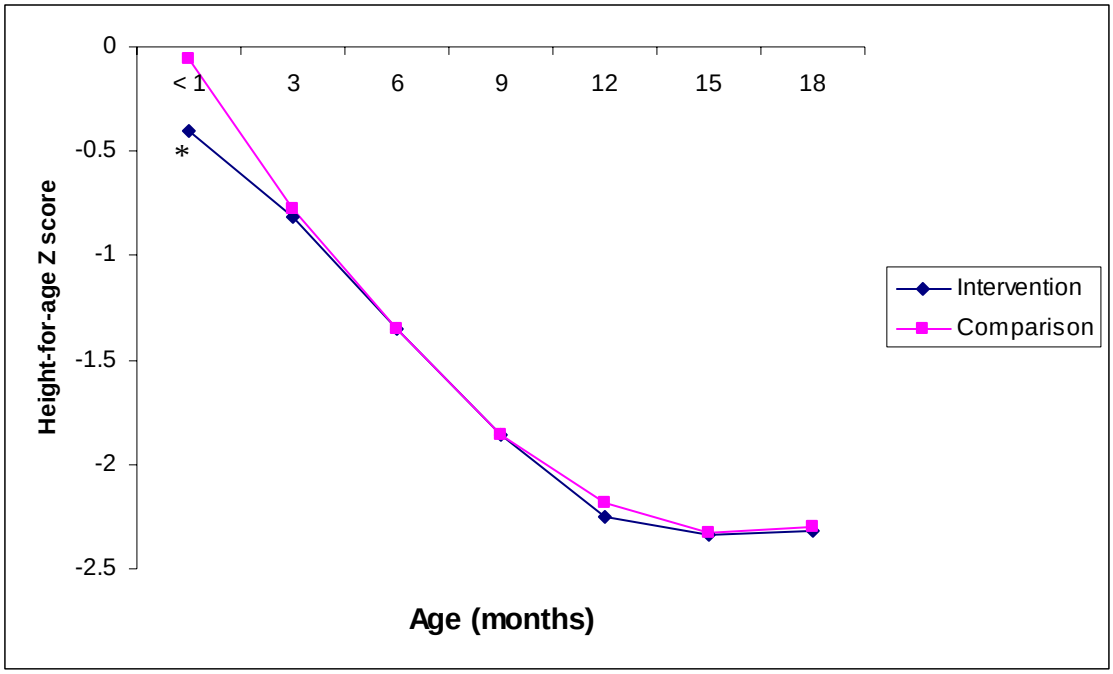
Table 12.3. Mean height-for-age Z score (HAZ) among children in the cohort sample at follow-up from 0-18 months, by district

	Mean HAZ					
	All children		Boys		Girls	
Age (mo)	Intervention	Comparison	Intervention	Comparison	Intervention	Comparison
<1	-0.40*	-0.06*	-0.38*	-0.14*	-0.42*	0.04*
3	-0.81	-0.78	-0.82	-0.79	0.80	0.78
6	-1.35	-1.35	-1.39	-1.47	-1.30	-1.25
9	-1.86	-1.86	-1.92	-2.01	-1.79	-1.67
12	-2.25	-2.18	-2.35	-2.28	-2.14	-2.05
15	-2.34	-2.33	-2.37	-2.34	-2.31	-2.31
18	-2.32	-2.30	-2.28	-2.27	-2.32	-2.38

* Student t test comparing means by district, significant at p<0.05.

As viewed in Figure 12.2, the mean HAZ in the 2 districts converged at 3 months of age and remained almost identical for the remainder of the follow-up visits. If the difference in mean HAZ between the 2 districts at the initial postpartum visit is taken as real, then the decline in the intervention district is less than that observed in the comparison district. Around 12 months, there is a leveling off of HAZ at approximately -2.3 in both districts. Again, the HAZ did not rise above the reference median at any age from birth to 18 months.

Figure 12.2. Mean height-for-age Z score (HAZ) among children in the cohort sample at follow-up from 0-18 months, by district



* Student t test comparing means by district, significant at p<0.05.

No statistically significant differences between the intervention and comparison districts were observed for prevalence of stunting (HAZ < -2 SD) in the cohort study among all children. An approximately 40-50 percentage point rise in the proportion stunted in both districts occurred between 3 and 12 months during the vulnerable complementary feeding period. Among all children, stunting prevalence was highest at 15-18 months. Disaggregating the sample by sex did not produce any significant differences between intervention and comparison groups for stunting prevalence with the exception of girls at the initial postpartum visit. The apparent length advantage in the comparison district appears to be driven by girls according to stunting prevalence.

Table 12.4. Stunting (% <-2SD HAZ) among children in the cohort sample at follow-up from 0-18 months, by district

	HAZ < -2SD (%)					
	All children		Boys		Girls	
Age (mo)	Intervention	Comparison	Intervention	Comparison	Intervention	Comparison
<1	6.5	4.0	5.6	5.7	7.5*	1.9*
3	12.0	11.7	10.7	15.1	13.4	7.6
6	21.2	26.4	22.9	30.8	19.3	20.7
9	42.5	42.4	46.6	50.3	38.0	32.8
12	59.8	55.7	63.5	60.6	56.1	49.5
15	62.0	63.6	65.2	63.7	58.7	63.4
18	60.9	61.4	61.0	59.3	60.8	64.0

* Pearson X^2, significant at $p<0.05$

Wasting

In contrast to the other two indices of WAZ and HAZ, the WHZ does not use chronological age to compare with the reference population. Instead, weight or body mass is examined relative to the height of individuals. This index, used to signify wasting or thinness, may be more responsive to short-term interventions or environmental factors influencing nutritional status. The cross-sectional analysis found the increases in wasting from baseline to endline were significantly reduced in the intervention versus comparison districts of Uttar Pradesh.

At 4 of the 7 follow-up visits, mean WHZ was significantly higher in the intervention relative to the comparison district, and a trend for higher average WHZ in the other rounds was found as well (Table 12.5). Both boys and girls in the intervention district had significantly higher average WHZ at the initial postpartum visit and at 9 months. Additionally, girls in the intervention district had statistically higher mean WHZ at 6 and 12 months as well. Nonetheless, these improvements in the intervention district disappeared for all children by 15 months of age.

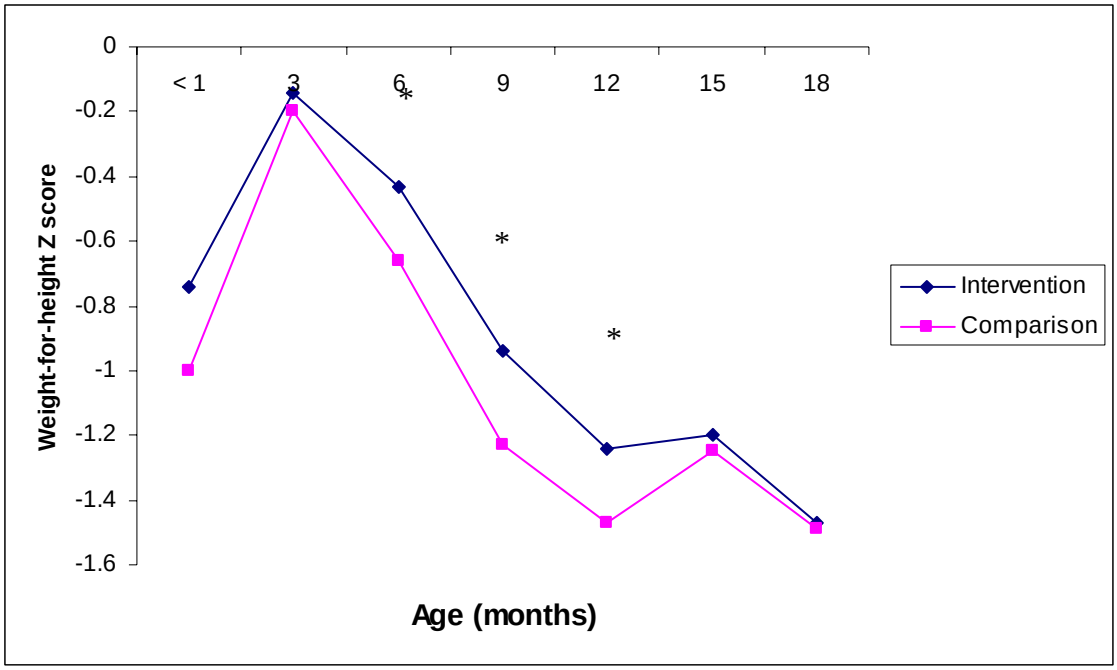
Table 12.5. Mean weight-for-height Z score (WHZ) among children in the cohort sample at follow-up from 0-18 months, by district

