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Exploring Factors Influencing Mothers' Adherence to a Micronutrient Powder Program for Young Children in Nepal

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Abstract

Exploring Factors Influencing Mothers' Adherence to a Micronutrient Powder Program for Young Children in Nepal

By Colleen Staatz

Background: Micronutrient malnutrition presents a large burden of disease among young children worldwide, and children ages six months to two years in resource-poor settings are particularly vulnerable. Micronutrient powders (MNPs) can be mixed into foods given to young children and are an efficacious intervention for preventing iron-deficiency anemia and other micronutrient deficiencies. High levels of adherence are necessary for MNPs to improve health, but little is known about the relative importance of various factors influencing mothers' adherence to these interventions. **Objectives:** This study explores the associations between mothers' knowledge and perceived positive and negative effects of MNPs and their adherence to a MNP program for young children in Nepal. **Methods:** The Government of Nepal has piloted an integrated infant and young child feeding program with an MNP component, and this study examines data from preliminary monitoring surveys from the first two districts in which the program was implemented. A total of 476 of the 707 mothers surveyed had ever given the MNP to their child. Logistic regression models were used, controlling for mothers' education, to determine associations between adherence and mothers' knowledge of MNPs and recommended preparation, awareness of anemia, exposure to various behavior change communication strategies, and perceived negative and positive effects of MNPs. All results were stratified by district. **Results:** The largest association by far was between perceived positive effects of the MNP and adherence. Mothers in both districts who perceived positive effects were nearly ten times as likely to have high adherence, controlling for all negative perceived effects. Perceived negative effects, mothers' knowledge of MNPs, awareness of anemia, and attending a mothers' group meeting were also significantly associated with higher adherence in one of the two districts. **Discussion:** Perceiving positive effects can be an important motivating factor for mothers to continue giving MNPs, even if they perceive some negative side effects. Mothers may need to use the product for some time before perceiving positive effects, however. Behavior change communication strategies should emphasize the benefits of MNP use and support mothers to continue using the product even if no positive effects are perceived initially.

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Table of Contents

Chapter 1: Introduction……...1

Introduction and Rationale……...1

Problem Statement……...2

Purpose Statement……5

Research Questions……..5

Specific Aims……...…6

Significance Statement……6

Chapter 2: Literature Review……..8

Burden of Micronutrient Deficiencies Worldwide……..8

Strategies to Combat Micronutrient Deficiencies……9

Micronutrient Powder Interventions to Date……11

Adherence to MNPs Compared to Iron Drops……...13

Factors Influencing Adherence to Iron Supplementation……..14

Factors Influencing Adherence to MNPs……...15

Adherence to Medical Treatments in General……...17

Infant and Young Child Feeding in Nepal……20

Breastfeeding Practices……..20

Complementary Feeding Practices……....20

Nutrition Status of Children of Nepal……21

Current Micronutrient Interventions in Nepal……...23

Summary and Study Relevance……24

Chapter 3: Methods……...26

Population and Sample……..26

Background on Nepal……26

Health System in Nepal…….27

Integrated IYCF & Baal Vita Micronutrient Powder Program……..29

Research Design…….35

Procedures……..36

Survey Instrument……..37

Data Analysis…….38

Scope of the Analysis…….39

IRB Consideration…….40

Chapter 4: Results…….41

Demographic Characteristics of the Population……41

Coverage and Ever Use of Baal Vita……..…43

Adherence to Baal Vita……..43

Mothers' Knowledge of Baal Vita…….44

Mothers' Knowledge of Baal Vita and Adherence……46

Awareness of Anemia and Iron and Adherence……47

Mothers' Exposure to Behavior Change Communication Strategies and Adherence……..49

Perceived Negative Effects of Baal Vita and Adherence……..50

Perceived Positive Effects of Baal Vita and Adherence……53

Chapter 5: Discussion……...56

Summary……56

Mothers' Knowledge and Adherence……57

Exposure to Behavior Change Communication Strategies……58

Perceived Effects and Barriers to Using Baal Vita……59

Limitations and Strengths……..61

Conclusions and Implications……63

References……..66

Appendices…….70

Appendix 1: Household Survey Questionnaire (English Version)……...70

Appendix 2: Baal Vita Brochure (English Draft Version)……88

Appendix 3: Baal Vita Reminder Card (English Draft Version)……..90

List of Figures and Tables

Figure 1: Sachets of Different Varieties of Micronutrient Powders…….12

Figure 2: Map of Nepal…….26

Figure 3: Organizational Structure of Nepal's Health System…….29

Figure 4: Baal Vita Micronutrient Powder Contents..……..31

Figure 5: Conceptual Framework for Integrated IYCF & Baal Vita MNP Program……34

Figure 6: Primary source of household income in rural households in Makwanpur district (n=356) and Palpa district (n=351), 3 months after intervention rollout in each district, 2010……42

Figure 7: Reported consumption of Baal Vita, among mothers who reported use of any Baal Vita in Makwanpur district (n= 188) and Palpa district (n=287), 3 months after intervention rollout, 2010……...44

Figure 8: Sources of awareness about anemia among mothers who used any Baal Vita and had heard of anemia in Makwanpur (n=65) and Palpa (n=108) districts, 3 months after intervention rollout, 2010……..……48

Table 1: Selected household assets and educational attainment in rural households in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010, compared to households in rural Nepal as a whole……42

Table 2: Awareness, coverage, and use of Baal Vita among mothers in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010…….43

Table 3: Reported consumption of Baal Vita among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……44

Table 4: Questions used for Baal Vita Knowledge Index……..45

Table 5: Mean and median Baal Vita knowledge index scores and Baal Vita preparation index scores among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……..46

Table 6: The independent effect of knowledge of Baal Vita and Baal Vita preparation on reported consumption of 45 or more sachets of Baal Vita, among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……..46

Table 7: Awareness of anemia and iron among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……47

Table 8: The association between having heard of anemia or iron and reported consumption of 45 or more sachets of Baal Vita, among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……49

Table 9: Exposure to behavior change communication strategies among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……..50

Table 10: The independent effect of exposure to various behavior change communication strategies on reported consumption of 45 or more sachets of Baal Vita, among mothers who used Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……..50

Table 11: Perceived negative effects of Baal Vita reported among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……52

Table 12: Barriers to giving 60 Baal Vita sachets among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……..52

Table 13: The association between perceiving any negative gastrointestinal effects or no negative effects and reported consumption of 45 or more sachets of Baal Vita, among mothers received Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout, 2010……...53

Table 14: Perceived positive effects of Baal Vita reported among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……..54

Table 15: The association between perceiving any positive effects of Baal Vita and reported consumption of 45 or more sachets, among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010……....54

Table 16: Mean and median number of Baal Vita sachets reported consumed, among mothers who used any Baal Vita in Makwanpur and Palpa districts, by perception of positive effects of Baal Vita, 3 months after intervention rollout in each district, 2010……55

List of Terms

BCC: Behavior Change Communication

CDC: Centers for Disease Control and Prevention

DALY: Disability-Adjusted Life-Year

DHS: Demographic and Health Survey

FCHV: Female Community Health Volunteer

HF: Health Facility

IYCF: Infant and Young Child Feeding

MNP: Micronutrient Powder

NTAG: Nepali Technical Assistance Group

WHO: World Health Organization

UNICEF: United Nations Children's Fund

VDC: Village Development Committee

Chapter 1: Introduction

Introduction and Rationale

Infant and young child feeding (IYCF) practices, including exclusive breastfeeding and use of appropriate complementary foods, are critical factors in young children's development. Throughout much of the developing world, young children are given complementary foods that lack essential vitamins and minerals, often due to household resource constraints. Suboptimal complementary feeding and breastfeeding practices are key factors leading to deficiencies of micronutrients such as vitamin A, zinc, iron, and iodine, as well as stunting and underweight among children under five years of age. Stunting, vitamin A deficiency, and zinc deficiency are major underlying factors in child mortality and account for up to 30% of disability-adjusted life-years (DALYs) in children under five (Black et al., 2008). Iron and iodine deficiency contribute significant morbidity through cognitive and motor impairment. Iron-deficiency anemia is the most prevalent nutritional problem in the world, affecting more than 750 million children (Zlotkin et al., 2005). Iron-deficiency anemia during the critical period of the first two years of life may have adverse lifelong consequences on cognition, productivity, and growth (Lozoff, 2007). Interventions to improve micronutrient consumption have been shown to be some of the most cost-effective public health interventions (Horton et al., 2008).

In countries with diets that are primarily plant-based, infants and children ages 6-23 months are especially vulnerable to nutritional deficiencies. Without fortification of complementary foods, it is difficult for children in this age group to have their nutritional

needs met due to their rapid growth and development during this period (K. G. Dewey & Brown, 2003). Micronutrient powders (MNPs), powders containing multiple micronutrients that can be used for home fortification of foods, have been demonstrated to be an efficacious intervention that can be added as a component of infant and young child feeding programs. The World Health Organization (WHO) currently recommends home fortification of complementary foods with MNPs for children 6-23 months of age in populations where the prevalence of anemia in children under two years or under five years of age is 20% or higher (WHO, 2011).

Since their introduction in the early 2000s, MNPs have been distributed and promoted through programs in a variety of countries worldwide. It was believed that MNPs may be more highly accepted than traditional methods of iron supplementation such as pills or syrup, as MNPs do not change the color or taste of the foods to which they are added, do not require changes in eating behavior, and have fewer side effects (De-Regil et al., 2011). Although much of the literature on MNPs focuses on their efficacy in treating iron-deficiency anemia, current formulations contain up to 15 micronutrients and thus address a variety of nutritional deficiencies.

Problem Statement

While multiple trials have shown the efficacy of MNPs, questions remain about the best methods for distribution and promotion and few effectiveness studies have been documented in the literature. Key components of MNP programs include the necessary policies, supply and delivery systems, appropriate packaging, training and supervision, quality control systems, and behavior change communication strategies to motivate

appropriate use and adherence (HF-TAG, 2011). One of the major challenges to effective implementation of these programs is caregiver adherence over a sustained period of time. Unlike vitamin A, which is fat-soluble and can be given in a single large dose semiannually, nutrients such as iron and zinc must be administered frequently in relatively small doses to be safe and effective (K. G. Dewey & Brown, 2003). While the ideal regimen for MNPs among young children 6-23 months of age is unknown, it is expected that for MNPs to be effective, they should be given to young children regularly with multiple doses being given per week, if not daily. Typical regimens include intake of 60 or 90 MNPs every six months between 6-23 months of age.

Poor adherence to recommended regimens has presented a challenge to past micronutrient supplementation programs. While the literature reports variable levels of adherence to MNPs adherence in efficacy trials, there is little published information about factors that influence adherence (De-Regil, et al., 2011). Adherence includes a variety of MNP use and intake behaviors including administering the MNPs according to the recommended frequency, giving them to the correct recipient, preparing the MNPs properly, and completing the full course of sachets. A variety of individual, inter-personal, and institutional factors could potentially influence adherence to MNPs, such as adverse side effects, lack of caretaker motivation, knowledge or understanding of the product, difficulty preparing food to which the MNP can be added, lack of family support for the use of MNP, poor healthcare provider–caretaker communication, difficulty accessing MNPs, or MNP stock-outs. Understanding these barriers to adherence is essential to designing future programs that can be successfully scaled up to the national level in target countries. Specifically, understanding how adherence is related to

mothers' or caretakers' MNP knowledge and their perceptions of positive and negative effects of MNP use can be used to improve the content of the behavior change communication (BCC) components of future MNP interventions.

In 2010-2011, the Government of Nepal implemented a pilot infant and young child feeding and MNP program that was supported with funding and technical assistance by the United Nations Children's Fund (UNICEF) and the U.S. Centers for Disease Control and Prevention (CDC). The *Integrated IYCF & Baal Vita MNP Program* is being implemented through Nepal's Ministry of Health and Population in six pilot districts (representing the three eco-zones in the country: plains, hills, and mountains) with the aim of eventually scaling up to all of Nepal's 75 districts. The pilot program targets children 6-23 months and provides supportive behavior change communication to mothers and caretakers on optimal infant and young child feeding practices as well as promotion of an MNP, which was locally branded as "Baal Vita." Preliminary monitoring data are available from representative cross-sectional surveys conducted after three months of implementation in the first two districts in which the program was rolled out, Makwanpur and Palpa districts. This survey includes questions on knowledge, attitudes, and practices surrounding IYCF, early child development, and Baal Vita.

The primary short-term purpose of these monitoring surveys was to assess coverage and adherence to Baal Vita in Makwanpur and Palpa and to make comparisons between the two districts. These districts used two different distribution models for Baal Vita: in Makwanpur, health facility staff distributed the product, while in Palpa it was distributed by Female Community Health Volunteers (FCHVs). On the basis of the results of these surveys, as well as surveys from other districts and internal monitoring

data, UNICEF Nepal will decide which Baal Vita distribution model to use when the project is eventually scaled up to all districts in Nepal. The survey also assessed IYCF behaviors including breastfeeding practices, types of complementary foods given, and frequency of child feeding. A separate monitoring survey was conducted among FCHVs implementing the intervention in both districts as well.

Purpose Statement

In the context of the broader monitoring program, this analysis will focus specifically on factors influencing adherence to Baal Vita, while recognizing the necessity of a distribution model that facilitates widespread coverage. Understanding the barriers to adherence is essential to designing future programs that can be successfully scaled up to the national level in target countries. Specifically, understanding how adherence is related to mothers' or caretakers' MNP knowledge and their perceptions of positive and negative effects of MNP use can be used to improve the content of the BCC components of future MNP interventions.

Research Questions

1. Is there an association between mothers' knowledge of the MNP and their reported adherence to the MNP?
2. Is there an association between mothers' awareness of anemia or iron and their reported adherence to the MNP?

3. Is there an association between mothers' exposure to the program's various behavior change communication intervention strategies and their reported adherence to the MNP?
4. Is there an association between the types of perceived effects reported by mothers in their children after use of the MNP and their reported adherence to the MNP?

Specific Aims

1. Evaluate knowledge of MNPs, awareness of anemia/iron, and exposure to behavior change communication strategies among mothers that used the MNP in the preliminary target districts of the program.
2. Evaluate the perceived negative and positive effects that were reported by mothers after their children used the MNP, as well as any barriers that prevented them from giving the MNP to children.
3. Evaluate the reported adherence behavior of mothers in the program and the possible influences of both knowledge and perceived effects on this behavior.
4. Identify priority areas for special attention when developing behavior change communication messages to improve adherence for future MNP projects.

Significance Statement

In response to the lack of information regarding factors influencing adherence to MNPs and the necessity of adherence for the success of MNP programs, this study will provide information on the relationship between knowledge, perceived negative and positive effects, and adherence, and highlight priority areas for behavior change

communication strategies to improve the effectiveness of MNP programs. This will contribute to the evidence base that can inform the design of future MNP programs to achieve high levels of adherence and improve children's nutritional status in target countries.

Chapter 2: Literature Review

Burden of Micronutrient Deficiencies Worldwide

Globally, maternal and child undernutrition are associated directly or indirectly with more than one-third of deaths occurring among children under five years of age (Lutter et al., 2011). Additionally, 10% of deaths and DALYs in children under five years of age worldwide are attributable to micronutrient deficiencies (Bhutta et al., 2008). Categories of undernutrition include stunting, wasting, and micronutrient deficiencies (Black, et al., 2008). Height-for-age that is more than two standard deviations below the mean is an indicator of stunting, while low weight-for-age indicates wasting. Stunting is in indicator of macronutrient deficiencies over the long term, while children who are wasted are likely to have experienced inadequate food intake or illness in the recent past (DHS, 2011).