	Mean WHZ					
	All children		Boys		Girls	
Age (mo)	Intervention	Comparison	Intervention	Comparison	Intervention	Comparison
<1	-0.74	-1.00*	-0.69	-0.90*	-0.81	-1.12*
3	-0.14	-0.20	-0.19	-0.18	-0.07	-0.23
6	-0.43	-0.66*	-0.66	-0.51	0.34	-0.66*
9	-0.94	-1.23*	-1.05	-1.26*	-0.84	-1.19*
12	-1.24	-1.47*	-1.32	-1.46	-1.17	-1.49*
15	-1.20	-1.25	-1.21	-1.28	-1.18	-1.22
18	-1.47	-1.49	-1.50	-1.54	-1.43	-1.43

* Student t test comparing means by district, significant at p<0.05.

In contrast to Figures 12.1 and 12,2 for mean WAZ and HAZ, respectively, WHZ values increased in the first 3 months of life before following the typical declining trend until 12 months (Figure 12.3). Between 12 and 15 months, average WHZ improved slightly, only to falter again between 15 and 18 months. The intervention district WHZ remained above that of the comparison district throughout the study period – with greatest distances between intervention and comparison observed at 9 and 12 months.

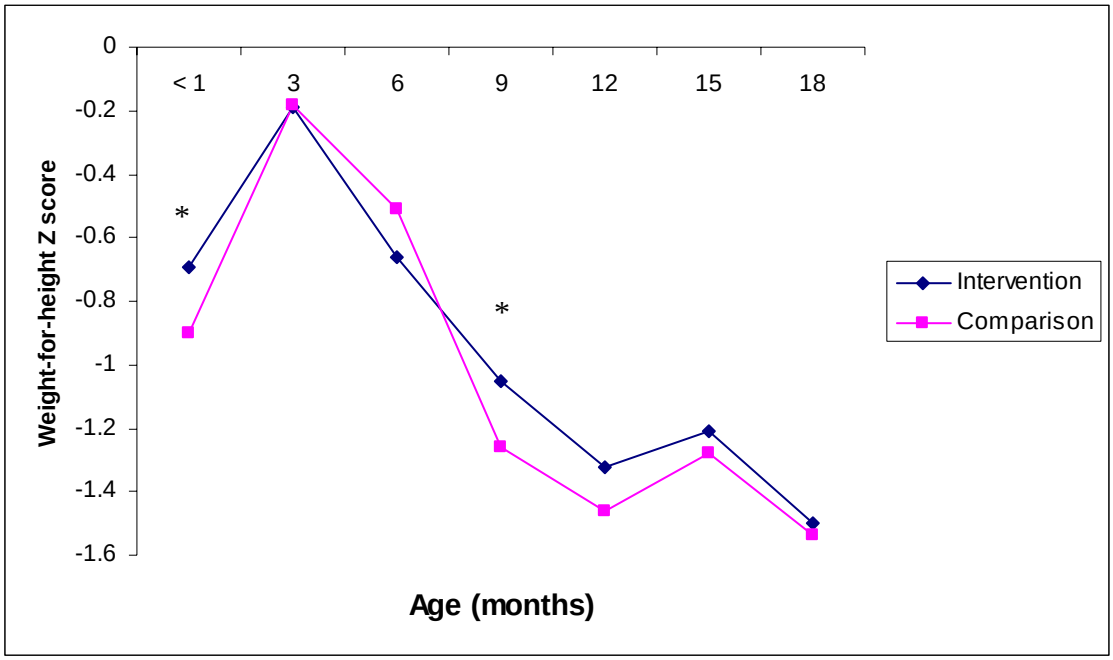
Figure 12.3. Mean weight-for-height Z score (WHZ) among children in the cohort sample at follow-up from 0-18 months, by district



* Student t test comparing means by district, significant at p<0.05.

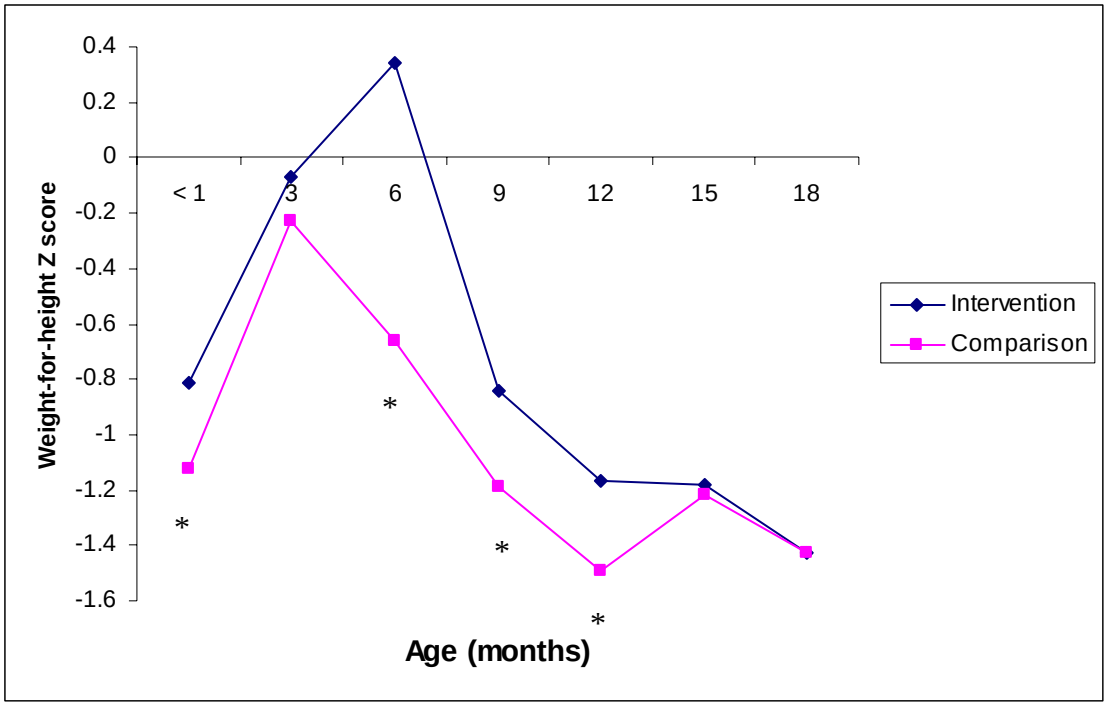
Figures 12.4 and 12.5 show average WHZ for boys and girls, respectively. The most apparent difference in these two figures is that average WHZ in the girls from the intervention district was above those observed in the girls from the comparison district throughout the study period, with a sizeable disparity observed at 6 months. At that age, the WHZ indicator among girls in the intervention district actually rose above the reference median only to fall precipitously at 9 months by 1.18 SD; WHZ of girls in the comparison district fell by 0.53 SD between those two ages. The differences by district observed for girls in the WHZ may be in part explained by lower average HAZ among girls observed from the initial postpartum visit to 12 months of age in the intervention district compared to the comparison district. Boys showed fewer differences by district in the cohort analysis of mean WHZ.