Micronutrient deficiencies can have lasting consequences over the long term, especially if infants are nutrient-deficient during the period from 6-24 months, a critical period for growth and development. Studies have demonstrated that infants with iron-deficiency anemia during this time are at risk for decreased cognitive, motor, social-emotional, and neurophysiologic development (Lozoff, 2007). Zinc deficiency has been shown to elevate children's risk of diarrhea, pneumonia, and malaria, while vitamin A deficiency is linked to increased all-cause mortality in children, as well as increased risk of vision problems, including blindness (Black, et al., 2008).

Micronutrient deficiencies arise from a variety of underlying factors. Iron-deficiency anemia is mainly caused by low consumption of animal-source foods, as well

as the consumption of certain foods and drinks that can inhibit the body's ability to absorb iron. Iron deficiency typically peaks around 18 months of age and then falls as the child's iron requirements decline and iron intake is increased through complementary foods (Black, et al., 2008). Breast milk contains iron that is highly bioavailable (easily absorbed), so infants that are exclusively breastfed for the first six months of life are typically at lower risk of iron deficiency. Certain compounds found in tea, coffee, and cocoa can significantly inhibit iron absorption, and children in countries where these beverages are given from a young age may be at higher risk for iron deficiency (Hurrell et al., 1999). Cereals containing phytates, such as wheat and soy, can also inhibit iron absorption.

Although the terms anemia and iron deficiency are sometimes used interchangeably, anemia can also arise from deficiencies of other micronutrients, such as vitamin A or B vitamins, and non-nutritional causes such as infections (including malaria, hookworm, and HIV) or blood disorders. Iron deficiency is the largest single cause of anemia, however, and it is generally assumed that about 50% of all anemia is due to iron deficiency, although this can vary by population according to the local conditions (de Benoist et al., 2008).

Strategies to Combat Micronutrient Deficiencies

Interventions used to prevent micronutrient deficiencies in young children include support of breastfeeding and complementary feeding, dietary diversification, biofortification, mass and targeted food fortification, home fortification (including MNPs), and supplementation. For the first six months of age, exclusive breastfeeding is

recommended by the WHO and is generally sufficient to meet micronutrient requirements among full-term infants with adequately nourished mothers (K. Dewey & Lutter, 2001). Although breastfeeding should continue for at least two years, after six months of age complementary foods are needed as well to meet the child's growing nutritional needs. While promotion of appropriate complementary feeding is important to ensure adequate caloric intake and maximum nutrient diversity, when complementary foods are primarily plant-based, they generally still provide insufficient amounts of key nutrients to meet the recommended intake during the age period from 6-24 months. Although animal-source foods could potentially fill this gap, as they contain nutrients that are more bioavailable than those in plant-based foods, these foods are not always available or affordable to poor communities in developing countries. Thus, when animal-source foods are not widely available, complementary foods given to children 6-24 months need to be supplemented in some way with micronutrients (K. G. Dewey & Adu-Afarwuah, 2008).

In the past, micronutrient supplementation has generally been attempted through giving liquid supplement "drops" or crushable tablets directly to the child. This was most common for vitamin A, although less common for other nutrients such as iron and zinc that must be administered on a more regular basis. Because of the way iron is metabolized, supplements need to be given in frequent low doses, but this can present adherence challenges if caregivers tire of giving the supplements to children on a daily basis or perceive that they cause negative effects (K. G. Dewey & Brown, 2003). Iron drops and syrups frequently lead to side effects such as abdominal discomfort and dark stains on the children's teeth and also have an unpleasant metallic aftertaste. Caregivers

can also give the incorrect amount of the syrups, as each dose has to be measured, and the syrups are packaged in glass bottles that can break during transport or in the home (Mora, 2002).

In recent years, new strategies to deliver micronutrients to young children have been established including fortified cereal-based complementary foods, fortified fat-based spreads, and MNPs, which attempt to overcome some of the adherence barriers that hindered previous micronutrient programs (Lutter, 2008). All of these interventions have been demonstrated to be efficacious in reducing anemia in controlled trial settings, and fortified cereals and fat-based spreads provide macronutrients as well. Very young children may not consume enough fortified foods to significantly increase their intake of key micronutrients, however (Mora, 2002).

The way in which iron is encapsulated within MNPs eliminates any adverse taste, and MNPs do not change the color or consistency of the food to which they are added when prepared and used as directed. The major side effect reported from use of MNPs is darkening of the child's stool because of the additional iron being excreted (Zlotkin, et al., 2005). Formative research has shown both MNPs and fat-based spreads to be well-accepted by caregivers who received them as part of pilot studies (Tripp et al., 2011).

MNP Interventions to Date

Micronutrient powders were developed by Dr. Stanley Zlotkin and his research team at the Hospital for Sick Children in Toronto, Canada (Zlotkin, et al., 2005). For home use, these powders are contained in single-dose sachets, similar to sugar packets,

which can be mixed into foods prepared in the home without changing the food's taste or appearance.

Figure 1: Sachets of different varieties of MNPs (www.sghi.org)

When used for young children 6-23 months of age, MNPs are added to soft or semi-solid foods such as porridge that are traditionally given to children in many countries as they begin complementary feeding, and thus have the advantage that they generally do not interfere with usual dietary practices. Since MNPs are targeted to children beginning at six months of age, they may actually facilitate the timely introduction of complementary foods, which is a problem among some populations where complementary foods are historically introduced later. MNPs have been introduced containing a variety of micronutrient combinations, usually including at least iron, zinc, and vitamin A. As the primary cost of the product comes from the packaging and additional nutrients can be added at a minimal cost, recently-developed combinations contain up to 15 micronutrients (de Pee et al., 2008). UNICEF now only procures the 15-micronutrient formulation for its projects, and the Home Fortification Technical Advisory Group recommends the use of this formulation for MNP projects (HF-TAG, 2011).

To date, MNP pilot and small scale programs have been implemented in a range of countries worldwide and have been taken to national scale in Bangladesh, Mongolia, and Haiti (De-Regil, et al., 2011). A recent review of eight MNP studies in various settings demonstrated their efficacy in reducing both anemia and iron deficiency. A study in Pakistan found the MNPs containing zinc were also effective at reducing the incidence of diarrhea among target children (Sharieff et al., 2006).

Adherence to MNPs Compared to Iron Drops

When MNPs were developed, it was hoped that caregivers would find them easier to use than conventional iron drops and syrups and thus adhere better to recommended regimens (Christofides et al., 2006). Several efficacy trials have directly compared MNPs and iron drops to see if adherence was higher among those using the MNPs, while also reporting the side effects experienced by those using each strategy. In a randomized controlled trial in India, stool discoloration, staining of teeth, vomiting, and diarrhea were significantly higher among the children given iron drops than among those given MNPs (Hirve et al., 2007). Adherence was also lower among the group given iron drops, suggesting that these side effects may possibly be linked to poor adherence. In Ghana, adherence was also lower among the group given iron drops (69%) than among those given MNPs (84%). There were similar levels of stool darkening and diarrhea reported between the two groups, but caretakers giving drops reported more staining of children's teeth and lower ease of use (Christofides, et al., 2006). Finally, a study of infants from low-income households in Boston found that side effects were similar between the two groups, and adherence was slightly better among the group that received iron drops (Geltman et al., 2009). Infants in the group that received iron drops were reported to be

fussier, and caregivers reported more difficulty integrating the drops into their daily routine, but this was not associated with adherence. Thus, while many reports cite ease of use and fewer side effects as an advantage of MNPs over traditional iron supplements, there is no conclusive consensus on whether these advantages actually lead to better adherence.

Factors Influencing Adherence to Iron Supplementation

Much of the literature on adherence to iron supplementation comes from interventions with pregnant women, as they are a key target group for interventions to reduce anemia due to the risks associated with maternal anemia during delivery (Black, et al., 2008). A review of the literature found that the influence of side effects on adherence to prenatal iron supplementation regimens has been overestimated and there is little evidence that side effects impede adherence in a major way. Among women in developing countries who stopped taking iron pills during pregnancy, less than 10% cited side effects as the reason for discontinuation. Instead, lack of a reliable supply was a major issue for many women and the quality of the patient-provider relationship was also highly related to adherence (Galloway & McGuire, 1994).

A large-scale prenatal iron and folic acid supplementation program in Nepal has reported similar findings, with the most common reasons reported for poor adherence being forgetting to take the tablets or stock-outs of the product. Less than 10% of women reported stopping because of side effects such as nausea (Pokharel et al., 2011). Other studies on factors associated with adherence to iron supplementation during pregnancy have had mixed, and sometimes contradictory, results. In Bangladesh, the overall

presence of gastrointestinal side effects was not associated with women's adherence to iron pills, but those reporting nausea and vomiting in particular did have poorer adherence. This association only held true for women in the lower socioeconomic group, however (Hyder et al., 2002). In Tanzania, women experiencing side effects had about one-third lower adherence than those who did not experience side effects (Ekstrom et al., 1996).

As the health consequences of anemia can be somewhat subtle, and positive effects of supplementation may not be observed immediately, information from healthcare providers can be an important means of increasing demand for iron supplementation and improving patient motivation to adhere to treatment regimens. The provision of factual information about the health consequences of anemia and the benefits of treatment may not be enough, however; the clarity of the message and how it is delivered are also important (Galloway & McGuire, 1994). A review found that consumer lack of knowledge on anemia was a major factor influencing poor adherence to iron supplementation, and that this was often caused by insufficient communication and counseling skills among health providers (Mora, 2002). A critical factor in the success of Nepal's prenatal and iron and folic acid supplementation program has been increasing awareness of anemia in the health system and in communities, which resulted in increased demand for the product (Pokharel , et al., 2011)

Factors influencing Adherence to MNPs

The literature on adherence to MNP regimens is similar to the iron supplementation literature in that there is little consensus on the relative importance of

various factors influencing adherence. In an effectiveness study of MNPs among infants and children in Mongolia, the primary reason that mothers reported not giving the MNP to their children on a daily basis was that they forgot (33%). Among mothers who gave the MNP regularly but did not follow the directions in some other way, reported reasons included perceptions that the MNP had a bad taste (13%), gave the child diarrhea (12%), changed the appearance of the food (11%), or made the child feel "bad" (10%). Some of these side effects relate to the taste of the product and appearance of the food and likely indicate inadequate knowledge of proper preparation. In the Mongolia program, 12% of mothers reporting adding the MNPs to water, 7% reported giving MNPs alone (with no food), and 4% reported adding it to tea, none of which are recommended preparation practices and could have contributed to reports of bad taste and children feeling unwell after consuming the product (World Vision, 2005). Clear instructions on proper preparation and use of MNPs could possibly limit the occurrence of side effects and therefore improve adherence.

Communication from health providers about possible side effects of MNPs could limit the influence of side effects on adherence. Formative research on MNPs in Niger found that mothers were not concerned when their children had diarrhea and darker stools during the first few days of MNP use because they had been warned about these side effects (Tripp, et al., 2011). Similarly, formative research in Kenya found that the reported potential barriers to use of MNPs centered on inadequate knowledge of the product, including use (Jefferds et al., 2010). Evaluations of interventions in Haiti and Bangladesh also found that addressing side effects with mothers in advance was helpful in encouraging their continued use of MNPs when their children experienced

gastrointestinal effects such as diarrhea or constipation (Karim et al., 2006; Menon et al., 2006).

Other studies of adherence to MNP regimens have focused on altering recommendations for the frequency of administration of the product. In most pilot studies, caregivers have been instructed to give MNPs to their children on a daily basis, but a few projects have experimented with more flexible administration schedules to see if this might improve caregiver adherence. A study in Bangladesh found that flexible administration of MNPs over three or four months resulted in better adherence than daily administration of the product for two months (Ip et al., 2007). Following this finding, a pilot program in Kyrgyzstan decided to switch from daily to flexible administration when the program is scaled up to the national level, with the hopes that this will improve adherence (Lundeen et al., 2010). At this point, most MNP programs are still recommending daily administration, however, partly because this message is easier to convey to caregivers, while flexible administration messaging could be perceived as confusing.

Adherence to Medical Treatments in General

A Cochrane review of the medical literature on adherence revealed a variety of factors that can lead to non-adherence to treatment regimens, including adverse effects of the medication, poor instructions, poor patient-provider relationships, poor memory, patients' disagreement with the need for treatment, and inability to pay for treatment. The review notes that the literature on interventions to improve adherence remains surprisingly weak, despite the myriad of new medical treatments that have become

available in the past few decades. There was little consensus between the studies reviewed on which interventions were most successful in improving adherence, as those studies investigating similar interventions often had contradictory findings (Haynes et al., 2008).

Adherence to AIDS medications has been an area of particular focus in the adherence literature given that resistance can develop if patients do not strictly follow the recommended regimen, and lessons from this field could apply to adherence to other medical interventions. A study of this subject concluded that it is difficult to predict which individuals might be less likely to adhere to their regimens, but self-reports are the most practical method of assessing adherence in routine settings. Identifying non-adherent individuals early on can allow providers to determine the factors influencing their non-adherence and work with them to address these barriers. Although self-reports may overestimate adherence, they are inexpensive and can provide an early indication of problems (Chesney, 2000).

Certain strategies can be used to increase the reliability of self-reports of adherence to various medications. The manner in which providers ask about adherence can make a significant difference in reports of adherence and may be able to reduce courtesy bias, which occurs when patients report what they think the interviewer wants to hear. An editorial on medical adherence suggests that clinicians ask patients about any barriers to taking their medication regularly and any adverse effects associated with the medication, rather than simply asking whether they took their medication as directed, which can be perceived as judgmental. By removing the burden of bringing up these issues from the patient and acknowledging the challenges of taking medication on a daily

basis, clinicians can develop better rapport with their patients and increase the likelihood of eliciting truthful responses (Arrington-Sanders, 2009).

Specific self-report instruments have been developed to further strengthen the validity of self-reported data. Some previously-used tools for assessing patient adherence included questions that were either too broad and simply asked whether patients took their medication "regularly," or were too narrowly-worded and only asked about a few types of non-adherent behavior. Leading questions or questions with implied judgment were also sometimes used. A patient screening questionnaire that was developed to overcome some of these barriers was able to achieve an overall accuracy of 95%, compared to an average accuracy level of 71% among published self-report adherence tools (Svarstad et al., 1999).

While much of the adherence literature focuses on improving tools for assessing adherence, there is less information available on factors influencing adherence, and the Cochrane review on this subject did not find any particular type of intervention to be the most effective in improving adherence. One intervention in which interest has developed is patient-focused care, which aims to improve communication between providers and patients and has been shown to improve adherence (Irwin & Richardson, 2006). This is based on the assumption that patients are more likely to follow treatment advice if they have a clear understanding of their medical condition, as well as the risks and benefits of their treatment regimen. This is supported by the findings in studies on adherence to MNPs in which mothers were not bothered by side effects because they understood that they were associated with the treatment and had been informed about them beforehand (Jefferds, et al., 2010; Karim, et al., 2006; Menon, et al., 2006; Tripp, et al., 2011).

Infant and Young Child Feeding in Nepal

Breastfeeding Practices

Exclusive breastfeeding is fairly widespread in Nepal, with 70% of mothers of children under six months reporting exclusive breastfeeding. This varies highly with the child's age, however, as 88 % of children under two months of age are exclusively breastfed, while only 53% of children 4-5 months of age are still exclusively breastfed. Significant improvement has been made since 2006, though, when only 53% of all children under six months were reported to be exclusively breastfed (DHS, 2006, 2011).

After six months of age, most children in Nepal begin eating complementary foods in addition to breastfeeding, in part because of a traditional ceremony called *Pasnee*, or the rice feeding ceremony (DHS, 2006). This ceremony typically occurs at either five or seven months of age for girls and at six or eight months for boys. The WHO recommends the introduction of complementary foods at six months of age, when breast milk is no longer sufficient to meet children's nutritional needs (K. Dewey & Lutter, 2001). In Nepal, breastfeeding often endures for a significant amount of time after the introduction of complementary foods, with 93% of children still breastfeeding between the ages of 20-23 months (DHS, 2011). This is consistent with WHO recommendations to continue breastfeeding for up to two years or more (K. Dewey & Lutter, 2001).

Complementary Feeding Practices

Between the ages of six and nine months, children in Nepal mainly consume grain-based complementary foods. Meat, poultry, fish, and eggs are rarely given to

children in this age group, with only about 10% of children consuming these foods. Only 20% of children in this age group consume vitamin A-rich fruits and vegetables on a daily basis (DHS, 2006).

Once complementary foods have been introduced, breastfed children need to eat a minimum of two meals per day between ages six and eight months, and three meals per day from nine to 23 months, while non-breastfed children need four meals per day from 6-23 months (WHO, 2007b). About 57% of children 6-23 months in Nepal are fed according to recommended feeding practices, meaning they achieved the minimum meal frequency as well as the minimum recommended dietary diversity. This varies by age group, however, with just 24% of children 6-7 months meeting recommendations, while 68% of those 12-15 months met recommendations (DHS, 2006).

Nutrition Status of Children in Nepal

In Nepal, 41% of children under five years of age are stunted, 11% are wasted, and 29% are underweight. The burden of anemia is high in Nepal, with 46% of children ages 6-59 months categorized as anemic (DHS, 2011). This figure has not changed much in the past five years, as 48% of children were categorized as anemic in the country's previous Demographic and Health Survey in 2006. Anemia in children 6-59 months is defined as having a hemoglobin level of less than 11.0 g/dl, adjusted for altitude (DHS, 2006).

Data on anemia prevalence by age are not yet available from the 2011 Nepal National Demographic and Health Survey, but the results of the 2006 survey indicate that children 6-23 months are at highest risk for anemia. In 2006, 82% of children 6-11

months and 71% of children 12-23 months were categorized as anemic, compared to 48% of children in the overall 6-59 months age category (DHS, 2006). This could arise from primarily grain-based complementary foods being given as young children begin weaning. The WHO considers anemia to a be a severe public health problem when its prevalence exceeds 40% in selected populations; this is the case for children under five in Nepal, and especially for children 6-23 months (WHO, 2001).

Use of iodized salt has increased in recent years in Nepal, with 80% of households having adequately iodized salt in 2011, compared with 58% in 2006 (DHS, 2011). In the districts with lowest coverage, many of which are located along the Indian border and import inadequately iodized salt from India, the government is promoting social marketing of iodized packaged salt. The proportion of schoolchildren categorized as iodine-deficient according to the WHO standard for urinary iodine excretion decreased from 35% in 1998 to 27% in 2005, and may have decreased further with the increased use of iodized salt, although more recent data are not yet available (Ministry of Health and Population, 2005).

Coverage of vitamin A supplementation is impressively high in Nepal, with over 90% of children 12-23 months having received a supplement in the past six months (DHS, 2006). The vitamin A distribution program began in 1993 and involves the distribution of tablets by FCHVs to all children 6-59 months twice per year. Distribution of de-worming tablets also occurs during this campaign as part of an anemia control approach (Ministry of Health and Population, 2010).

Current Micronutrient Interventions in Nepal

Several MNP programs have been introduced in Nepal in recent years to combat childhood and maternal malnutrition. In March 2008, the World Food Program began providing MNPs to children 6-59 months in Bhutanese refugee camps in southeast Nepal, instructing caregivers to give the children one sachet every other day. An impact assessment in 2010 found no significant change in the prevalence of mild anemia in these children, but moderate anemia did decline from 19% in 2007 to 14% in 2010. There were also significant declines in the prevalence of stunting and diarrhea among children in the target age group (Rah et al., 2012). In 2009, World Food Program also began distributing MNPs along with emergency food aid in 17 food-insecure districts throughout the country, targeting 114,000 children 6-59 months. In this case, MNP sachets were supposed be given on a daily basis. An impact assessment of this program is being conducted, but the results are not yet available (Rah, et al., 2012).

In 2004, the Government of Nepal launched a prenatal iron supplementation program, called the Iron Intensification Program, in five districts, with the goal of scaling up to 70 of Nepal's 75 districts by 2011. In this program, FCHVs distribute iron and folic acid supplements to pregnant women in their communities and counsel the women to attend antenatal care sessions at the government health facility. The antenatal care sessions include the provision of de-worming tablets as an additional strategy to reduce maternal anemia. A monitoring survey in 2008 found that coverage of iron and folic acid supplementation among pregnant women had increased from 47% to 86%. Key factors in the program's success include the community-based delivery platform, effective

monitoring, and clear communication of messages on the negative consequences of anemia and interventions available to address it (Pokharel , et al., 2011).

Other micronutrient programs currently being implemented in Nepal include zinc treatment and flour fortification, as well as the vitamin A supplementation, provision of de-worming tablets, and salt iodization programs mentioned earlier. Zinc supplementation has been introduced recently in Nepal as treatment for acute diarrhea in children, with health facilities and FCHVs distributing a ten-day course of zinc tablets along with oral rehydration solution to children with diarrhea. In a survey of 40 districts, zinc coverage was estimated to be only 7%, however (Ministry of Health and Population, 2010). Flour fortification has been successful in Nepal, with 75% of the country's large roller mills voluntarily adding iron, vitamin A, and folic acid to their wheat flour. The Government of Nepal announced in August 2011 that flour fortification would now be mandatory in large roller mills throughout the country (Micronutrient Initiative, 2011). This type of fortification program is likely to have the lowest impact on children who are just beginning to eat complementary foods, as these children generally consume insufficient quantities of food for the fortified food to meet their micronutrient needs, as well as rural residents who are more likely to consume flour from small local mills that are not included in the compulsory fortification.

Summary and study relevance

Evidence has demonstrated the efficacy of MNPs in reducing anemia and other micronutrient deficiencies in young children, but the causes of poor adherence among mothers represent the biggest gaps in current knowledge. Possible factors leading to poor

adherence include lack of understanding of anemia and its negative consequences, incomplete knowledge of how to prepare MNPs, poor communication from those delivering the intervention, forgetting to administer the product on a daily basis, stock-outs of the product, and perceived negative effects after using the product. The relative importance of each of these factors is unknown, and a better understanding of barriers to adherence is critical in designing effective behavior change communication strategies to support mothers to adhere to MNP regimens.

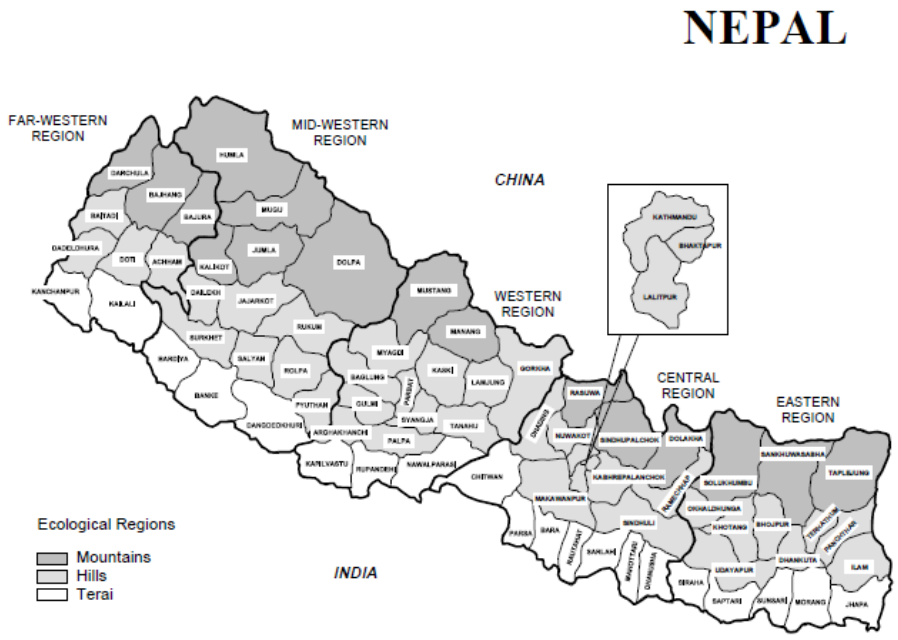
Chapter 3: Methods

Population and Sample

Background on Nepal

Nepal is a landlocked country in the Himalayan region of Asia, bordered by China to the north and India to the south, east, and west (DHS, 2006). The country has three district ecological zones: the mountains, hills, and *terai*, or plains (Figure 2). The population is currently estimated at 30 million, with 7% living in the mountains, 44% in the hills, and 48% in the *terai* (World Bank, 2011). The country has experienced periodic political instability in recent years due to conflicts between the Maoist insurgency and the government, with an estimated 12,000 people killed in the conflict since 1996. An even larger number of people have been internally displaced during this period, with estimates ranging up to 200,000 people (WHO, 2007a).

Figure 2: Map of Nepal (DHS, 2006)



Nepal is one of the poorest and least-developed countries in the world, despite the rapid economic growth of its neighbors, India and China (DHS, 2006). Over 80% of the population works in agricultural production, a sector which is predicted to be threatened by climate change in the future due to decreasing rainfall (WHO, 2007a). In 2010, approximately 19% of the population was living in urban areas (United Nations, 2011). Infant mortality in Nepal is 46 per 1000 births, which represents a decline from previous years, albeit at a relatively slow rate. Infant and child mortality rates are generally higher in the rural areas than in the urban areas (DHS, 2011).

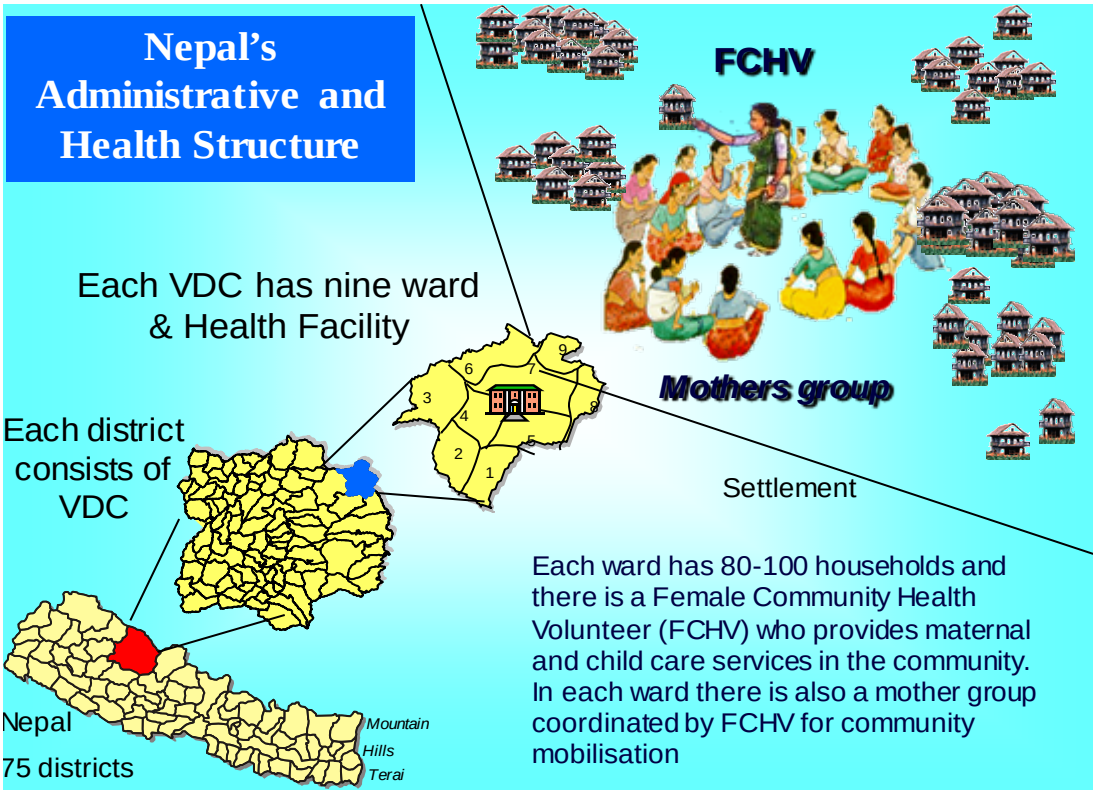
There are 92 languages spoken in Nepal, with Nepali being the mother tongue of about half of the population and the country's official language. The majority of the people in the country are able to understand and speak Nepali, however. Other prevalent languages include Maithili, spoken by 12% of the population, and Bhojpuri, spoken by 8% of the population (DHS, 2006).

Health System in Nepal

Nepal is divided into five administrative developmental regions: Eastern, Central, Western, Mid-western, and Far-western (Figure 2). These regions are sub-divided into 14 zones and 75 districts. Each district is further subdivided into Village Development Committees (VDCs) in the rural areas and municipalities in the urban areas (Rai et al., 2001). Each VDC is served by a health center, health post, or sub-health post. The VDCS are each further sub-divided into nine wards, which consist of roughly 80-100 households (Figure 3).

In addition to staff at the government health facilities, Nepal has an extensive network of female community health volunteers (FCHVs) who play an integral role in the implementation and support of government health campaigns, particularly in rural areas. Each ward is supposed to have assigned at least one FCHV. As of 2006, there were a total of 48,352 FCHVs serving throughout the country at the ward level (WHO, 2007a). The FCHV program, which has existed since 1988, has an attrition rate of less than 5%, despite the fact that the women do not receive any formal salaries. The volunteers are selected by their communities and attend an18-day training, with subsequent refresher trainings, and participate in activities such as semiannual vitamin A distribution, immunization campaigns, and the prenatal iron supplementation program. In the absence of formal salaries, the women usually receive some incentives such as transport stipends, bicycles, access to microcredit funds, and payment for participation in certain health campaigns such as vitamin A distribution (Glenton et al., 2010).

Figure 3: Organizational Structure of Nepal's Health System (Pokharel , et al., 2011)



Integrated IYCF & Baal Vita Micronutrient Powder Program

The Government of Nepal, with financial and technical support from UNICEF Nepal and technical assistance from CDC, began implementing a pilot program in 2010 to support optimal infant and young child feeding practices and distribute MNPs to children 6-23 months. This pilot is known as the *Integrated Infant and Young Child Feeding (IYCF) and Baal Vita Micronutrient Powder (MNP) Program.* The need for such a program was further supported by the release of the WHO guidelines in 2011 recommending the use of MNPs for the complementary feeding of all children 6-23 months in countries with a high prevalence of anemia (WHO, 2011). The MNP used in

the Nepal program was locally branded as “Baal Vita” and contains 15 micronutrients (Figure 4). In this program, mothers were given 60 Baal Vita sachets at a time and were instructed to give the sachets daily until they were finished, and then return in four months for the next batch of 60 sachets. The program originally intended to use a flexible administration model, but pre-tests of the messaging found that mothers were not comfortable with instructions to give Baal Vita at their convenience. Based on this feedback, the program chose to use a “daily but forgiving” message, meaning that mothers were encouraged to give Baal Vita sachets daily, with the understanding that if they stopped for any reason, they should restart giving the sachets until their child had completed the full course of 60 sachets. Thus, children were supposed to receive 60 sachets every six months, for a total of 180 sachets between the ages of 6-23 months.

In addition to promotion and distribution of Baal Vita, the program included comprehensive behavior change communication including health education on nutrition and anemia, child development, and infant and young child feeding practices. The program was designed to be piloted in six districts in the three eco-zones of Nepal, using two different models for Baal Vita distribution in rural areas, with a third distribution model piloted in urban areas. Based on the results from monitoring of the pilot program, one rural distribution model was to be selected for the eventual scale-up of the program to all districts in Nepal, taking into consideration the lessons learned from the pilot of both rural distribution models.