Figure 12.4. Mean weight-for-height Z score (WHZ) among boys in the cohort sample at follow-up from 0-18 months, by district



* Student t test comparing means by district, significant at p<0.05.

Figure 12.5. Mean weight-for-height Z score (WHZ) among girls in the cohort sample at follow-up from 0-18 months, by district



* Student t test comparing means by district, significant at p<0.05.

The proportion of children classified as wasted in the cohort study was very high in the non-emergency context of both districts. In the neonatal period, there were relatively high rates of wasting at the initial postpartum visit that were reduced at 3 and 6 months of the breastfeeding period (Table 12.6). From 9 to 18 months, prevalence of wasting was above 10% and by 18 months, over one-fourth of the children were wasted. The intervention district had significantly lower proportions wasted at 6 and 12 months. No differences were observed among the boys by district, and among the girls, there was significantly lower prevalence of wasting in round 6 months for the intervention district compared to the comparison district.

Table 12.6. Wasting (% <-2SD WHZ) among children in the cohort sample at follow-up from 0-18 months, by district

	WHZ < -2SD (%)					
	All children		Boys		Girls	
Age (mo)	Intervention	Comparison	Intervention	Comparison	Intervention	Comparison
<1	5.2	8.5	3.7	6.8	7.0	10.6
3	1.6	2.5	2.0	1.7	1.1	3.5
6	2.6	6.5*	3.4	6.4	1.7	6.7*
9	10.7	15.3	18.0	14.2	7.0	11.9
12	16.6	24.3*	18.2	25.8	14.9	22.3
15	15.1	15.1	15.9	16.8	14.3	12.9
18	27.3	28.1	31.9	31.5	23.1	23.4

* Pearson X^2, significant at $p<0.05$

Longitudinal modeling of physical growth

The previous sections have presented standardized measures of weight and height, centered in each age group. Growth patterns will now be considered longitudinally to examine the impact of the intervention on physical growth. A cubic polynomial equation has been applied to account for a declining rate of growth from 0-6 months that plateaus between 6 and 18 months, and begins to increase thereafter from 18-24 months. Interaction terms for district and age represent the growth differences between intervention and comparison districts.

Among all children, infants from the intervention district showed a 0.017 kg increase in weight in one month's time compared to infants in the comparison district ($p<0.06$), adjusting for confounding factors. This translates into a 0.199 kg increase over 12 months time. After stratifying by sex, the increase in weight among boys from the intervention district compared to the comparison district remained (0.011 kg/m), but was not significant. In the girls from the intervention district, however, there was a 0.026 kg/m increase in weight compared to the girls from the comparison district ($P<0.05$), and 0.307 kg for the entire year observed. After consideration of a significant negative quadratic age term – suggesting a declining rate of weight increases over 12 months - in the longitudinal model for girls, the total intervention effect for weight was 0.025 kg/m and 0.294 kg/yr.

A significant increase in height was found for all infants from the intervention district compared to the comparison district, 0.052 cm/months ($P=0.05$). Even with a 12-month accumulation calculated at 0.619 cm/yr, the difference in height for the children was minimal, albeit statistically significant. When longitudinal modeling was carried out for boys and girls separately, those from the intervention district still showed greater increases in height – 0.043 cm/m for boys and 0.069 cm/m for girls – though the effect was no longer statistically significant when disaggregated by sex. Similar to weight, girls from the intervention district demonstrated

the greater growth rate advantage compared to the increase noted for boys. Over one year's time, the heights of girls and boys from the intervention district were 0.82 and 0.51 cm greater, respectively, than those from the comparison district.

Thus, after controlling for confounding variables maternal age and education, longitudinal modeling showed a small, positive intervention effect for height (p=0.05) and a trend toward a positive intervention effect for weight (p=0.06). Only weight gain in girls retained significance when modeling growth separately by sex.

Summary

High rates of childhood malnutrition were found in both districts of the cohort study conducted in Uttar Pradesh. For all nutritional status indicators, there was a clear trend toward dramatically worsening status between 3 and 12 months of age. However, there was some limited evidence that nutritional status and physical growth among children less than 2 years of age were improved significantly in the intervention relative to the comparison district. Mean WHZ and wasting showed the greatest differences between districts throughout the study period. Children from the intervention district had consistently larger average WHZ than those in the comparison district, with significant differences at four of the seven follow-up visits. There was an important clustering of significant differences in WHZ and wasting at 6 through 12 months of age - a period when children are considered at high-risk for growth faltering. After stratifying by sex, the largest improvements attributable to the intervention during the latter half of infancy were observed among girls.

There was a consistent trend for higher average WAZ among children in the intervention relative to the comparison district during the first year of life that was statistically significant at 6 and 9 months only. Underweight was significantly lower among intervention district children at 6 months only. These trends were similar for boys and girls except that the intervention benefits appeared to extend to 12 months among girls only. With the exception of an uninterpretable difference at the initial postpartum visit during the neonatal period, no differences in HAZ and stunting prevalence were observed between the intervention and comparison districts.

At 6 months of age, it is recommended that infants are fed solid foods in addition to breast milk to increase the caloric and micronutrient density of the diets. This complementary feeding period, usually lasting from 6 to 24 months, may be a particularly vulnerable period for malnutrition and growth faltering. The risks arise from inadequate feeding practices, among other causes (e.g. infectious diseases), that were targeted by the CARE program. Some program effectiveness in the cohort analysis may be surmised from the response documented in the WHZ index, though additional investigation of program interventions in relation to outcomes is needed.

The longitudinal modeling of physical growth outcomes took into consideration confounding factors and assessed differences in the rate of weight and height gains between the districts. Small positive intervention effects were found, with a slight advantage demonstrated for girls. Infants from the intervention district grew just over one-half of a cm more over 12 months (0.619 cm/yr; P=0.05) compared to those in the comparison district. Weight gain in one year was about

one-fifth of a kilogram (0.199 kg; P=0.06) higher in the intervention district compared to the comparison district. This effect was statistically significant for weight gain in girls only.

Despite the positive intervention impacts, rates of underweight, stunting, and wasting reached unacceptable levels in these populations. Rapid ascents in malnutrition prevalences were especially observed in the 6-12 month period - with probable lifetime consequences. Wasting that exceeds 5% in a population signifies a potential crisis situation; in this sample of children, wasting reached and surpassed 25%. Over 60% of the children by 18 months of age were classified as stunted and underweight. Additional program and policy attention is obviously deserved.

CHAPTER 13: SUMMARY FINDINGS AND RECOMMENDATIONS FOR FURTHER ANALYSES

Summary findings

Antenatal care

- Receipt of ANC visits was universal in AP. INHP-II significantly increased ANC coverage in UP so that 50% of women reported at least one visit and 25% reported ≥3 visits during the most recent pregnancy.

- INHP-II was highly effective in both states at increasing outreach by service providers to provide ANC services and health and nutrition advice to pregnant women through home visits and contacts in the community. Approximately 50% of AP women and 60% of UP women reported at least one home visit by a service provider during the most recent pregnancy. Home visits by AWW increased most dramatically in both states. However, ANM and CA also increased their outreach significantly in UP. Service provider contacts at the Anganwadi Centers and Nutrition Health Days increased significantly also.

- Improvements in coverage and consumption of antenatal IFA supplementation were limited in AP. However, UP state recorded significant increases in the proportion of women who received (65%) and consumed (36%) ≥90 tablets during their most recent pregnancy. In both states, the proportion of women who consumed all the IFA tablets they received more than doubled by endline.

- Recent attendance at NHD increased significantly among pregnant women and mothers of children 0-23 months in both states. Coverage during the past 3 months was only ~15% in AP, but 34-39% in UP at endline. However, the proportion of women in both states who remain unaware of NHD is still too high.