Figure 4: Baal Vita MNP contents (Nepali Technical Assistance Group, 2012)

Contents of Micronutrient Powder – Baal-vita (in One Gram Sachet)			
Micronutrient	**Amount**	**Micronutrient**	**Amount**
Vitamin A	400 µg	Vitamin B12	0.5 mg
Vitamin C	60.0 mg	Folic acid	150 µg
Vitamin D	5.0 µg	Iron	10.0 mg
Vitamin E	5.0 mg	Zinc	4.1 mg
Vitamin B1	0.5 mg	Copper	0.56 mg
Vitamin B2	0.5 mg	Selenium	17.0 mg
Niacin	6.0 mg	Iodine	90.0 µg
Vitamin B6	0.9 µg		

In the health facility distribution model, staff members at the government health facility were responsible for distributing Baal Vita to mothers, with FCHVs providing health education about the product and recommended infant and young child feeding practices during mothers' group meetings in the village and through regular inter-personal communication. The FCHVs counseled mothers on the benefits and proper use of Baal Vita and encouraged mothers to get the product from the health facility. The rationale behind this model was that the FCHVs are already involved in a number of other government health promotion initiatives, and if they were also put in charge of distributing Baal Vita to mothers, this might be overly burdensome for them. Furthermore, many FCHVs are illiterate or marginally literate and maintaining the product logs could be a barrier. It was also hypothesized that if mothers were encouraged to go the health facility to pick up Baal Vita, they might take advantage of other services available at the health facility, such as immunization services or child growth monitoring. In this model, a potential barrier for mothers and caretakers is the need to travel to the health facility, which might limit coverage.

The other Baal Vita distribution model piloted in rural areas was distribution in the community directly through the FCHVs. Although this involves more work for the FCHVs, it was thought that this model would increase the accessibility of Baal Vita to mothers, possibly resulting in better coverage. In this model, the FCHVs provided the same supportive behavior change communication to mothers as in the health facility model; the only difference was the location at which mothers received the 60 Baal Vita sachets every six months.

In urban areas, Baal Vita was distributed to mothers through ward offices as well as government health facilities. Only one model of Baal Vita distribution was piloted in urban areas. The FCHV structure is different in urban areas, but local FCHVs also carried out supportive behavior change communication to mothers in these areas.

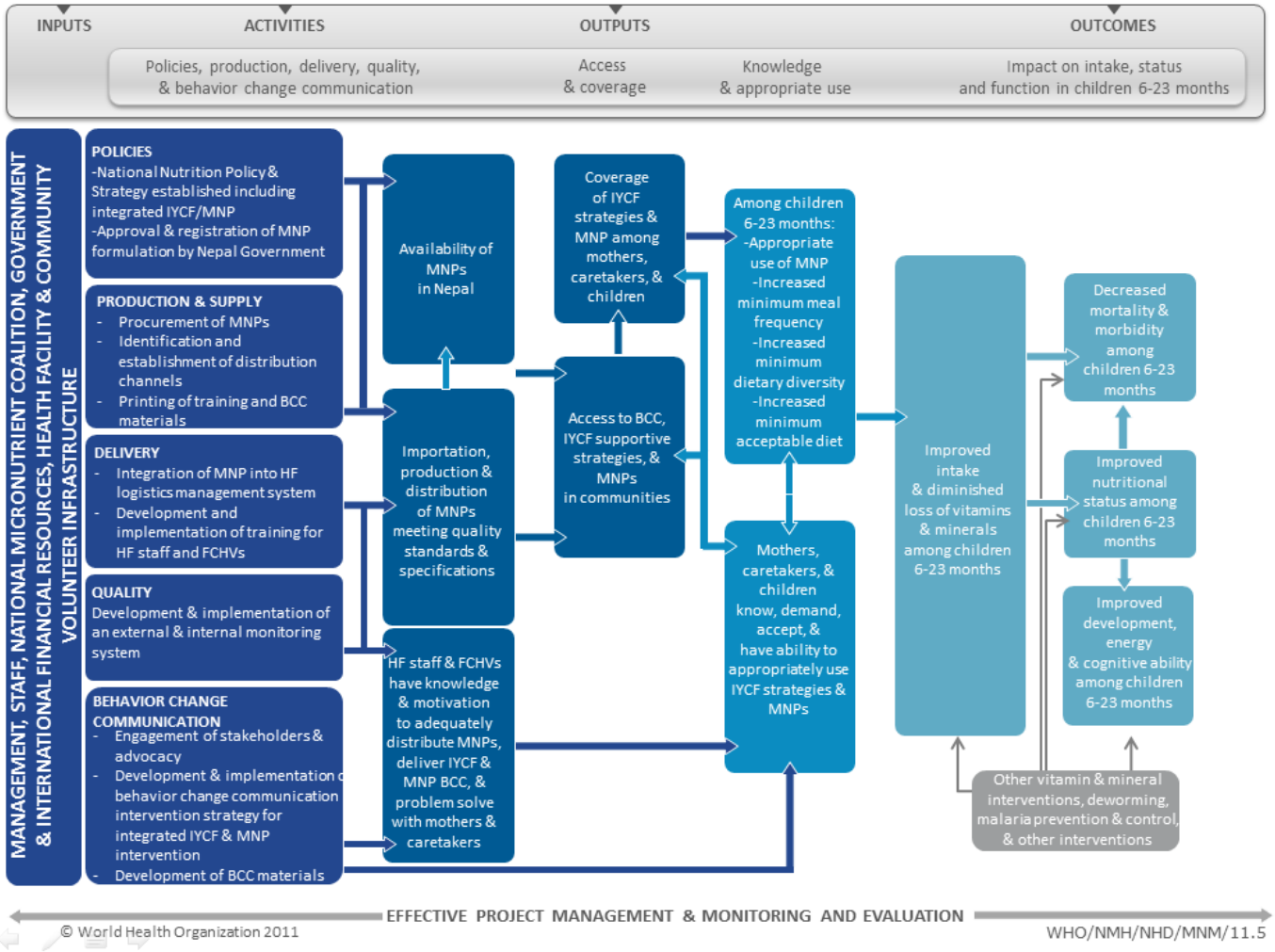
At the beginning of the intervention, program staff conducted orientation and engagement of community and opinion leaders to develop a supportive structure and environment for the intervention strategies. One of the primary behavior change communication intervention strategies was health education by FCHVs at mothers' group meetings within the community. These mothers' groups meet on a regular basis at the ward level and participate in a number of activities such as microcredit programs and community health education on a variety of topics. The FCHVs were supposed to conduct health education sessions at these mothers' group meetings using a flipchart that included key messages on infant and young child feeding and Baal Vita use. The expectation was that mothers' first exposure to information about Baal Vita would be at the mothers' group meetings and that this venue would allow for thorough coverage of all concepts in the intervention package. Although many attendees at mothers' group

meetings are mothers or grandmothers of children older than 6-23 months, ideally these women would be motivated to support mothers in the community with Baal Vita use and optimal IYCF practices after receiving this information. Outside of mothers' group meetings, the FCHVs were also supposed to use informal inter-personal communication to give advice and troubleshoot issues with Baal Vita use or IYCF practices.

When mothers picked up Baal Vita from either the FCHV or health facility staff, they were supposed to receive a brochure with information about Baal Vita and its benefits and possible side effects, as well as a reminder card with basic product information and the date on which they were due to pick up the next course of 60 sachets. See Appendices 2 and 3 for English versions of the first draft of the Baal Vita brochure and reminder card that were developed in the program; these were tested with potential participants, revised, and finalized in Nepali. In the health facility distribution model, health facility staff members were also supposed to provide supportive health education surrounding infant and young child feeding and Baal Vita use. Additional behavior change communication strategies such as a radio jingle are now being implemented as well, but these strategies were not yet in place during the initial roll-out of the program in the first pilot districts. In some areas, school children were also oriented and instructed to prompt mothers of infants that just turned six months to start the use of Baal Vita.

Figure 5 shows the logic model that was used to guide the intervention, which was adapted from a model developed by the WHO and the CDC for micronutrient interventions in public health (WHO/CDC, 2011). This analysis focuses on the knowledge and appropriate use outputs of the intervention.

Figure 5: Conceptual Framework for Integrated IYCF and Baal Vita MNP Program (WHO/CDC, 2011)



The *Integrated IYCF and Baal Vita MNP Program* was rolled out in rural areas of the first two pilot districts, Makwanpur and Palpa, starting in May and June 2010, respectively. Both Makwanpur and Palpa districts are located in the hill eco-zone, and Makwanpur is in the Central region of Nepal, while Palpa is in the Western region. The health facility distribution model was used in Makwanpur and the FCHV distribution model was used in Palpa. The first monitoring surveys were conducted in September and October 2010 in Makwanpur and in November 2010 in Palpa, after three months of program implementation in each district (Nepali Technical Assistance Group, 2012).

Implementation began in the urban areas of Makwanpur and Palpa districts in December 2010. In December 2010 and January 2011, program implementation began in Rasuwa and Gorkha districts, which are in the mountain eco-zone. Finally, implementation began in May-August 2011 in two districts in the *terai* eco-zone, Rupendehi and Parsa.

Research Design

The Government of Nepal, along with the implementing partner organizations, developed a monitoring plan at the start of the program to assess the progress of the *Integrated IYCF and Baal Vita MNP Program* and identify strengths and weaknesses associated with each of the distribution models. External representative cross-sectional surveys were administered in the rural areas of each of the six pilot districts after approximately three months of program implementation, and additional surveys were conducted after 15 months of rural implementation in Makwanpur and Palpa districts. Additional surveys were also planned for the urban areas of Rupendehi and Parsa

districts. The surveys included questions on household demographic characteristics, coverage and intake of Baal Vita, current infant and young child feeding practices, knowledge of IYCF and Baal Vita, and experiences related to Baal Vita use (Nepali Technical Assistance Group, 2012). Due to delays in program implementation in all districts, data collection for these surveys occurred from fall 2010 to fall 2011 in order to ensure comparability of timing since program implementation in the different districts.

This analysis uses data from the first two monitoring surveys of mothers and caretakers, which were carried out in the rural areas of Makwanpur and Palpa districts from September-November 2010. These monitoring surveys were conducted by an external agency, the Nepali Technical Assistance Group (NTAG), which also produced summary reports of the survey results that were submitted to UNICEF. This study builds on those reports by conducting additional secondary analyses.

Procedures

The cross-sectional surveys in the rural areas of Makwanpur and Palpa districts used a multi-stage cluster design in order to achieve estimates that were representative for rural areas in each of the districts. Within each district, clusters were defined as wards and 30 clusters were selected following the population proportional to size method. Four VDCs in each district were excluded from possible selection because they had been part of the feasibility study for this program and had already implemented the intervention. A household census was carried out in each selected ward to enumerate all of the children less than three years of age. From the lists of these children's names, 12 children 6-23 months of age in each cluster were randomly chosen, for a total projected sample size of

360 households in each district. This sample size was calculated based on an 80% coverage estimate, with a design effect of 2.0, ±6% confidence interval, and 95% response rate (Nepali Technical Assistance Group, 2012).

The households of each of the selected children were visited on the same day or within a few days of the census in order conduct the survey with the child's mother or primary caretaker. The mothers or caretakers gave their consent orally after the interviewer read aloud the consent form in Nepali. In cases in which the mother or caretaker was not at home, the interviewers returned up to three times to attempt to find the individual. A total of 356 surveys were conducted in Makwanpur district and 351 surveys were conducted in Palpa district. Additionally, each FCHV in the 30 selected wards in each district was interviewed using a separate FCHV survey, so a total of 60 FCHV interviews were conducted (Nepali Technical Assistance Group, 2012).

Survey Instrument

The survey questionnaire was administered in Nepali, but had been originally developed in English. The survey went through several rounds of back-and-forth translation to ensure that the Nepali and English versions were equivalent. The survey instrument was pilot tested during the training of the survey teams and was revised based on feedback from that exercise. Training of enumerators for the survey teams was conducted from September 20-25, 2010 at the NTAG office, and a total of 32 enumerators were trained. The enumerators carried out the surveys in teams of two (Nepali Technical Assistance Group, 2012).

The questionnaire used for mothers and caretakers contained 91 multiple choice questions and included questions on the household's demographic characteristics, hygiene behavior in the home, IYCF practices, knowledge of IYCF, knowledge of Baal Vita and experiences with Baal Vita use, and knowledge of micronutrients. See Appendix 1 for a full copy of the mother/caretaker survey. A separate survey was used for interviews with the FCHVs in each district and included questions on the FCHVs' work history and training, knowledge of IYCF practices and Baal Vita, and experiences implementing the *Integrated IYCF & Baal Vita MNP Program.*

Data Analysis

The survey data were originally entered by NTAG staff using EPI INFO software and then transferred to SPSS, which was used to conduct the analysis for the summary report produced by NTAG for UNICEF Nepal. For this analysis, the SPSS datasets were transferred to SAS version 9.3, which was used for all analyses. As this was a cluster survey design, the "surveyfreq" and "surveymeans" procedures were used for conducting descriptive analyses of the key variables related to maternal knowledge, perceived positive and negative effects of Baal Vita, and Baal Vita intake. The population used was a subset of the entire survey population that only included mothers who had ever used Baal Vita. The sample size of this population was 189 mothers in Makwanpur and 287 mothers in Palpa, for a total sample size of 476 mothers.

To assess factors associated with adherence, logistic regression models were run using the "surveylogistic" procedure with reported consumption of 45 or more sachets of Baal Vita as the outcome. Reported consumption of 45 or more sachets was used as an

outcome rather than consumption of 60 sachets to account for the fact that some mothers used a flexible administration schedule for providing the sachets. Data from the survey on the reported number of Baal Vita sachets consumed was triangulated with additional data on the number of Baal Vita sachets observed in the household by the enumerators. The reported and observed data were very consistent, and the reported data were used for this analysis because there were fewer missing values.

All results were stratified by district, as tests for interaction revealed significant interaction between the district variable and the variables for mothers' knowledge. All models controlled for mothers' education level, as this was found to be a significant confounder in some of the models and was included in all models for consistency. Variables used as predictors included mothers' general knowledge of Baal Vita and Baal Vita preparation (measured by a knowledge index that was created using 7 questions from the survey), mothers' awareness of iron and anemia, mothers' exposure to BCC strategies, and mothers' perceived positive and negative effects of Baal Vita.

Scope of the Analysis

In the context of this broad knowledge, attitudes, and practices survey given to mothers and caretakers, this analysis only focuses on specific variables related to mothers' knowledge of Baal Vita and anemia/iron, exposure to behavior change communication strategies, perceived positive and negative effects of Baal Vita, and reported consumption of Baal Vita.

IRB Consideration

This analysis was determined to be IRB-exempt because it is an analysis of secondary data and all data were de-identified prior to analysis. Identifying variables that were removed from the dataset prior to analysis by the researcher include the name of each VDC and cluster and the birthdates of each mother or caretaker.

Chapter 4: Results

Demographic Characteristics of the Population

Most of the households in the survey area relied as farming as their primary source of income, with more households in Makwanpur (78%) than Palpa (51%) engaging in farming (Figure 6). Other sources of income included casual wage labor and remittances. More households in Palpa district had assets such as electricity, televisions, and toilet facilities than did those in Makwanpur (Table 1). Mothers and fathers in Makwanpur lower levels of schooling than those in Palpa, with 52% of mothers in Makwanpur having no formal education, compared to 20% of mothers in Palpa. Just 6% of fathers in Palpa had no education, while 37% in Makwanpur had no education. Table 1 shows that in general, households in Makwanpur were much more similar to households in rural Nepal as a whole than were households in Palpa. Households in Palpa generally had more household assets and higher levels of educational attainment than the rest of rural Nepal. Household size was similar in Makwanpur (mean: 6.6 people) and Palpa (mean: 6.7 people), both of which are higher than household size in rural Nepal overall (mean: 5.0) (DHS, 2006).

Figure 6: Primary source of household income in rural households in Makwanpur district (n=356) and Palpa district (n=351), 3 months after intervention rollout in each district, 2010

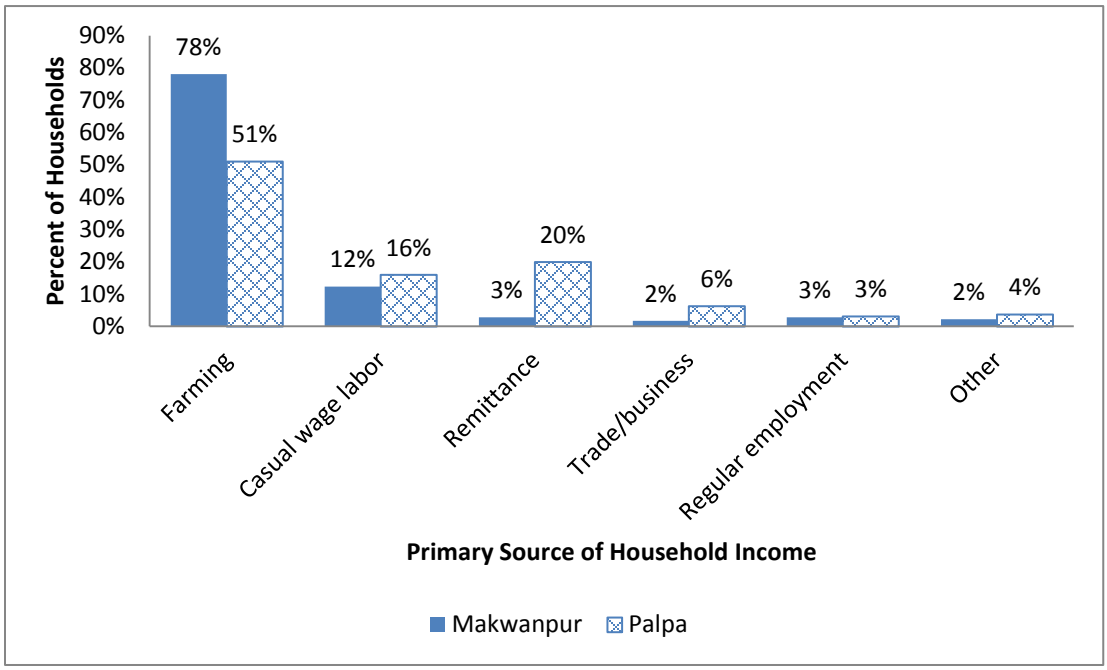


Table 1: Selected household assets and educational attainment in rural households in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010, compared to households in rural Nepal as a whole (DHS, 2006)

	Nepal (rural)	Makwanpur (n=356)	Palpa (n=351)
Household has:	%	%	%
Electricity	43.2	57.6	81.5
Radio	59.2	60.7	70.7
Television	20.8	25.8	37.3
Bednet	58.5	41.3	63.8
Earth/mud/dung floor	83.0	90.2	84.3
No toilet facility	57.2	62.6	27.9
No formal education (men/father)[a]	24.9	36.9	6.6
No formal education (women/mother)[b]	51.7	52.2	20.1

[a] The DHS estimates include all men, while the household surveys in Makwanpur and Palpa only asked about the father of the target child. In Makwanpur there was one missing (n=355) and in Palpa there was also one missing (n=350).

[b] The DHS estimates include all women, while the household surveys in Makwanpur and Palpa only asked about the mother of the target child. In Makwanpur there were 9 missing (n=347) and in Palpa there were 7 missing and one "don't know", which was changed to missing (n=343)

Coverage and Ever Use of Baal Vita

The proportion of mothers who received Baal Vita varied between the two districts, with 53% of mothers in Makwanpur district having received Baal Vita, while 82% of mothers in Palpa district received Baal Vita (Table 2). In both districts, nearly everyone who received Baal Vita used the product at least once.

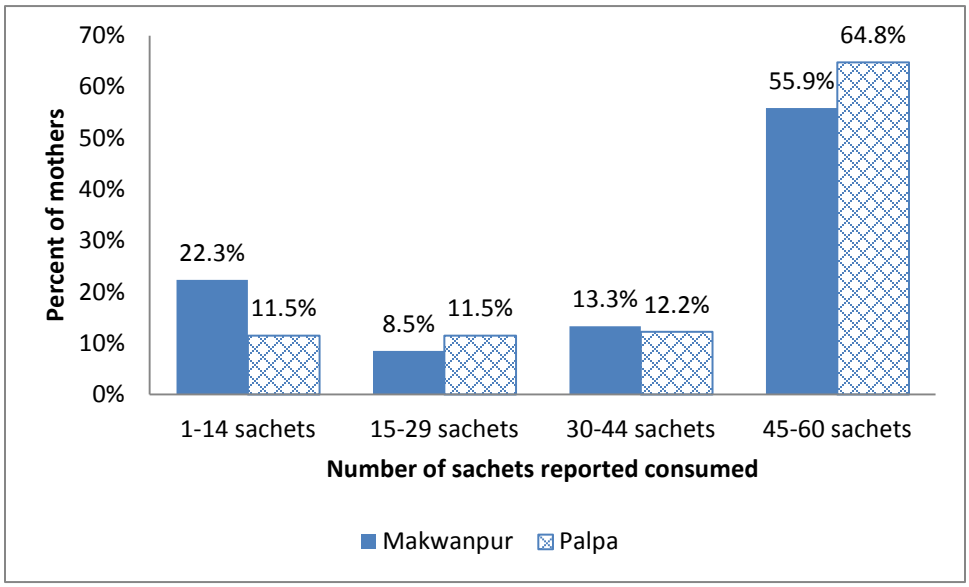
Table 2: Awareness, coverage, and use of Baal Vita among mothers in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010

	Makwanpur (n=356)				Palpa (n=351)			
	n	%	95% CI		n	%	95% CI	
Heard of BV	233	65.4	57.0	73.9	308	87.7	82.6	92.9
Received BV	190	53.4	44.6	62.1	288	82.1	78.0	86.1
Child ever consumed BV	189	53.1	44.3	61.9	287	81.8	76.8	86.7

Adherence to Baal Vita

In Makwanpur, 56% of mothers reported using 45 or more sachets of Baal Vita, while 65% of mothers in Palpa reported doing so (Table 3). The distribution of reported consumption of Baal Vita is shown in Figure 7. In Makwanpur, 44% of mothers reported full adherence of 60 sachets, and in Palpa 55% of mothers reported using 60 sachets (Table 3). For all further analyses, reported consumption of 45 or more sachets was used as the outcome of interest in order to explore factors associated with higher levels of adherence.

Figure 7: Reported consumption of Baal Vita, among mothers who reported use of any Baal Vita in Makwanpur district (n= 188)[a] and Palpa district (n=287), 3 months after intervention rollout, 2010



[a] "Don't know" was categorized as missing (n=1)

Table 3: Reported consumption of Baal Vita among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010

	Makwanpur (n=188)[a]				Palpa (n=287)			
	n	%	95% CI		n	%	95% CI	
Reported child consumed 60 sachets	83	44.1	32.8	55.5	158	55.1	46.5	63.6
Reported child consumed 45 or more sachets	105	55.9	46.0	65.7	186	64.8	55.9	73.7

[a] "Don't know" was categorized as missing (n=1)

Mothers' Knowledge of Baal Vita

A knowledge index was constructed to assess mothers' knowledge of Baal Vita, based on the number of correct answers they gave to the questions shown in Table 3. In addition to the overall knowledge index, a preparation knowledge index was also

constructed that assessed the number of correct answers to three questions dealing specifically with the preparation of Baal Vita that could affect the taste of the food (questions 3, 5, 7 in Table 4).

Among mothers who used Baal Vita, both general knowledge scores (possible scores ranged from 0-7) and preparation knowledge scores (possible scores ranged from 0-3) were very high. Median scores on the knowledge index were 6.2 in Makwanpur and 6.3 in Palpa, while median scores on the preparation knowledge index were 2.3 in Makwanpur and 2.4 in Palpa (Table 5).

Table 4: Questions used for Baal Vita Knowledge Index

Question	Acceptable Answers[a]
1. How often should a child consume Baal Vita?	- One sachet per day
2. To what size portion of food should you add Baal Vita?	- Small portion that a child can finish
3. Should you add Baal Vita to food that is cooking or hot?	- No
4. A sachet of Baal Vita is for how many children?	- One child
5. Should Baal Vita be added to liquids?	- No
6. To what types of food should you add Baal Vita?	- Soft foods - Porridge - Mashed rice and dal - Jawlo/khichadi - BhaKo Mar (rice water/starch)
7. How soon after adding Baal Vita to food should you serve it to the child?	- Immediately - Within 30 minutes

[a] Responses of "don't know" to these questions were categorized as incorrect. For each question, "don't know" was usually answered by less than 5% of participants.

Table 5: Mean and median Baal Vita knowledge index scores and Baal Vita preparation knowledge index scores among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010

	Makwanpur (n=189)				Palpa (n=287)			
	Median	Mean	95% CI for Mean		Median	Mean	95% CI for Mean	
Knowledge Index	6.2	6.4	6.1	6.6	6.3	6.6	6.5	6.8
Preparation Index	2.3	2.7	2.5	2.8	2.4	2.8	2.6	2.9

Mothers' Knowledge of Baal Vita and Adherence

It is possible that greater knowledge of Baal Vita among mothers, and specifically knowledge of proper preparation, can lead to improved adherence, possibly due to fewer changes in organoleptic properties or fewer side effects. In Palpa there was a significant association between mothers' knowledge of Baal Vita and Baal Vita preparation and the likelihood of consuming 45 or more sachets, controlling for mothers' education levels (Table 6). In Makwanpur there did not appear to be any association between either Baal Vita knowledge or Baal Vita preparation knowledge and the likelihood of consuming 45 or more Baal Vita sachets.

Table 6: The independent effect of knowledge of Baal Vita and Baal Vita preparation on reported consumption of 45 or more sachets of Baal Vita, among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010[a]

	Makwanpur (n=184)			Palpa (n=281)		
	aOR	95% CI		aOR	95% CI	
Baal Vita Knowledge Index Score	1.10	0.75	1.62	2.03	1.51	2.73
Baal Vita Preparation Knowledge Index Score	0.99	0.66	1.50	2.55	1.73	3.75

[a] These adjusted odds ratios are from logistic regression models controlling for mother's education level. They represent the effect of a one-unit increase in the Baal Vita Knowledge Index score or the Baal Vita Preparation Index score on the odds of consuming 45 or more sachets of Baal Vita.

Awareness of Anemia and Iron and Adherence

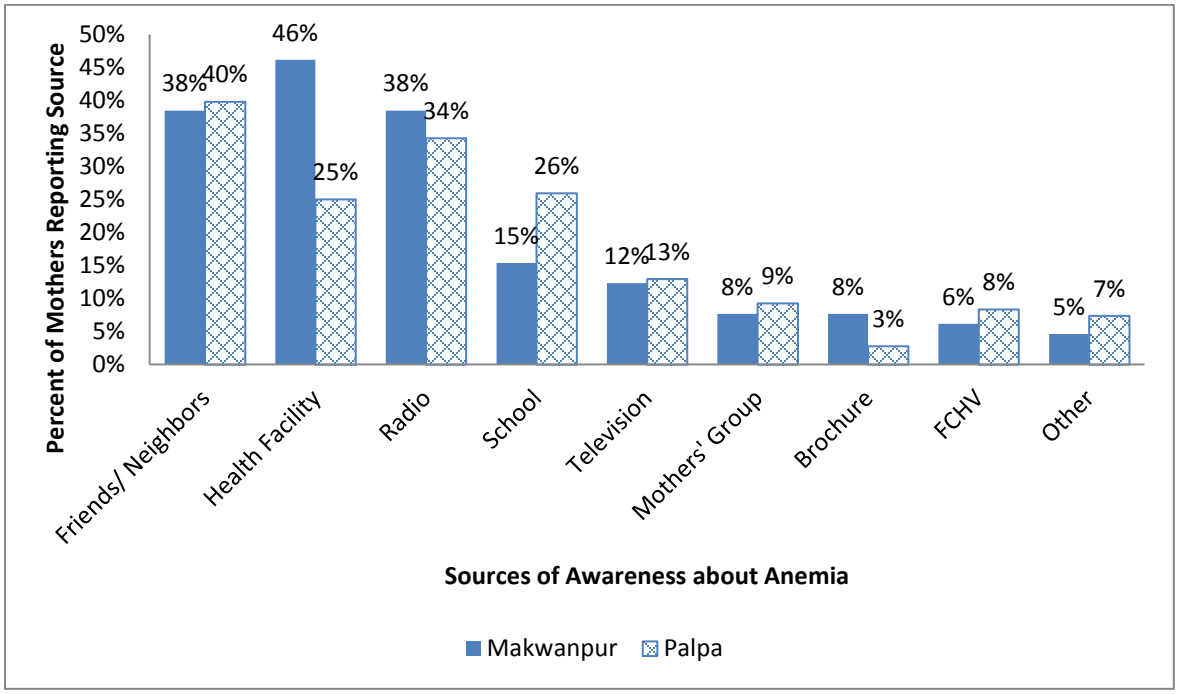
In addition to knowledge of Baal Vita, it is possible that mothers with higher levels of awareness of anemia and iron are more likely to complete the recommended course of Baal Vita sachets. They may better understand the importance of vitamins and minerals if they have heard about anemia and its negative consequences. For this analysis, having heard of anemia or having heard of iron were used as indicators of having basic awareness of micronutrients and their importance. In both districts, a much larger proportion of mothers had heard of iron than had heard of anemia (Table 7). Approximately 34% of mothers who used Baal Vita in Makwanpur and 38% of mothers in Palpa had heard of anemia, while roughly 88% of mothers in both districts had heard of iron.

Among mothers who had heard of anemia, the most common sources of awareness about anemia were friends and neighbors, the health facility, radio, and school (Figure 8). In Makwanpur district, which used the health facility model for Baal Vita distribution, a much larger proportion of women listed the health facility as a source of awareness on anemia than in Palpa, which used the FCHV distribution model.

Table 7: Awareness of anemia and iron among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010

	Makwanpur (n=189)				Palpa (n=287)			
	n	%	95% CI		n	%	95% CI	
Heard of Anemia	65	34.4	23.4	45.3	108	37.6	28.7	46.6
Heard of Iron	166	87.8	82.2	93.5	253	88.2	83.6	92.7

Figure 8: Sources of awareness about anemia among mothers who used any Baal Vita and had heard of anemia in Makwanpur (n=65) and Palpa (n=108) districts, 3 months after intervention rollout, 2010[a]



[a] Mothers could report multiple sources of awareness, so totals exceed 100%

In Makwanpur district, mothers who had heard of anemia had 2.5 times the odds of reporting their child consumed 45 or more sachets of Baal Vita than did mothers who had not heard of anemia (Table 8). In Palpa there was no association between having heard of anemia and consumption of 45 or more sachets, however. In both districts, there was no significant association between having heard of iron and consumption of 45 more Baal Vita sachets.

Table 8: The association between having heard of anemia or iron and reported consumption of 45 or more sachets of Baal Vita, among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010[a]

	Makwanpur (n=184)			Palpa (n=281)		
	aOR	95% CI		aOR	95% CI	
Heard of Anemia	2.46	1.18	5.15	1.02	0.62	1.68
Heard of Iron	0.86	0.32	2.33	1.25	0.51	3.07

[a] These odds ratios are from separate logistic regression models adjusted for mother's level of education.