Maternal nutrition

- Receipt of SN among pregnant and postpartum women increased significantly to ~50% in both states. At endline, consumption of SN was more common among intervention district than comparison district women also. In the recall of dietary intake during the past 7 days, SN intake was significantly increased among all groups of women in UP and among pregnant women only in AP.

- Consumption of at least 3 meals a day increased but snack consumption decreased in AP state where the vast majority of women already consumed 3 meals a day. In UP state, only 25% of women ate 3 meals a day at baseline, but both meal and snack consumption increased at endline. In both states, these changes in meal and snack consumption occurred among pregnant and recently delivered women as well as mothers of children 6-23 months of age.

- There were multiple improvements in women's diets attributable to INHP-II in both states. Recent consumption of legumes, dark green leafy vegetables, and yellow-orange fruits was increased among all groups of women in AP. In UP, only yellow-orange fruit

intake increased significantly among all women, but pregnant women and mothers of children 6-23 months increased their weekly intake of meat, fish, chicken and eggs and recently delivered women increased their dairy intake. Dietary messages delivered to women during pregnancy and the early postpartum period appeared to have a positive effect on all women's diets in many cases.

- Malnutrition was very high among pregnant and non-pregnant women in both states, but it was particularly alarming in the AP intervention district where over 50% of mothers of children 6-23 months were malnourished. However, malnutrition prevalence decreased significantly among first trimester pregnant women and mothers of children 6-23 months of age in AP. In UP, malnutrition decreased among third trimester pregnant women only. The increase in BMI of ~1 unit among the first (AP) and third (UP) trimester pregnant women in the intervention districts over a 2-year evaluation period is an impressive improvement.

- The INHP-II was not effective in reducing the prevalence of anemia among pregnant women in either state. Overall prevalence was comparable to the NFHS-2 prevalence although the severity of anemia was greater in this study population.

<u>Infant and child feeding</u>

- The INHP-II program was highly effective at improving newborn feeding practices, including increasing early initiation of breastfeeding and reducing the provision of prelacteal feeds. The intervention effects were particularly dramatic in UP state. More modest changes in these feeding practices occurred in the UP cohort.

- Exclusive breastfeeding among infants 0-5 months increased at endline in UP, but declined in AP. However, inappropriate early introduction of complementary foods and liquids before 6 months of age decreased significantly in both states. The decline in exclusive breastfeeding in AP was explained by an increase in breastfeeding with water, but the reasons for this are unknown. In the UP cohort, exclusive breastfeeding at 3-5 months of age was more prevalent in the intervention than comparison district, but early introduction of complementary foods was not affected by the intervention.

- The proportion of mothers of children 6-23 months of age who reported timely introduction of complementary foods at 6-8 months increased in both states, but only the increase in AP was attributable to the INHP-II intervention. Increases in cereal intake from the 24-hour recall among children 6-8 months were observed also in both states, but the increase in the intervention relative to the comparison district was significant in UP state only. By contrast, the intervention did not influence timely introduction of complementary foods among UP cohort mothers when defined by maternal recall or reported current dietary intake.

- In UP, the INHP-II program was highly effective at increasing consumption of cereals and legumes among children 6-23 months. In AP, cereal intake increased equally in both districts and legume intake remained low. Fruit and vegetable intake was not influenced by INHP-II complementary feeding messages in either state, but intake increased in the

UP districts and decreased in the AP districts. The intervention was highly effective also at increasing legume consumption from 9 to 18 months among children in the UP cohort. However, cereal intake increased equally in both districts and fruit and vegetable intake increased more rapidly among cohort children in the comparison than the intervention district.

- INHP-II was effective at increasing complementary feeding indicators of diet quantity, quality and feeding frequency among children 6-23 months of age in UP, but not AP state. Diet quantity, quality, and frequency did increase in AP and remained more prevalent than in UP, but improvements were comparable in the two AP districts. However, the quality, frequency, and particularly quantity of dietary intake among children 6-23 months remained quite inadequate at the end of the evaluation. The intervention was less effective in the UP cohort, increasing the feeding frequency, but not diet quantity or quality among children from 9 to 18 months of age.

- Receipt and consumption of SN among children 6-23 months was more prevalent in the intervention than comparison district in both states. However, recent declines in coverage and utilization of SN in late 2005 in the AP intervention district are of concern for the ongoing success of the program. The intervention was effective at distributing SN to families of weaning age children in the UP cohort as well.

- Mothers in the intervention district of both states were more likely than those in the comparison district to report that they usually fed their child. In UP only, the intervention was also effective at encouraging mothers to feed their young children from a separate, rather than a shared, plate. In the UP cohort, some variation in the intervention effects was observed. While intervention district mothers were more likely to usually feed their child than comparison district mothers, they were less likely to feed them from a separate plate. The explanation for the inconsistency in the intervention effect in UP is unknown.

<u>Micronutrient supplementation</u>

- Vitamin A supplementation coverage increased significantly in both states. Receipt of at least one dose of vitamin A syrup among children 12-23 months increased by ~50% to 79% coverage in AP and four-fold to 69% coverage in UP.

- Pediatric IFA supplementation coverage increased modestly to 30% in AP and dramatically to 69% in UP. Gains in coverage occurred during the second year of the intervention. However, few children reported consumption of more than a handful of tablets.

<u>Child nutritional status and anemia</u>

- The INHP-II intervention did not have an effect on child nutritional status in the study populations in AP and UP states.

- In AP state, underweight and stunting among all children did not change significantly. However, the mean HAZ score declined and severe wasting increased significantly in the intervention district. Stunting was increased significantly also among boys, but not girls.

- In UP state, underweight, stunting, and wasting did not change significantly. However, the underweight prevalence increased and mean HAZ score declined significantly among girls, but not boys in the intervention district.

- In the UP cohort, all 3 indicators of nutritional status followed the same worsening trend over the first 18 months of life that were observed in the cross-sectional data. However, there was limited evidence of a positive effect of the intervention on nutritional status and growth in the cohort sample. Mean WHZ was increased and wasting prevalence reduced among intervention children, particularly among girls from 3 to 12 months of age. The same benefits of the intervention were observed for mean WAZ and underweight prevalence at 6 and 9 months only. No effects on HAZ and stunting were observed.

- Longitudinal modeling of weight and height gains among cohort children identified small positive effects of the intervention on physical growth from 0 to 18 months of age. The borderline significant weight gain in intervention district children was larger and statistically significant for girls only. The height gain among intervention district children was statistically significant also, but was larger for girls also. When calculated over a 12-month period, children in the intervention district were predicted to have an additional 200 g weight gain and 0.6 cm gain in height relative to those in the comparison district. The comparable gains for girls only were an additional 300 g weight gain and 0.8 cm gain in height.

- The INHP-II program was not effective at reducing anemia among children 12-23 months of age in either state, and overall prevalence remained >85% at endline.

Recommendations for Further Analyses

The INHP-II program was quite successful at improving maternal dietary practices and nutrition, infant and child feeding practices, and micronutrient supplementation in the intervention districts of both states, but particularly in UP. The pre-test, post-test, quasi-experimental design of this study allowed for evaluation of program impact on various indicators of these outcomes that are considered key to improved child nutritional status and health. However, study data from both the pre-test, post-test evaluation and the cohort also provide a valuable and unique resource to explore in detail the sociodemographic, environmental, health care utilization, and program factors that are associated with or predict key study outcomes. Listed below are some examples of additional analyses of the Nutrition Evaluation Research data that would be of high priority to better understand which factors and program inputs were most strongly associated with positive maternal and child nutrition outcomes. The following list is a starting point only.