Mothers' Exposure to Behavior Change Communication Strategies and Adherence

A fairly low proportion of mothers who used Baal Vita had attended a mothers' group meeting (30% in Makwanpur and 39% in Palpa), which was a primary medium through which they were supposed to receive supportive behavior change communication (Table 9). A larger portion had received the brochure and reminder card, with more mothers in both districts having received the reminder card than the brochure, although these were supposed to be given simultaneously. A significantly higher proportion of mothers had received education on Baal Vita from health facility staff in Makwanpur (73%) than in Palpa (33%), which is expected since Makwanpur used the health facility model for distribution of Baal Vita.

Table 10 shows the results of logistic regression models examining the independent effect of exposure to various BCC strategies on reported intake of 45 or more Baal Vita sachets. Mothers in Palpa who had attended a mothers' group meeting had 2.4 times the odds of reporting that their child consumed 45 or more Baal Vita sachets than mothers who had not attended a mothers' group meeting. There were no other significant associations between exposure to BCC strategies and reported

consumption of 45 or more sachets. This may be due to the small sample sizes for some of the estimates, however.

Table 9: Exposure to behavior change communication strategies among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010[a]

	Makwanpur (n=189)				Palpa (n=287)			
BCC Strategies Received	n	%	95% CI		n	%	95% CI	
Attended Mothers' Group Meeting led by FCHV	56	29.6	19.4	39.8	111	38.7	28.5	48.9
Received BV Brochure	126	66.7	53.0	80.3	222	77.4	70.5	84.2
Received BV Reminder Card	169	89.4	81.8	97.0	254	88.5	82.5	94.5
HF Staff ever gave BV Education	138	73.0	63.4	82.6	95	33.1	24.3	41.9

[a] "Don't know" (Makwanpur, n=6; Palpa, n=16) or missing (Palpa, n=7) were categorized as not having received the strategies.

Table 10: The independent effect of exposure to various behavior change communication strategies on reported consumption of 45 or more sachets of Baal Vita, among mothers who used Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010[a]

	Makwanpur (n=184)			Palpa (n=274)		
BCC Strategies Received	aOR	95% CI		aOR	95% CI	
Attended Mothers' Group Meeting led by FCHV	1.15	0.56	2.37	2.39	1.32	4.33
Received BV Brochure	0.99	0.41	2.40	0.75	0.38	1.49
Received BV Reminder Card	0.41	0.12	1.36	3.28	0.94	11.49
HF Staff ever gave BV Education	1.10	0.47	2.57	1.66	0.85	3.23

[a] These odds ratios are from logistic regression models, controlling for all other behavior change communication strategies listed and mother's education level.

Perceived Negative Effects of Baal Vita and Adherence

Approximately 46% of mothers in Makwanpur and 54% of mothers in Palpa perceived no negative effects after using Baal Vita (Table 11). Among those who perceived negative effects, the most common types of negative effects reported were

gastrointestinal effects, with 41% of mothers in Makwanpur and 38% of mothers in Palpa reporting negative gastrointestinal effects. The most common types of gastrointestinal effects reported were black stools or loose stools, with vomiting, nausea, and constipation reported less frequently. "Other" negative effects were reported by 12% of mothers in Makwanpur and 7% of mothers in Palpa, but the descriptions of these "other" effects were not included in the quantitative dataset and were thus unable to be analyzed. Increased appetite was not perceived as a negative effect of Baal Vita by any mothers in Makwanpur and was reported by less than 1% of mothers in Palpa.

Perceived barriers to giving 60 sachets of Baal Vita were similar to perceived negative effects, except that the child rejecting the food was a major barrier, reported by 28% of mothers in Makwanpur and 26% of mothers in Palpa (Table 12). Gastrointestinal effects were reported as a barrier to use of 60 sachets by 23% of mothers in Makwanpur and 27% of mothers in Palpa, which is lower than the portion of mothers in those districts that reported perceiving negative GI effects. Difficulty remembering to use Baal Vita was not a significant barrier, reported by just 4% of mothers in Makwanpur and less than 1% of mothers in Palpa.

Reporting any gastrointestinal effects was associated with a decreased likelihood of consumption of 45 sachets of Baal Vita, but this association was not statistically significant in either district (Table 13). Perceiving no negative effects of Baal Vita was significantly associated with increased odds of consuming 45 or more sachet in both districts (Makwanpur, aOR=2.01; Palpa, aOR=2.21).

Table 11: Perceived negative effects of Baal Vita reported among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010[a]

	Makwanpur (n=189)				Palpa (n=287)			
	n	%	95% CI		n	%	95% CI	
No negative effects	86	45.5	36.5	54.5	155	54.0	46.0	62.1
Any gastrointestinal effects[b]	77	40.7	30.2	51.2	110	38.3	30.6	46.0
Black stools	43	22.8	12.9	32.6	56	19.5	13.3	25.7
Loose stools	36	19.0	11.8	26.3	63	22.0	16.1	27.8
Other	22	11.6	5.2	18.0	20	7.0	2.9	11.0
Vomiting	16	8.5	3.4	13.5	11	3.8	1.4	6.3
Nausea	11	5.8	1.8	9.9	8	2.8	0.0	5.7
Constipation	7	3.7	0.9	6.5	6	2.1	0.2	4.0
Increased appetite	0	0.0	0.0	0.0	2	0.7	0.0	1.7

[a] Mothers could report multiple negative effects. Of those that experienced any negative effects, most reported one or two negative effects.
[b] Includes black stools, loose stools, vomiting, nausea, and constipation

Table 12: Barriers to giving 60 Baal Vita sachets among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010

	Makwanpur (n=187)				Palpa (n=284)			
	n	%	95% CI		n	%	95% CI	
No Barriers	84	44.9	32.7	57.2	132	46.5	38.9	54.1
Child rejects food/dislikes taste	52	27.8	18.2	37.4	74	26.1	18.5	33.6
Any gastrointestinal problem (loose/dark stools or vomiting)	42	22.5	13.9	31.1	76	26.8	20.0	33.6
Loose Stools	25	13.4	6.7	20.1	43	15.1	9.7	20.5
Other barrier	24	12.8	6.1	19.6	22	7.7	3.1	12.4
Dark (black) stools	18	9.6	3.3	15.9	35	12.3	7.1	17.6
Vomiting	14	7.5	2.9	12.1	12	4.2	1.4	7.1
Need to put in small quantity of food	11	5.9	0.0	13.0	1	0.4	0.0	1.1
Difficult to remember to use	7	3.7	0.8	6.7	2	0.7	0.0	1.7
Need to share with other children	4	2.1	0.1	4.1	0	0.0	0.0	0.0
Don't know enough about BV	1	0.5	0.0	1.6	1	0.4	0.0	1.1
Difficult preparation	0	0.0	0.0	0.0	1	0.4	0.0	1.1
Family doesn't support BV use	0	0.0	0.0	0.0	1	0.4	0.0	1.1
Increased appetite	0	0.0	0.0	0.0	0	0.0	0.0	0.0
Don't trust BV	0	0.0	0.0	0.0	0	0.0	0.0	0.0
Stock out at HF/FCHV	0	0.0	0.0	0.0	0	0.0	0.0	0.0
FCHV not available/ HF closed	0	0.0	0.0	0.0	0	0.0	0.0	0.0

Table 13: The association between perceiving any gastrointestinal effects[a] or no negative effects and reported consumption of 45 or more sachets of Baal Vita, among mothers received Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout, 2010[b]

	Makwanpur (n=184)			Palpa (n=281)		
	aOR	95% CI		aOR	95% CI	
Any gastrointestinal effects	0.79	0.38	1.67	0.63	0.34	1.17
No negative effects	2.01	0.86	4.70	2.21	1.25	3.92

[a] Includes black stools, loose stools, vomiting, nausea, or constipation

[b] These adjusted odds ratios are from separate logistic regression models adjusted for mother's level of education and all perceived positive effects of Baal Vita (increased appetite, increased energy, making child stronger, making child healthy, physical growth, and no positive effects).

Perceived Positive Effects of Baal Vita and Adherence

Frequently perceived positive effects of Baal Vita were that it increases the child's energy, makes the child stronger, makes the child healthy, increases the child's appetite, and increases the child's immunity (Table 14). Among mothers in Makwanpur, 29% perceived no positive effects after using Baal Vita, while 23% of mothers in Palpa perceived no positive effects.

Perceiving any positive effects of Baal Vita was strongly associated with adherence, and in both districts mothers who perceived any positive effects had nearly 10 times the odds of reporting consumption of 45 or more sachets than mothers who did not perceive any positive effects (Table 15). However, it is possible that mothers with high levels of adherence were more likely to perceive positive effects because they had been using Baal Vita for longer than mothers with lower levels of adherence, and thus their high adherence is what caused them to perceive positive effects. Table 16 shows that mothers who perceived any positive effects had used a median of 58 sachets in Makwanpur and 59 sachets in Palpa, while those who perceived no positive effects had used a median of 20 sachets in Makwanpur and 24 sachets in Palpa. Not all mothers with

high adherence perceived positive effects, however: 10% of mothers in Makwanpur and 9% of mothers in Palpa who reported consumption of 45 or more sachets perceived no positive effects of using Baal Vita.

Table 14: Perceived positive effects of Baal Vita reported among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010[a]

	Makwanpur (n=189)				Palpa (n=287)			
	n	%	95% CI		n	%	95% CI	
Increased energy	57	30.2	21.4	38.9	89	31.0	23.8	38.2
No positive effects	54	28.6	19.8	37.3	65	22.6	16.0	29.3
Makes child stronger	47	24.9	17.1	32.7	106	36.9	29.7	44.2
Makes child healthy	45	23.8	14.3	33.4	69	24.0	18.2	29.9
Increased appetite	33	17.5	9.9	25.0	62	21.6	15.7	27.5
Increased immunity	22	11.6	6.4	16.9	46	16.0	10.9	21.1
Mental development	16	8.5	3.1	13.8	38	13.2	7.9	18.6
Physical growth	8	4.2	1.3	7.1	31	10.8	6.8	14.8
Don't know	8	4.2	0.5	8.0	14	4.9	1.5	8.3
Other	7	3.7	0.8	6.6	16	5.6	1.1	10.1

[a] Mothers could report multiple positive effects. Of those that experienced any positive effects, most reported one or two positive effects.

Table 15: The association between perceiving any positive effects of Baal Vita and reported consumption of 45 or more sachets, among mothers who used any Baal Vita in Makwanpur and Palpa districts, 3 months after intervention rollout in each district, 2010[a]

	Makwanpur (n=184)			Palpa (n=281)		
	aOR	95% CI		aOR	95% CI	
Perceived any positive effects	9.88	4.06	24.05	9.77	4.44	21.50

[a] These adjusted odds ratios are from logistic regression models adjusted for mother's education and for all negative reported effects of Baal Vita (black stools, loose stools, constipation, vomiting, nausea, increased appetite, other negative effects, and no negative effects).

Table 16: Mean and median number of Baal Vita sachets reported consumed, among mothers who used any Baal Vita in Makwanpur and Palpa districts, by perception of positive effects of Baal Vita, 3 months after intervention rollout in each district, 2010

Perceived any positive effects	Makwanpur (n=188)				Palpa (n=287)			
	Median # of sachets	Mean # of sachets	95% CI for Mean		Median # of sachets	Mean # of sachets	95% CI for Mean	
No	20	20.2	13.9	26.5	24	28.2	22.7	33.7
Yes	58	48.7	44.8	52.6	59	50.5	47.3	53.7

Chapter 5: Discussion

Summary

Literature on programmatic experience with MNPs describes potential barriers to adherence as inadequate maternal knowledge of the product and preparation, perceiving negative side effects of the product, children rejecting food with the product, and mothers forgetting to give the product (Jefferds, et al., 2010; Menon, et al., 2006; World Vision, 2005). This analysis was consistent with the previous findings regarding knowledge, children rejecting the food, and perceiving negative effects, but forgetting to give the product was not a substantial barrier to adherence among mothers. Additionally, perceiving positive effects was strongly associated with adherence. Perceiving positive effects after using the product can be an important motivating factor for mothers to continue giving Baal Vita to their children, even if they do experience some negative side effects. Maternal knowledge of the product and preparation is necessary for adherence, but mothers also must have motivation and interpersonal support to continually use the product. Counseling mothers on the potential benefits of MNP use for their children should be a priority behavior change communication strategy for MNP programs in the future, especially as mothers may need motivation to use MNPs for some time before they begin perceiving positive effects. We did not find broader structural and community-level barriers to adherence mentioned in the literature such as stock-outs, lack of family support, and poor patient- provider relationships to be major barriers to adherence in this intervention.

Mothers' Knowledge and Adherence

The marginal levels of adherence reported, despite high knowledge levels, indicate that knowledge about Baal Vita is necessary but not sufficient for mothers to adhere to Baal Vita. This is consistent with the intervention's logic model, which suggests that mothers and caretakers must "know, demand, accept, and have the ability to appropriately use IYCF strategies and MNPs" (Figure 5). It is unclear why mothers' knowledge was associated with adherence in Palpa district but not in Makwanpur. Perhaps mothers in Palpa with higher levels of Baal Vita knowledge also had greater access to FCHVs for troubleshooting and support with Baal Vita use, since the FCHV distribution model was used in that district. Thus, mothers with higher levels of Baal Vita knowledge in Palpa may have also accepted Baal Vita more easily and had greater ability to use the product, as they had support from FCHVs within their community. This is supported by findings from the prenatal iron and folic supplementation program in Nepal, which cited the involvement of FCHVs as community-based distribution agents as a key factor in achieving the program's high levels coverage and adherence (Pokharel , et al., 2011).

Awareness of anemia was associated with adherence in Makwanpur but not in Palpa, and the sources of awareness about anemia differed between the two districts, with more mothers in Makwanpur hearing about anemia at the health facility than those in Palpa. It is possible that the health facility staff members are perceived as more authoritative sources of knowledge than friends and FCHVs. This could explain why those who heard about anemia from health facility staff were more likely to adhere to Baal Vita than those who heard about anemia from other sources. This is supported by

findings in the literature that lack of anemia knowledge is a factor influencing poor adherence to iron supplementation and that effective communication from health providers can help improve adherence (Mora, 2002). The indicator used for anemia awareness (having heard of anemia) does not provide a clear picture of mothers' level of anemia knowledge, which likely depends on the source from which they heard about anemia. Since mothers in Makwanpur were more likely to have heard about anemia at the health facility, rather than from informal sources such as friends and neighbors, perhaps they had more through knowledge of anemia and its consequences, and this was more likely to motivate them to complete the full course of sachets.

Exposure to Behavior Change Communication Strategies

Of the behavior change communication strategies received by mothers, only attending a mother's group meeting was significantly associated with adherence, and this association was only seen in Palpa district. Since FCHVs distributed Baal Vita in Palpa, perhaps they were better able to provide detailed education to mothers at mothers' group meetings and support them to use the product. This is supported by the adherence literature, which has demonstrated that quality communication between patient and providers is a key factor influencing adherence (Irwin & Richardson, 2006). Although mothers' group meetings were part of the intervention package in both Makwanpur and Palpa, the quality of communication was not captured in this survey, and perhaps the FCHVs in Palpa were better able to communicate with and support mothers to continue using the product. Additionally, attendance at mothers' groups meetings in both districts was lower than anticipated among mothers who received Baal Vita, even though these meetings were supposed to be the primary medium for health education surrounding Baal

Vita, which suggests that mothers were getting information on Baal Vita from alternate sources.

Receiving the Baal Vita brochure and reminder card were not significantly associated with adherence in either district, although there was a non-significant positive association between having received the reminder card and adherence in Palpa. This suggests that in rural populations such as these, distributing written materials may not be the best means of conveying behavior change communication messages, as interpersonal communication through mothers' group meetings appears to have a greater effect. Also, in contrast to other settings in which mothers reported that they often forgot to give MNPs to their children (World Vision, 2005), very few mothers in this study reported forgetting to give Baal Vita as a barrier to full adherence. Thus, the Baal Vita reminder card, which contains boxes that mothers can check every day after giving their child the product, may not be necessary among this population, especially in districts with lower levels of literacy such as Makwanpur. Conversely, having received the card may have been the reason mothers did not forget to give Baal Vita and a significant association many not have been seen because nearly all mothers who used Baal Vita received the reminder card. This survey did no capture how or if mothers used the boxes that were printed on the reminder card.