<u>Infant and child feeding</u>

- Sociodemographic, environmental, pregnancy, antenatal care utilization and program factors/predictors associated with early initiation of breastfeeding

- Survey data: cross-sectional association of the factors with early breastfeeding initiation in the endline data in AP and UP.
- Cohort data: Factors assessed at pregnancy enrollment and immediately postpartum that predicted early breastfeeding initiation in the 2 UP districts

- Sociodemographic, environmental, pregnancy, health care utilization, delivery, infant feeding, and program factors/predictors associated with exclusive breastfeeding and early introduction of complementary foods and liquids.
  - Survey data: cross-sectional association of factors with exclusive breastfeeding and early introduction of complementary foods and liquids among children 0-5 months of age in AP and UP
  - Cohort data: Factors assessed at pregnancy enrollment, and 1, 3, and 6 months postpartum that predicted a) exclusive breastfeeding until 6 months of age or b) early introduction of complementary foods and liquids in 2 UP districts.

- Sociodemographic, environmental, health care utilization, infant, and program factors/predictors associated with introduction of solids to breastfeeding infants 6-11 months of age

- Sociodemographic, environmental, health care utilization, infant, and program factors/predictors associated with adequate quantity, frequency, and diversity of dietary intake among children 6-23 months of age

- The association between diversity in the diets of mothers and their children (cross-sectionally from survey data and longitudinally from cohort data).

- Evaluation of variation in intervention impact on infant and child feeding practices by child sex and household socioeconomic status (survey data).

<u>Child nutritional status and anemia</u>

- Sociodemographic, environmental, health care utilization, maternal, infant, and program factors/predictors of a) malnutrition, and b) good nutritional status of children at 6, 12, 18, and 24 months of age
  - Survey data: cross-sectional association of factors with a) malnutrition, and b) good child nutritional status
  - Cohort data: Factors assessed at pregnancy enrollment, and at 1, 3, 6, 9, 12, 15, and 18 months of age that predicted a) malnutrition and b) good nutritional status as 6, 12, and 18 months of age.

- Intervention effect on nutritional status and growth from 0-18 months of age in the 2 UP districts (cohort – in process)

- Sociodemographic, environmental, health care utilization, maternal, infant, and program predictors of good physical growth between birth and 18 months of age in the 2 UP districts (cohort).

- Sociodemographic, environmental, health care utilization, maternal, infant, and program factors associated with anemia among children 12-23 months of age

- The association between receipt and consumption of pediatric IFA supplements and child anemia.

Micronutrient supplementation

- Sociodemographic, environmental, health care utilization, maternal, infant and program factors/predictors of receipt and consumption of pediatric IFA supplements (survey and cohort data)

Maternal Nutrition

- Sociodemographic, environmental, dietary, and program factors/predictors (advice given, receipt of SN, etc.) of women's BMI and malnutrition
    - Survey data: cross-sectional association of factors with BMI and malnutrition
    - Cohort data: Factors assessed at pregnancy enrollment associated with third trimester BMI
- Association of third trimester BMI and neonatal weight (cohort data)
- Sociodemographic, environmental, dietary, health utilization, pregnancy, delivery, and program (contacts with service providers, attendance at NHD, advice given, etc.) factors associated with the receipt and consumption of SN

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APPENDIX I: CARE India's INHP-II Basic Package of Nutrition Interventions

Life Cycle Period	Basic Package

Pregnancy	*3 contacts*
	• Iron Folic Acid (IFA large) supplementation
	• Rest for 1-2 hours
	• Dietary advice
	  • Consume one additional meal everyday
	  • Consume all available foods in the house
	  • Consume Supplementary Nutrition (SN)

Birth- 28 days	*3+ contacts at 0, 3 and 7 days*
	• Initiate breastfeeding within 1 hour
	• Exclusive breastfeeding
	  • Make sure baby is getting as much milk as possible, e.g. correct position and attachment
	  • Feed from one breast until soft and then switch to the other in order for child to receive fore and hind milk
	•
	• For newborn who does not feed vigorously; provide expressed breast milk with clean cup and spoon as long as breastfeeding is not adequately vigorous; frequent feeding
	• Dietary advice for mother
	  • Consume one additional meal everyday
	  • Consume all available foods in the house
	  • Consume SN

1-5 months	*3 contacts at 1.5, 2.5 and 3.5 months*
	• Exclusive breastfeeding for 6 months
	• Dietary advice for mother
	  • Consume one additional meal everyday
	  • Consume all available foods in the house
	  • Consume SN

6-8 months	*1+ contact*
	• Continued breastfeeding
	• Appropriate Complementary Feeding
	  • Initiate complementary foods: rice, dal, *suji*, banana etc.
	  • Start with few teaspoons and gradually increase the quantity
	  • Child should be fed 1/2 *katori* of soft mashed food 3 times a day, with 1/2 to 1 tsp of oil added
	  • Feed the child yourself from a separate plate or bowl to assess how much the child has eaten; interact with the child
	  • During illness breastfeed more frequently, provide fluids
	  • After illness give more food at each sitting and feed more frequently until the child has regained weight

9-11 months	*1+ contact*
	• Continued breastfeeding
	• Appropriate Complementary Feeding
	  • Child should be fed 1/ 2 *katori* of soft mashed food (rice, *dal*, vegetables, green leafy vegetables, fruits. Milk products, egg , meat , fish if available and feasible) 4 times with 1 tsp of oil added
	  • Feed the child yourself from a separate plate or bowl to assess how much the child has eaten; interact with the child
	  • During illness breastfeed more frequently, provide fluids
	  • After illness give more food at each sitting and feed more frequently until the child has regained weight
	• Vitamin A and measles immunization at 9 months

12-24 months	*2+ contacts*
	• Continued breastfeeding
	• Appropriate Complementary Feeding
	  • Child should be fed 3/4 *katori* of soft mashed food (rice, *dal*, green leafy vegetables, other vegetables, fruits. Milk products, egg , meat , fish if available and feasible) 4-5 times a day with 1-2 tsp oil
	  • Feed the child yourself from a separate plate or bowl to assess how much the child has eaten; interact with the child
	  • During illness breastfeed more frequently, provide fluids
	  • After illness give more food at each sitting and feed more frequently until the child has regained weight
	• Vitamin A at 18 months
	• Give iron supplements beginning 12 months {GOI policy, available for about 50% of children}

APPENDIX II: ADDITIONAL TABLES FROM THE PRE-TEST, POST-TEST EVALUATION

A. Antenatal Care Services

Andhra Pradesh

Table A.1. Mothers of children 0-5 months of age reporting 1+ service provider home visits during the last pregnancy in Andhra Pradesh

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall	34.9	56.0	21.1	24.3	29.9	5.6	15.5*
ANM	30.3	41.6	11.3	22.1	23.2	1.1	10.2*
AWW	13.6	47.6	34	8.2	16.1	7.9	26.1*
CA	0	3.0	3	0.2	0.2	0	3*
Total # of mothers	624	563		646	622		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Table A.2. Mothers of children 0-5 months of age reporting 1-2, 3+ service provider home visits during the last pregnancy in Andhra Pradesh

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall							
1-2	13.9	13.5	-0.4	9.9	11.1	1.2	-1.6
3+	21.0	42.5	21.5	14.4	18.8	4.4	17.1*
ANM							
1-2	13.6	17.2	3.6	11.0	12.7	1.7	1.9
3+	16.7	24.3	7.6	11.2	10.5	-0.7	8.3*
AWW							
1-2	5.9	18.3	12.4	4.6	8.4	3.8	8.6*
3+	7.7	29.3	21.6	3.6	7.7	4.1	17.5*
CA							
1-2	0	1.1	1.1	0	0.2	0.2	0.9*
3+	0.2	2.0	1.8	0	0	0	1.8*
Total # of mothers	624	563		646	622		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Table A.3. Mothers of children 0-5 months of age reporting 1+ times receiving advice from places other than home during the last pregnancy in Andhra Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ times receiving advice from places other than home during during the last pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall		56.7			55.6		

AWC		50.4*			40.8*		
NHD		15.1*			8.5*		
Mahila		0.4			0.6		
Others		7.1*			20.1*		
Total # of mothers		563			622		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table A.4. Mothers of children 0-5 months of age reporting 1-2, 3+ service provider home visit during the last 3 months of the most recent pregnancy in Andhra Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last 3 months of pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall							
1-2		19.9			12.9		
3+		22.2			9.8		
ANM							
1-2		23.5			13.0		
3+		6.9			4.0		
AWW							
1-2		25.8			9.2		
3+		11.6			2.9		
CA							
1-2		1.4			0.2		
3+		1.1			0		
Total # of mothers		563			622		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table A.5. Mothers of children 0-5 months of age reporting 1+ service provider home visit during the last 3 months of the most recent pregnancy in Andhra Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last 3 months of the most recent pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall		42.1*			22.7*		
ANM		30.4*			17.0*		
AWW		37.3*			12.1*		
CA		2.5*			0.2*		
Total # of mothers		563			622		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table A.6. Mothers of children 0-5 months of age reporting 1+ times receiving advice from places other than home during the last 3 months of the most recent pregnancy in Andhra Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ times receiving advice from places other than home during the last 3 months of the most recent pregnancy (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall		40.9			43.6		
AWC		36.4*			30.4*		
NHD		9.6*			5.5*		
Mahila		n/a			n/a		
Others		5.5*			18.5*		
Total # of mothers		563			622		

* Statistical test result comparing intervention and control districts at endline, significant at $p<0.05$

Table A.7. Pregnancy advice on diet, rest, and IFA supplements given during home visits to mothers of children 0-5 months of age who received any advice during last pregnancy in Andhra Pradesh (endline only)

Pregnancy advice by service provider type	Advice received (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Auxilary Nurse Midwife (ANM)							
Diet		54.6*			37.5*		
Rest		49.1*			33.7*		
IFA supplements		44.2			51.9		
Breastfeeding advice		10.9*			1.9*		
Total # of mothers 0-5m who received advice from ANM		165			104		
Anganwadi worker (AWW)							
Diet		54.2			58.9		
Rest		59.7*			41.1*		
IFA supplements		40.8*			17.8*		
Breastfeeding advice		9.0*			1.4*		
Total # of mothers 0-5m who received advice from AWW		201			73		
Change Agent							
Diet		62.5			n/a		
Rest		50.0			n/a		
IFA supplements		37.5			n/a		
Breastfeeding advice		12.5			n/a		
Total # of mothers 0-5m who received advice from CA		16			n/a		

* Statistical test result comparing intervention and control districts at endline, significant at $p<0.05$

Uttar Pradesh

Table A.8. Mothers of children 0-5 months of age reporting 1+ service provider home visit during the last pregnancy in Uttar Pradesh

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall	23.1	70.4	47.3	18.4	25.1	6.7	40.6*
ANM	17.4	47.8	30.4	11.7	18.3	6.6	23.8*
AWW	7.6	57.4	49.8	4.8	9.4	4.6	45.2*
CA	1.2	28.2	27	0	0.3	0.3	26.7*
Total # of mothers	804	763		727	682		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Table A.9. Mothers of children 0-5 months of age reporting 1-2, 3+ service provider home visits during the last pregnancy in Uttar Pradesh

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall							
1-2	15.4	15.2	-0.2	13.8	17.6	3.8	-4.0
3+	7.7	55.2	47.5	4.7	7.5	2.8	44.7*
ANM							
1-2	13.6	26.9	13.3	9.8	16.9	7.1	6.2*
3+	3.9	21.0	17.1	1.9	1.5	-0.4	17.5*
AWW							
1-2	4.5	21.0	16.5	2.6	5.7	3.1	13.4*
3+	3.1	36.4	33.3	2.2	3.7	1.5	31.8*
CA							
1-2	0.5	11.9	11.4	0	0.3	0.3	11.1*
3+	0.8	16.3	15.5	0	0	0	15.5*
Total # of mothers	804	763		727	682		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Table A.10. Mothers of children 0-5 months of age reporting 1+ times receiving advice from places other than home during the last pregnancy in Uttar Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ times receiving advice from places other than home during during the last pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall		55.3*			20.8*		
AWC		38.0*			7.9*		
NHD		32.4*			2.2*		
Mahila		3.3*			0*		
Others		12.6			12.3		
Total # of mothers		763			682		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table A.11. Mothers of children 0-5 months of age reporting 1-2, 3+ service provider home visits during the last 3 months of the most recent pregnancy in Uttar Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last 3 months of pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall*							
1-2		19.1			16.7		
3+		40.0			3.5		
ANM*							
1-2		29.8			14.8		
3+		8.0			0.9		
AWW*							
1-2		27.3			5.1		
3+		19.5			1.0		
CA*							
1-2		12.2			0		
3+		9.8			0		
Total # of mothers		763			682		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table A.12. Mothers of children 0-5 months of age reporting 1+ service provider home visit during the last 3 months of the most recent pregnancy in Uttar Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ service provider home visit during the last 3 months of the most recent pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall		59.1*			20.2*		
ANM		37.8*			15.7*		
AWW		46.8*			6.2*		
CA		22.0*			0*		
Total # of mothers		763			682		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table A.13. Mothers of children 0-5 months of age reporting 1+ times receiving advice from places other than home during the last 3 months of the most recent pregnancy in Uttar Pradesh (endline only)

Service provider type	Mothers of 0-5 month olds reporting 1+ times receiving advice from places other than home during the last 3 months of the most recent pregnancy (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Overall		37.2*			12.0*		
AWC		26.3*			5.6*		
NHD		23.3*			1.2*		
Mahila		1.2			0.6		
Others		4.7			6.0		
Total # of mothers		763			682		

* Statistical test result comparing intervention and control districts at endline, significant at $p<0.05$

Table A.14. Pregnancy advice on diet, rest, and IFA supplements given during home visits to Mothers of children 0-5 months of age who received any advice during last pregnancy in Uttar Pradesh (endline only)

Pregnancy advice by service provider type	Advice received (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Auxilary Nurse Midwife (ANM)							
Diet		56.4*			19.6*		
Rest		42.9*			8.8*		
IFA supplements		54.2			52.0		
Breastfeeding advice		14.5*			1.0*		
Total # of mothers 0-5m who received advice from ANM		282			102		
Anganwadi worker (AWW)							
Diet		62.2*			35.3*		
Rest		51.6*			23.5*		
IFA supplements		47.4*			31.4*		
Breastfeeding advice		19.8*			2.0*		
Total # of mothers 0-5m who received advice from AWW		384			51		
Change Agent							
Diet		66.1			n/a		
Rest		54.8			n/a		
IFA supplements		44.6			n/a		
Breastfeeding advice		28.5					
Total # of mothers 0-5m who received advice from CA		186			n/a		

* Statistical test result comparing intervention and control districts at endline, significant at $p<0.05$

B. Rest during Pregnancy and the Postpartum Period

Table B.1. Afternoon rest (≥2 hours) during the past week among pregnant women and mothers of children 0-5 months in Andhra Pradesh

	Afternoon rest for ≥2 hours during the past week (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	79.9 (582)	61.1 (572)	-18.8	76.1 (632)	57.0 (703)	-19.1	0.3
Mothers of children 0-5 months	66.5 (624)	48.1 (563)	-18.4	79.2 (638)	58.0 (622)	-21.2	2.8

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table B.2. Afternoon rest (≥2 hours) during the past week among pregnant women and mothers of children 0-5 months in Uttar Pradesh

	Afternoon rest for ≥2 hours during the past week (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Pregnant women	26.9 (745)	38.8 (724)	11.9	27.2 (699)	24.4 (676)	-2.8	14.7*
Mothers of children 0-5 months	22.7 (802)	24.6 (763)	1.9	13.8 (724)	14.8 (682)	1.0	0.9

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

C. Delivery, Newborn, and Postpartum Care

Andhra Pradesh

Table C. 1. Place of delivery among women of infants 0-5 months of age in Andhra Pradesh