Perceived Effects and Barriers to Using Baal Vita

The association between perceived positive effects and adherence was much larger than that between negative effects and adherence, which was unexpected given that paucity of perceived positive effects has not often been cited as a barrier to adherence in

the literature. Although perceiving positive effects was very strongly associated with adherence in both districts, the direction of causality is unclear, and high levels of adherence may have been what caused mothers to perceive positive effects. This seems likely, as mothers who perceived positive effects reported consumption of a much larger number of sachets, on average, than did mothers who perceived no positive effects. Some mothers with high levels of adherence perceived no positive effects, however, indicating that other factors can motivate mothers to continue giving the product. Communication strategies should clearly emphasize to mothers that they may need to use MNPs for some time before they start perceiving positive effects in order to motivate them to continue using the product in the absence of immediately noticeable effects.

Although perceiving no negative effects was associated with adherence in both districts, the association was only statistically significant in Palpa. Also, not all of the mothers who perceived black or loose stools cited these effects as a barrier to adherence, indicating that these effects are not insurmountable barriers. Through the Baal Vita brochure, mothers were warned about the possibility of side effects occurring, which has been shown to decrease the likelihood that they will perceive side effects as a barrier to use (Jefferds, et al., 2010; Tripp, et al., 2011). Not all mothers who received the brochure were necessarily able to read and understand it, however.

The largest barrier reported in this study was the child rejecting the food, although MNPs should not change the taste, color, or texture of food when prepared properly (Zlotkin, et al., 2005). Rejecting the food was reported consistently among children of all ages, and does not simply represent the youngest children, who are newest to solid foods and may be likely to reject new foods in general. While MNPs changing the taste of the

food has been cited as a barrier in some cases (Menon, et al., 2006; World Vision, 2005), in other studies some children liked the taste of MNPs or even confused them with sugar packets (Jefferds, et al., 2010; Karim, et al., 2006). Seeing the mother use the sachets may influence children's perception of taste, and some mothers in other settings have mixed MNPs into food out of children's sight in order to improve their acceptability (Karim, et al., 2006). Future behavior change communication strategies should emphasize this as a strategy to minimize the likelihood of the child rejecting the food.

Limitations and Strengths

There were several limitations to this study. One issue was that data on time since receipt of Baal Vita was not collected directly. Among those respondents that received Baal Vita, only 53% of those had data on time since receipt available, based on the date of receipt written on the reminder card. Therefore, when adherence was calculated in terms of having consumed a certain number of Baal Vita sachets, it is possible that some of the respondents were consuming the sachets regularly but had simply received them very recently and had not completed many yet, and thus were misclassified as non-adherent.

A broader issue is that Baal Vita use was self-reported by mothers and caretakers. Although one question on the survey required the enumerator to observe the number of sachets remaining in the respondent's home and this was used to validate the self-reported data, it is still possible that some respondents may have not shown all of the sachets in their home to the interviewers or may have shared sachets with older children or other families. Similarly, some mothers may have overstated the positive effects of

Baal Vita and hesitated to report negative effects or barriers to using the product due to courtesy bias.

These surveys were designed to be administered in Nepali, but there are a wide range of languages spoken in Nepal and not all respondents spoke Nepali as their mother tongue. Enumerators were selected based on their fluency in the dominant languages in the selected districts and conducted on-the-spot translation of survey questions when participants did not speak Nepali. It is possible that these spot translations did not correspond exactly to the meaning of the words in Nepali, especially for technical terms such as “iron” and “anemia.”

Additionally, these surveys took place after just three months of program implementation in each district, and the barriers to adherence reported will likely change after a longer period of implementation. For example, mothers did not report stock-outs of Baal Vita to be a problem, but at this time they had only picked up the first course of 60 sachets. Therefore, results from this survey may not be generalizable to other MNP programs that have existed for a longer period of time.

As these surveys were quantitative in nature, they were not able to capture some of the nuances of program implementation. Although the survey asked mothers to report the type of behavior change communication strategies they had received, the quality of communication received at mothers’ group meetings and from health facility staff may have varied between districts and within districts. Health facility staff and FCHVs probably had varying levels of knowledge and motivation to promote Baal Vita, and

likely implemented the intervention with different levels of fidelity to the implementation protocol.

Finally, some of the mothers' responses to the questions on perceived positive and negative effects and barriers to adherence were categorized as "other," but the details of these responses were not included in the quantitative dataset that was analyzed for this survey. Thus, some details on the types of perceived effects and barriers to using Baal Vita were not captured in this report.

Strengths of this study include the fact that the surveys were representative of the two districts, the fairly large sample size, and the very high response rate of 98% (Nepali Technical Assistance Group, 2012). Additionally, the surveys were conducted by a well-trained team of individuals with prior experience conducting surveys in the study area.

Conclusions and Implications

One area for future research is determining the dosing and timeframe within which mothers typically begin noticing positive effects of MNPs in their children. If researchers were able to determine the number of days of use after which mothers typically begin noticing increased energy, strength, and other positive effects of MNP use, this information could be used to help tailor behavior change communication messages. If mothers knew that they should not expect to perceive positive effects during the early period of MNP use, this may encourage them to continue using the product, rather than feeling discouraged and stopping because they did not perceive the positive effects promised in behavior change communication messages. Just as negative side effects are less likely to be a barrier to adherence if mothers are warned about them ahead

of time, lack of perceived positive effects may become less of a barrier if mothers know that they need to use MNPs for a sustained period of time before positive effects become apparent.

Future research could also use qualitative methods to assess the utility of certain behavior change communication tools, such as reminder cards and brochures. While this survey recorded whether mothers received these materials, it did not assess how helpful mothers perceived these materials to be and whether they used them on a regular basis.

Another implication is that the model through which MNPs are delivered may significantly affect the quality of behavior change communication given. Although the health facility delivery model and the FCHV delivery model used in this intervention were supposed to be implemented in the same way except for the actual distribution of the MNP, mothers may have utilized the FCHVs differently in the two different models. Because FCHVs distributed the product in Palpa, this might have strengthened the perception of FCHVs as a community resource for Baal Vita and mothers may have sought them out for support and troubleshooting. Future interventions should not only ensure that mothers have accurate knowledge about MNPs, but should also consider the best mechanisms for providing interpersonal support and motivation to use the product, as knowledge alone is usually not sufficient for high adherence. This could include training health workers and FCHVs in techniques to improve caregiver motivation such as motivational interviewing.

Finally, behavior change communication messages should focus on the motivation for why MNPs are needed, as mothers may not have any previous

understanding of anemia and its consequences are fairly subtle. If the majority of young children in a community are anemic, mothers may view their child's level of activity and strength as normal in comparison to other children. By focusing on the negative consequences of anemia and the positive effects of MNPs, future programs can increase demand for the product among mothers. Observing tangible changes in other people's children who have used MNPs may also increase mothers' motivation to use the product (Jefferds, et al., 2010). Directly addressing barriers to use such as children rejecting food mixed with MNPs and promoting strategies that mothers have used to overcome these barriers should also be a priority strategy to improve adherence. By choosing delivery models that facilitate high-quality supportive behavior change communication and emphasizing the positive effects of MNPs, future programs can reduce mothers' barriers to adherence and lessen the burden of micronutrient deficiencies among young children worldwide.

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Appendices

Appendix 1: Household Survey Questionnaire (English Version)

A. Household information panel Verify name of the child 6-24 months selected from the line listing: First Name of Child_____ Sex of child: Male or Female (circle one) DOB of child from census form_____ in months of child from census form				
No	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP**	**VARIABLE**
1.	Name of the head of household			HHHEAD
2.	**Name of <child's> mother**			MOTHER
3.	**CASTE OF CHILD**	1. Dalit Hill/ Terai 2. Disadvantage Janajati/ Hill/ Terai 3. Disadvantage Non Dalit Terai Caste Group 4. Religious Minorities 5. Relatively Advantaged Janajati Upper Caste Group 6. Upper caste 77. Refuse to answer		CASTE
4.	How many people are eating from the same kitchen?	Total number of People_____ 88. Do not know 77. Refuse to answer		TOTH
B) SOCIO- ECONOMIC INFORMATION				
5.	What is <child's name> father's level of schooling?	1. None 2. Primary level 3. Lower secondary 4. Secondary level 5. Higher secondary 6. Intermediate and above 7. Other……. 88. Don not know 77. Refuse to answer		EDFATHER
6.	What is <child's name> mother's level of schooling?	1. None 2. Primary level 3. Lower secondary 4. Secondary level 5. Higher secondary 6. Intermediate and above 7. Other…….		EDMOTHER

		88. Don not know 77. Refuse to answer		
7.	What is the household's main source of income? *Select one option only*	1. Crop farming 2. Livestock farming 3. Fishing 4. Casual wage labour 5. Remittance 6. Trade/ business 7. Assistance programmes (pensions, development aid programmes, etc) 8. Regular employment 9. Forest products collection 99. Other……. 88. Do not know 77. Refuse to answer		HINCOME
8	What material is the floor made of? (Please Observe)	1. Earth/ Mud/ dung 2. Wood plank 3. Linoleum/carpet 4. Ceramic tiles, marble chips 5. Cement 99. Other (Specify)…		FLOOR
9.	What are the main materials of the roof? (Please Observe)	1. Natural Roof - Thatch/straw/wheat straw 2. Rudimentary Roof- Wood planks, cardboard/rustic mate/ bamboo 3. Finished roof – galvanized sheet, wood, asbestos, ceramic tiles/slate, cement, roofing shingles 99. Other……		ROOF
10.	What are the main materials of the walls? (Please Observe)	1. Bamboo with mud 2. Bamboo with cement 3. Adobe 4. unfinished wood 5. Cement 6. Bricks 7. Cement blocks 8. Wood planks 9. No walls 99. Other……		WALL
11.	What of the following does your household have? *(Read options)*			

	Electricity	1. Yes	2. No		11ELEC
	Radio	1. Yes	2. No		11RADIO
	Television	1. Yes	2. No		11TV
	Mobile telephone	1. Yes	2. No		11MOB
	Land line telephone	1. Yes	2. No		11TLF
	Refrigerator	1. Yes	2. No		11REFRIG
	Table	1. Yes	2. No		11 TABLE
	Chair	1. Yes	2. No		11 CHAIR
	Bed	1. Yes	2. No		11BED
	Sofa	1. Yes	2. No		11SOFA
	Cupboard	1. Yes	2. No		11CUPB
	Watch/clock	1. Yes	2. No		11WATCH
	Computer	1. Yes	2. No		11COMP
	Fan	1. Yes	2. No		11FAN
	Dhikki	1. Yes	2. No		11DHIKKI
	Bicycle	1. Yes	2. No		11BIKE
B: WATER, HYGIENE AND SANITATION					
12.	What is your main source of drinking water for member of your household?	1. Piped water into house/yard/plot 2. Public/neighbor's tap 3. Dug well in house/yard/plot 4. Public/neighbor's Dugwell 5. Tube well in yard/ plot 6. Public/neighbor's Tube well 7. Spring/ Kuwa 8. River/Stream/Pond/Lake 99. Other…… 88. Do not know 77. Refuse to answer			MAINWATER
13.	What type of toilet facilities does your house have?	1. Flush toilet 2. Traditional Pit toilet 3. ventilated improved pit latrine 4. no facility /bush/field 99. Other…… 88. Do not know 77. Refuse to answer			TOILET
14.	On most days, what do you use to wash your hands?	1. Do not use anything 2. Soap 3. Mud 4. Plain water 5. Wet Mud 6. Ash 99. Other (Please mention) 88. Do not know 77. Refuse to answer			WHATWASH

15.	Do you have soap in your home? Would you like to show it to me?	1. Soap is Observed 2. No soap in the house 77 Refuse to answer		OBSSOAP
16.	Have you used soap today or yesterday?	1. Yes, I did 2. No, I didn't 88. Do not know 77. Refuse to answer	If No, DK or Refuse Go to 18	USESOAP
17.	For what purpose did you use the soap yesterday? *(Multiple answers)*	1. to wash clothes 2. to take a bath 3. Washing my children 4. Washing child's bottoms 5. Washing my children's hands 6. Washing hands after defecating 7. Washing hands after cleaning child 8. Washing hands before feeding child 9. Washing hands before preparing food 10. Washing hands before eating 99. Other…… 88. Do not know 77. Refuse to answer		17Clothes 17Bath 17Child 17Butt 17Hands 17Defec 17Clean 17Feed 17Prep 17Eating 17other 17DK 17Refuse
18.	Do you have a bed net?	1. Yes 2. No 88. Do not know 77. Refuse to answer		BEDNET
C: INFANT AND YOUNG CHILD FEEDING PRACTICES				
19	Have you ever breastfed [CHILD'S NAME]?	1. Yes 2. No 77. Refuse to answer	If No or Refuse Go to 25	EVERBF
20.	How long after birth did you first put [CHILD'S NAME] to the breast? ***Read options 1-4 to the participant***	1. Immediately after birth 2. Within one hour 3. After one hour but within one day 4. After one day 88. Do not know 77. Refuse to answer		STARTBF
21.	Are you still breastfeeding [CHILD'S Name]?	1. Yes 2. No 77. Refuse to answer	If no or refuse Go to 25	STILLBF
22.	How many times did you breastfeed [CHILD'S NAME] during the	…… Times 88. Do not know 77. Refuse to answer		FREQDAY

	daylight hours yesterday?			
23.	How many times did you breastfeed [CHILD'S NAME] last night between sunset and sunrise?	…… Times 88. Do not know 77. Refuse to answer	Go to 25	FREQNIGHT
24.	Why are you no longer breastfeeding [CHILD'S NAME]? *Multiple answers*	1. Workload 2. New pregnancy 3. Not enough breast milk 4. Start using contraception 5. Child ill/ weak 6. Mother ill/ weak 7. Nipple/breast problem 8. Child refused 9. Weaning age/ age to stop 99. Other…… 88. Do not know 77. Refuse to answer		24 work 24preg 24insuffi 24contra 24childsick 24momsick 24prob 24childref 24wean 24other 24DK 24refuse
25.	Did [CHILD'S NAME] drink anything from a bottle with a nipple the previous day?	1. Yes 2. No 88. Do not know 77. Refuse to answer	If no, DK or Refuse Go to 28	BOTTLE
26.	Did [CHILD'S NAME] receive anything to drink other than breast milk during the previous day?	1. Yes 2. No 88. Do not know 77. Refuse to answer	If no, DK or Refuse Go to 28	LIQUID
27.	If yes, what was [CHILD'S NAME] given to drink? *Mark all that apply*	1. Milk (other than breast milk) 2. Plain water 3. Sugar or glucose water 4. Gripe water 5. Sugar- salt- water solution 6. Fruit juice 7. Infant formula 8. Tea/ infusions 9. Honey 10. Bhatko mar (rice water/starch) 99. Other (please mention) 88. Do not know 77. Refuse to answer		27MILK 27PLAIN 27SUGAR 27GRIPE 27SOLUTION 27JUICE 27FORMULA 27TEA 27HONEY 27BHAT 27OTHER 27DK 27refuse
28.	How old was [CHILD'S NAME] when he/ she was introduced to solid, semi- solid or soft solid food (complementary	1. _____ Months 2. Not yet introduced 88. Do not know 77. Refuse to answer		INTROCF

	feeding) for the first time?			
29.	Did [CHILD'S NAME] receive solid, semi- solid or soft solid food yesterday?	1. Yes 2. No 88. Do not know 77. Refuse to answer	If no, DK, or refuse Go to 32	AGECF
30.	How many times did you give [CHILD'S NAME] solid, semi- solid or soft solid yesterday?	1. 1 time 2. 2 times 3. 3 times 4. 4 or more 88. Do not know 77. Refuse to answer		FREQCOMPL