	Place of delivery (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Sub-Center, PHC, Govt Hospital	11.9	15.0	3.1	36.9	38.6	1.7	1.4
Private Clinic, Hospital	59.8	64.6	4.8	17.3	28.1	10.8	-6
At Home	27.7	20.2	-7.5	42.2	33.1	-9.1	1.6
Other	0.2	0.2	0	2.2	0	-2.2	2.2*
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.2. Birth attendant among women of infants 0-5 months of age in Andhra Pradesh

	Birth Attendant (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
No assistance during delivery	0.8	0.5	-0.3	0.6	0.2	-0.4	0.1
Untrained birth attendant (Dai), relative, or Dai training status unknown	11.9	6.5	-5.4	32.7	16.9	-15.8	10.4*
Trained Dai/TBA	4.4	9.4	5	6.7	11.4	4.7	0.3
Doctor/nurse /ANM	80.5	81.2	0.7	57.6	69.3	11.7	-11*
Other	0.3	2.4	2.1	2.3	2.3	0	2.1
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.3. Postpartum contacts with ANM among mothers of infants 0-5 months of age in Andhra Pradesh

1+ contacts	1+ postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
	37.1	47.7	10.6	33.3	40.5	7.2	3.4
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.4. Postpartum contacts with AWW among mothers of infants 0-5 months of age in Andhra Pradesh

1+ contacts	1+ postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
	30.5	56.1	25.6	29.8	28.9	-0.9	26.5*
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.5. Postpartum contacts with CA among mothers of infants 0-5 months of age in Andhra Pradesh

1+ contacts	1+ postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference
	Baseline	Endline	Δ	Baseline	Endline	Δ	of Δ
	0.6	4.3	3.7	n/a	n/a		
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.6. Postpartum contacts on the day of delivery with ANM among mothers of infants 0-5 months of age who delivered at home in Andhra Pradesh

1+ contacts	postpartum contacts on the day of delivery (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	3.5	4.5	1	1.9	1.0	-0.9	1.9
Total # of mothers 0-5 mo who delivered at home	172	112		271	204		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.7. Postpartum contacts on the day of delivery with AWW among mothers of infants 0-5 months of age who delivered at home in Andhra Pradesh

1+ contacts	postpartum contacts on the day of delivery (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	1.2	2.7	1.5	0	2.0	2	-0.5
Total # of mothers 0-5 mo who delivered at home	172	102		271	174		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.8. Postpartum contacts on the day of delivery with CA among mothers of infants 0-5 months of age who delivered at home in Andhra Pradesh

1+ contacts	postpartum contacts on the day of delivery (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	0	0		n/a	n/a		
Total # of mothers 0-5 mo who delivered at home	172	102		271	174		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.9. Postpartum contacts in the first week after delivery with ANM among mothers of infants 0-5 months of age who delivered at home in Andhra Pradesh

1+ contacts	postpartum contacts on the first week after delivery (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	11.1	14.3	3.2	6.6	4.4	-2.2	5.4
Total # of mothers 0-5 mo who delivered at home	172	112		271	204		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.10. Postpartum contacts in the first week after delivery with AWW among mothers of infants 0-5 months of age who delivered at home in Andhra Pradesh

1+ contacts	postpartum contacts on the first week after delivery (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	10.5	18.8	8.3	9.2	4.4	-4.8	13.1*
Total # of mothers 0-5 mo who delivered at home	172	102		271	174		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.11. Postpartum contacts in the first week after delivery with CA among mothers of infants 0-5 months of age who delivered at home in Andhra Pradesh

1+ contacts	postpartum contacts on the first week after delivery (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	0	1.8	1.8	n/a	n/a		
Total # of mothers 0-5 mo who delivered at home	172	102		271	174		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.12. Postpartum contacts (0, 1-2, 3+) with ANM among mothers of infants 0-5 months of age in Andhra Pradesh

Number of contacts	postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	22.1	27.2	5.1	22.7	25.9	3.2	1.9
3+	15.0	20.5	5.5	10.5	14.6	4.1	1.4
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.13. Postpartum contacts (0, 1-2, 3+) with AWW among mothers of infants 0-5 months of age in Andhra Pradesh

Number of contacts	postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	20.2	29.0	8.8	23.0	18.3	-4.7	13.5*
3+	10.1	26.1	16	6.5	9.6	3.1	12.9*
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.14. Postpartum contacts (0, 1-2, 3+) with CA among mothers of infants 0-5 months of age in Andhra Pradesh

Number of contacts	postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	0.5	2.4	1.9	n/a	n/a		
3+	0.2	2.2	2	n/a	n/a		
Total # of mothers 0-5m	625	551		648	617		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.15. Number of home visits by ANM in the first week (including the day of delivery) among mothers of infants 0-5 months of age in Andhra Pradesh (endline survey only)

Number of contacts	postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	-	11.0*		-	5.0*		
3+	-	1.4		-	1.0		
Total # of mothers 0-5m	-	551		-	617		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table C.16. Number of home visits by AWW in the first week (including the day of delivery) among mothers of infants 0-5 months of age in Andhra Pradesh (endline survey only)

Number of contacts	postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	-	11.7*		-	4.0*		
3+	-	3.0		-	1.5		
Total # of mothers 0-5m	-	497		-	504		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table C. 17. Number of home visits by CA in the first week (including the day of delivery) among mothers of infants 0-5 months of age in Andhra Pradesh (endline survey only)

Number of contacts	postpartum contacts (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	-	0.5		-	0		
3+	-	0.4		-	0		
Total # of mothers 0-5m	-	497		-	504		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table C.18. Advice received at postpartum contacts with ANM among mothers of infants 0-5 months of age in Andhra Pradesh

	Advice received among all mothers who received any advice (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any breastfeeding advice	19.4	60.7	41.3	6.5	22.1	15.6	25.4*
Any complementary feeding advice	7.3	17.1	9.8	4.4	4.4	0	9.8*
Advice to have child weighed	14.1	34.6	20.5	28.3	15.3	-13	33.5*
Any child health advice	76.4	81.3	4.9	79.0	90.8	11.8	-6.9
Any maternal nutrition advice	31.4	24.1	-7.3	28.3	8.4	-19.9	12.6*
Total # of mothers 0-5 mo who received any advice	191	257		138	249		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.19. Advice received at postpartum contacts with AWW among mothers of infants 0-5 months of age in Andhra Pradesh

Type of advice received	Advice received among all mothers who received any advice (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any breastfeeding advice	19.3	64.2	44.9	4.2	30.7	26.5	18.4*
Any complementary feeding advice	6.0	28.7	22.7	2.8	13.5	10.7	12*
Advice to have child weighed	30.1	45.4	15.3	50.7	38.7	-12	27.3*
Any child health advice	64.5	62.1	-2.4	66.2	54	-12.2	9.8
Any maternal nutrition advice	36.1	40.3	4.2	31.7	26.4	-5.3	9.5
Total # of mothers 0-5 mo who received any advice	166	293		142	163		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.20. Advice received at postpartum contacts with CA among mothers of infants 0-5 months of age in Andhra Pradesh

Type of advice received	Advice received among all who mothers who received any advice (%)						
	Intervention (Karimnagar)			Comparison (Rangareddy)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any breastfeeding advice	50.0	80.0	30	n/a	n/a		
Any complementary feeding advice	0	45.0	45	n/a	n/a		
Advice to have child weighed	0	30.0	30	n/a	n/a		
Any child health advice	50.0	80.0	30	n/a	n/a		
Any maternal nutrition advice	50.0	30.0	-20	n/a	n/a		
Total # of mothers 0-5 mo who received any advice	2	21		n/a	n/a		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Uttar Pradesh

Table C.21. Place of delivery among mothers of infants 0-5 months of age in Uttar Pradesh

	Place of delivery (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Sub-Center, PHC, Govt Hospital	7.5	8.9	1.4	5.0	9.9	4.9	-3.5
Private Clinic, Hospital	7.8	16.4	8.6	6.2	8.7	2.5	6.1*
At Home	82.7	73.9	-8.8	85.8	80	-5.8	-3
Other	0.8	0.8	0	2.6	1.5	-0.9	0.9
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Table C.22. Birth attendant among mothers of infants 0-5 months of age in Uttar Pradesh

	Birth Attendant (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
No assistance during delivery	3.7	1.2	-2.5	5.3	5.3	0	-2.5
Untrained birth attendant (Dai), relative, or Dai training status unknown	53.4	50.7	-2.7	68.7	62.5	-6.2	3.3
Trained Dai/TBA	3.2	8.2	5	4.0	2.4	-1.6	6.6*
Doctor/nurse /ANM	22.8	30.2	7.4	16.3	21.3	5	2.4
Other	16.9	9.6	-6.7	5.7	8.6	2.9	-9.6*
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.23. Postpartum contacts with ANM among mothers of infants 0-5 months of age in Uttar Pradesh

1+ contacts	1+ postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	29.2	66.8	37.6	25.6	25.8	0.2	37.4*
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C. 24. Postpartum contacts with AWW among mothers of infants 0-5 months of age in Uttar Pradesh

1+ contacts	1+ postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	17.9	71.2	53.3	10	14.8	4.8	48.5*
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.25. Postpartum contacts with CA among mothers of infants 0-5 months of age in Uttar Pradesh

1+ contacts	1+ postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	5.1	33.7	28.6	n/a	n/a		
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.26. Postpartum contacts on the day of delivery with ANM among mothers of infants 0-5 months of age who delivered at home in Uttar Pradesh

1+ contacts	postpartum contacts on the day of delivery (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	1.8	5.0	3.2	0.8	1.5	0.7	2.5*
Total # of mothers 0-5 mo who delivered at home	665	556		621	529		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.27. Postpartum contacts on the day of delivery with AWW among mothers of infants 0-5 months of age who delivered at home in Uttar Pradesh

1+ contacts	postpartum contacts on the day of delivery (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	0.9	4.8	3.9	1.0	1.1	0.1	3.8*
Total # of mothers 0-5 mo who delivered at home	665	556		621	529		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.28. Postpartum contacts on the day of delivery with CA among mothers of infants 0-5 months of age who delivered at home in Uttar Pradesh

1+ contacts	postpartum contacts on the day of delivery (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	0.8	6.3	5.5	n/a	n/a		
Total # of mothers 0-5 mo who delivered at home	665	556		621	529		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.29. Postpartum contacts in the first week after delivery with ANM among mothers of infants 0-5 months of age who delivered at home in Uttar Pradesh

1+ contacts	postpartum contacts on the first week after delivery (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	4.2	16.8	8.6	3.9	1.7	-2.2	10.8*
Total # of mothers 0-5 mo who delivered at home	665	556		621	529		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.30. Postpartum contacts in the first week after delivery with AWW among mothers of infants 0-5 months of age who delivered at home in Uttar Pradesh

1+ contacts	postpartum contacts on the first week after delivery (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	1.8	28.0	26.2	1.1	1.9	0.8	25.4*
Total # of mothers 0-5 mo who delivered at home	665	556		621	529		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.31. Postpartum contacts in the first week after delivery with CA among mothers of infants 0-5 months of age who delivered at home in Uttar Pradesh

1+ contacts	postpartum contacts on the first week after delivery (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
	0.6	12.4	11.8	n/a	n/a		
Total # of mothers 0-5 mo who delivered at home	665	556		621	529		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C. 32. Postpartum contacts (0, 1-2, 3+) with ANM among mothers of infants 0-5 months of age in Uttar Pradesh

Number of contacts	postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	21.3	37.7	16.4	20.4	21.5	1.1	15.3*
3+	8.0	29.1	21.1	5.2	4.3	-0.9	22*
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.33. Postpartum contacts (0, 1-2, 3+) with AWW among mothers of infants 0-5 months of age in Uttar Pradesh

Number of contacts	postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	12.4	31.9	19.5	6.7	11.4	4.7	14.8*
3+	5.4	39.3	33.9	3.3	3.4	0.1	33.8*
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.34. Postpartum contacts (0, 1-2, 3+) with CA among mothers of infants 0-5 months of age in Uttar Pradesh

Number of contacts	postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	4.1	17.5	13.4	n/a	n/a		
3+	1.0	16.2	15.2	n/a	n/a		
Total # of mothers 0-5m	804	759		731	679		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.35. Number of home visits by ANM in the first week (including the day of delivery) among mothers of infants 0-5 months of age in Uttar Pradesh (endline survey only)

Number of contacts	postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	-	17.6*		-	3.2*		
3+	-	2.9*		-	0.2*		
Total # of mothers 0-5m	-	759		-	679		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table C.36. Number of home visits by AWW in the first week (including the day of delivery) among mothers of infants 0-5 months of age in Uttar Pradesh (endline survey only)

Number of contacts	postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	-	24.9*		-	2.4*		
3+	-	5.5*		-	0*		
Total # of mothers 0-5m	-	759		-	679		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table C.37. Number of home visits by CA in the first week (including the day of delivery) among mothers of infants 0-5 months of age in Uttar Pradesh (endline survey only)

Number of contacts	postpartum contacts (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
1-2	-	11.1		-	0		
3+	-	5.8		-	0		
Total # of mothers 0-5m	-	759		-	679		

* Statistical test result comparing intervention and control districts at endline, significant at p<0.05

Table C.38. Advice received at postpartum contacts with ANM among mothers of infants 0-5 months of age in Uttar Pradesh

	Advice received among all mothers who received any advice (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any breastfeeding advice	13.1	75.4	62.3	5.7	20.3	14.6	47.7*
Any complementary feeding advice	2.5	18.3	15.8	1.4	7	5.6	10.2*
Advice to have child weighed	1.9	13.0	11.1	0	2.1	2.1	9.0*
Any child health advice	49.4	64.6	15.2	41.4	86.7	45.3	-29.9*
Any maternal nutrition advice	1.9	8.8	6.9	1.4	2.8	1.4	5.5
Total # of mothers 0-5 mo who received any advice	160	475		140	143		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at p<0.05

Table C.39. Advice received at postpartum contacts with AWW among mothers of infants 0-5 months of age in Uttar Pradesh

	Advice received among all mothers who received any advice (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any breastfeeding advice	23.8	81.9	58.1	13.6	27	13.4	44.7*
Any complementary feeding advice	4.8	20.4	15.6	7.6	5.7	-1.9	17.5*
Advice to have child weighed	1.9	22.6	20.7	1.5	16.2	14.7	6
Any child health advice	35.2	52.3	17.1	31.8	43.2	11.4	5.7
Any maternal nutrition advice	9.5	16.7	7.2	4.6	18.9	14.3	-7.1
Total # of mothers 0-5 mo who received any advice	105	514		66	74		

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$

Table C.40. Advice received at postpartum contacts with CA among mothers of infants 0-5 months of age in Uttar Pradesh

	Advice received among all mothers who received any advice (%)						
	Intervention (Barabanki)			Comparison (Unnao)			Difference of Δ
	Baseline	Endline	Δ	Baseline	Endline	Δ	
Any breastfeeding advice	53.3	85.2	31.9	n/a	n/a		
Any complementary feeding advice	0	22.4	22.4	n/a	n/a		
Advice to have child weighed	6.7	15.2	8.5	n/a	n/a		
Any child health advice	53.3	48.5	-4.8	n/a	n/a		
Any maternal nutrition advice	0	17.3	17.3	n/a	n/a		
Total # of mothers 0-5 mo who received any advice	15	238					

* Statistical test result comparing change from baseline to endline in intervention and control districts, significant at $p<0.05$