31. Dietary diversity
Did [CHILD'S NAME] eat from the following food groups the previous day?
Read the food groups and the examples

No.	Food Group	Example			VARIABLES
I	Grains, roots and tubers, such as	Bread, biscuits, noodles, rice or beaten rice, maize, wheat or porridge made from any of these	1. Yes	2. No	GRAINROTU
II	Legumes and nuts, such as	Beans, peas, lentils, nuts, seeds or food made from these	1. Yes	2. No	LEGNUT
III	Dairy products, such as	milk, Ghee, curds, cheese or other milk products	1. Yes	2. No	DAIRY
IV	Flesh foods, such as	Chicken, mutton, buff, fish. Poultry, liver, kidney, heart and other organ meats or blood based food.	1. Yes	2. No	FLESH
V	Eggs	Egg	1. Yes	2. No	EGG
VI	Vitamin A rich fruits and vegetables, such as	Ripe mango, pumpkin, carrot papaya, green vegetable	1. Yes	2. No	VITA FRUIT
VII	Other fruits and vegetables, such as	Wild fruits dried amala, banana, apple seasonal fruits and vegetable	1. Yes	2. No	FRUIT

32.	Does [CHILD'S NAME] eat from the same plate along with another child? **Read responses 1-4 aloud**	1. All of the meals 2. Most of the meals but not all the meals 3. A few meals but not often 4. None of the meals 88. Do not know 77. Refuse to answer		SHAREPLATE
33.	Does [CHILD'S Name] eat from the	1. All of the meals 2. Most of the meals but not		PLATEADULT

	same plate along with the mother or caretaker? **Read responses 1-4 aloud**	all the meals 3. A few meals but not often 4. None of the meals 88. Do not know 77. Refuse to answer		
E: KNOWLEDGE ABOUT IYCF				
34.	In your opinion, why does a child below 2 years of age needs to be fed with nutritious food? *Multiple answers*	1. For overall health/healthy development 2. For physical growth 3. For mental development 4. For strength/strong body 5. For developing strong immunity 6. For activity/playing 7. For increased appetite 99. Other (specify) 88. Do not know 77. Refuse to answer		34health 34growth 34mental 34body 34immunity 34active 34appetite 34other 34DK 34refuse
35.	In your opinion, what are the main types of vitamins and minerals that are important for health? *Multiple answers*	1. Vitamin A 2. Iron 3. Iodine 4. Calcium 5. Zinc and other minerals 99. Other…… 88. Do not know 77. Refuse to answer		35VA 35Iron 35iodine 35calcium 35zinc 35other 35DK 35refuse
36.	In your opinion, why does a mother need to breastfeed her child? *Multiple answers*	1. Breast milk contains nutrients that a baby needs 2. Breast milk protects a baby against infection 3. Breast milk is easily digested by the body 4. Breast milk costs less than artificial feeding 5. Child does not need other types of food for first 6 months of birth 6. Mother will become healthy 7. Strong bond between mother and child 99. Other…… 88. Do not know 77. Refuse to answer		36nutrients 36protects 36digested 36cost 36notneed 36mother 36bond 36other 36DK 36refuse

37.	In your opinion, at what age does a child need to start eating supplementary foods in addition to breastmilk?	_____ Months (complete) _____ Years 99. Other…… 88. Do not know 77. Refuse to answer		AGECF
38.	In your opinion, how many times in a day does [CHILD'S NAME] need to be fed with supplementary foods in addition to breastmilk?	1. 0 times a day 2. 1 times a day 3. 2 times a day 4. 3 times a day 5. 4 times a day 6. 5 times a day 7. More than 5 times a day 88. Do not know 77. Refuse to answer		CFFREQ
39.	Did you give [CHILD'S NAME] sarbottomlito/pitho yesterday?	1. Yes 2. No 88. Do not know 77. Refuse to answer		LITO
40.	What are the main ingredients of sarbottomlito/pitho ?	1. Cereals and legumes 99. Other……. 88. Do not know 77. Refuse to answer		INGRED
41.	Do you know how to prepare sarbottomlito/ pitho?	1. Yes 2. No 88. Do not know 77. Refuse to answer		PREPLITO
F: Baal Vita EXPERIENCES AND KAP				
42.	Have you ever heard of Baal Vita? *Show sample sachet*	1. Yes 2. No 88. Do not know 77. Refuse to answer	If no, skip to Section G	HEARDBV
43.	What is Baal Vita? *Multiple answers*	1. Sachet of vitamins and minerals 2. Something added to the food of young children 3. Other_____ 88. Do not know 77. Refuse to answer		50VM 50added 50other 50DK 50refuse
44.	At what age should you start giving a child Baal Vita? *Probe for age in months complete*	1. 6 months of age complete/7 months 2. Before 6 months 3. After 8 months 88. Do not know 77. Refuse to answer		AGEBV
45.	At what age does a	1. after 24 mos/2 years		STOPBV

	child no longer need to take Baal Vita?	2. Before 2 years 3. Other:_____ 89. Do not know 77. Refuse to answer		
46.	How often should a child consume Baal Vita?	1. One sachet a day 2. More than 1 sachet a day 3. Other 88. Do not know 77. Refuse to answer		OFTENBV
47.	To what size portion of food should you add Baal Vita?	1.Small portion a child can eat all of 2.Other 88. Do not know 77. Refuse to answer		PORTIONBV
48.	Should you add Baal Vita to food that is cooking or hot?	1. Yes 2. No 88. Do not know 77. Refuse to answer		COOKBV
49.	A sachet of Baal Vita is meant for how many children?	1. One child 2. More than one child 3. Other 88. Do not know 77. Refuse to answer		ONECHILD
50.	Should Baal Vita be added to liquids?	1. Yes 2. No 88. Do not know 77. Refuse to answer		LIQUIDBV
51.	What are the benefits of using Baal Vita? *Multiple answers*	1. No benefits 2. Increased appetite 3. Increased energy and activity 4. Mental development/Make child clever/smarter 5. Increased immunity (less sick) 6. Make child healthy 7. Make child stronger 8. Physical growth 99. Other (describe): 88. Do not know 77. Refuse to answer		51NONE 51APP 51ENERGY 51MENTAL 51IMMUN 51HEALTH 51STRONG 51GROWTH 51OTHER 51DK 51Refuse
52	Who needs to know about Baal Vita in order for a family to give Baal Vita to their young children?	1. Mother of child 2. Father of child 3. Mother-in-law (of mother) 4. Father-in-law (of mother) 5. Mother (of mother)		52MOM 52DAD 52MIL 52FIL 52MOM 52MDAD 52OTHER

	Multiple answers	6. Father (of mother) 7. Other family 8. Friends 9. Community leaders 10. FCHV 11. Staff at Health facilities (SHP, HP, PHC) 12. Other (specify) ___ 88. Do not know 77. Refuse to answer		52FRIENDS 52COML 52FCHV 52HF 52OTHER 52DK 52REFUSE
53.	To what types of food should you add Baal Vita? *Multiple answers*	1. Soft foods (not a specific example of soft food) 2. Porridge (including sarbottomlito/pitho) 3. Mashed rice and dal 4. Jawlo/khichadi 5. BhatKo Mar (rice water/starch) 6. Other (specify) ___ 88. Do not know 77. Refuse to answer		53SOFT 53PORR 53RICE 53JAWLO 53BHAT 53OTHER 53DK 53REFUSE
54.	How soon after adding Baal Vita to food should you serve it to the child? *Multiple answers*	1. Serve immediately 2. Serve within 30 minutes 99. Other 88. Do not know 77. Refuse to answer		54SOON 5430MIN 54Other 54DK 54Refuse
55.	Did you get Baal Vita sachets for [CHILD'S NAME]?	1. Yes 2. No 88. Do not know 77. Refuse to answer	If yes, GO to 57	RECBV
56.	Why did you not get Baal Vita sachets for [CHILD'S NAME]? *Multiple answers*	1. I did not know I was supposed to get Baal Vita for my child 2. My child does not need Baal Vita 3. I heard Baal Vita causes side effects (e.g., stool changes, nausea) 4. I do not know enough about Baal Vita 5. My family does not want me to give Baal Vita to my child 6. I do not know where to get Baal Vita 7. I lack transportation to the Health Facility /FCHV		56KNOW 56NEED 56SIDEEFF 56ENOUGH 56FAMILY 56WHERE 56TRANS 56ACCESS 56STOCK 56OTHER 56DK 65REFUSE

		house 8. The Health facility/FCHV is not accessible 9. Stock out at the HF/FCHV when I went to get Baal Vita 99. Other (specify):___ 88. Do not know 77. Refuse to answer		
57.	How much time did it take you to pick up your Baal Vita sachets from the time you left your house until you returned home?	1. ___Minutes 2. ____Hours 88. Don't know		
58.	How many sachets of Baal Vita were you given to [CHILD'S NAME]?	1. 60 sachets (2 boxes) 2. 30 sachets (1 box) 99. Other amount: ___ 88. Do not know 77. Refuse to answer		HOWMANY
59	Where did you get the Baal Vita sachets?	1. FCHV 2. Health Facility (SHP, HP, PHC) 3. Health Facility Outreach Clinic, EPI clinic 99. Other (specify) 88. Do not know 77. Refuse to answer		GETBV
60.	Do you think Baal Vita is easily accessible to you?	1. Yes 2. No 88. Do not know 77. Refuse to answer		ACCESSBV
61	From where would you prefer to get Baal Vita sachets? *Multiple answers*	1. FCHV 2. Health Facility (SHP, HP, PHC) 3. Health Facility Outreach Clinic/EPI clinic 4. During Biannual campaign days 5. Other (specify) 88. Do not know 77. Refuse to answer		61CHV 61HF 61CLINIC 61WARD 61CAMP 61OTHER 61DKk 61REFUSE
62.	Did a health facility staff member ever give you education about Baal Vita?	1. Yes 2. No 88. Do not know 77. Refuse to answer		HFEduc

63.	Have you attended a mother's group meeting led by an FCHV where you talked about Baal Vita?	1. Yes 2. No 89. Do not know 77. Refuse to answer		FLIPBV
64.	Have you ever been given a Baal Vita reminder card? *Show example*	1. Yes 2. No 88. Do not know 77. Refuse to answer	If no, Go to 67	CARDBV
65	If yes, may I see the reminder card please? *Observe the date documented on the reminder card*	Date of Baal Vita receipt on front of reminder card: ___ ___ /___ ___ / ___ ___ D D M M Y Y 99/99/99 if left blank		CARDDATE
66.	Observe the inside of the reminder card on the bottom row, observe the two months marked	Months marked on inside of Baal Vita card on the bottom row: 1) January 2) February 3) March 4) April 5) May 6) June 7) July 8) August 9) September 10) October 11) November 12) December 13) Not marked 14) Other		66MO1 66MO2
67.	Have you ever been given a Baal Vita brochure *Show example*	1. Yes 2. No 88. Do not know 77. Refuse to answer		BROCHBV
68.	Has [CHILD'S NAME] consumed any of the Baal Vita sachets?	1. Yes 2. No 88. Do not know 77. Refuse to answer	If no, Go to 72	ANYBV
69.	How many of the Baal Vita sachets did [CHILD'S NAME] consume?	1. 60 sachets (2 boxes) 2. 30 sachets (1 box) 3. _____Number consumed 88. Do not know 77. Refuse to answer	If NO sachets consumed, Go to 72	NUMBV
70.	What were the positive effects of using Baal Vita?	1. Increased appetite 2. Increased energy and activity		70appet 70energy 70mental

	Multiple answers	3. Mental development/Make child clever/smarter 4. Increased immunity (less sick) 5. Make Child healthy 6. Make child stronger 7. Physical growth 8. No positive effects 9. Other (specify) 88. Do not know 77. Refuse to answer		70immun 70healthy 70strong 70growth 70None 70Other 70DK 70Refuse
71.	What were the negative effects of using Baal Vita? *Multiple answers*	1. Black stool 2. Loose stool 3. Constipation 4. Vomiting 5. Nausea 6. Increased appetite 7. No negative effects 99. Other (specify) 88. Do not know 77. Refuse to answer		71black 71loose 71constip 71vomit 71nausea 71appet 71none 71other 71DK 71refuse
72.	What are the barriers to giving 60 sachets of Baal Vita to [CHILD'S NAME]? *Multiple answers*	1. None 2. Need to put in small quantity of food 3. Causes loose stools 4. Causes dark (black) stools 5. Causes vomiting 6. Child rejects food /dislikes taste 7. Need to share with other children 8. Difficult preparation 9. Difficult to remember to use 10. Don't trust Baal Vita 11. I don't know enough about Baal Vita 12. Increased appetite is a problem 13. Family doesn't support use of Baal Vita 14. Stock out at HF or FCHV 15. FCHV not available when I		72none 72Small 72loose 72dark 72vomit 72reject 72share 72prep 72remem 72trust 72know 72appet 72famly 72stock 72access 72other 72DK 72Refuse

		went to get it or HF closed 99. Other barrier: ____ 88. Do not know 77. Refuse to answer		
73.	Did you feel pressure to share Baal Vita with children other than [CHILD'S NAME]?	1. Yes 2. No 89. Do not know 77. Refuse to answer		pressure
74.	Please show me any Baal Vita sachets you have in your house right now. *Observe*	_____Number of unopened sachets observed 88. Do not know 77. Refuse to answer	If response to #69 is 60 sachets and 0 sachets in #74, GO to 75. Others, Go to 76	OBSBV
Next question is only for mothers that gave all 60 sachets (#69) and show no unopened sachets in #74.				
75.	Please describe the supports and motivations that helped you give all 60 sachets to [CHILD'S NAME].	1. Increased appetite 2. Increased energy and activity 3. Mental development/Make child clever/smarter 4. Increased immunity (less sick) 5. Make Child healthy 6. Make child stronger 7. Physical growth 8. Child did not experience side effects 9. Child liked Baal Vita 10. Support from husband 11. Support from mother-in-law 12. Support from friends/neighbors 13. Support from FCHV 14. Support from HF staff 99. Other (specify)____ 88. Do not know 77. Refuse to answer	Go to 78.	75appet 75energy 75mental 75immunity 75health 75strong 75growth 75NOSE 75liked 75husb 75mil 75friend 75fchv 75HF 75other 75DK 75Refuse
***The remaining questions are only for mothers/caretakers who did* not give ANY or ALL 60 Baal**				

Vita sachets either. Less than 60 sachets consumed in #69or observed unopened sachets in #74				
76.	Why did you not give all 60 sachets of Baal Vita to [CHILD'S NAME]? *Multiple answers*	1. Need to share with other children 2. My child does not need Baal Vita 3. I'm lazy and just didn't give them all 4. Forgot to give them 5. Difficult preparation 6. Don't trust Baal Vita 7. I don't know enough about Baal Vita 8. Causes loose stools 9. Causes vomiting 10. Child had illness (not side effect of BV use) that caused me to stop giving Baal Vita 11. Increased appetite is a problem 12. Child rejects food with Baal Vita 13. Family members (husband, mother-in-law) don't support use of Baal Vita 14. Stock out at HF/FCHV/Ward, Baal Vita was not available when I went to get it 15. Change in my routine caused me to stop giving (e.g., travel, sickness) 99. Other reason for non/limited use (describe): 88. Do not know 77. Refuse to answer		76share 76need 76lazy 76forgot 76prep 76trust 76enough 76loose 76vomit 76illness 76appet 76rejects 76family 76stock 76routine 76other 76DK 76Refuse
77.	What would help support or motivate you to start or continue giving Baal Vita to [CHILD'S NAME]? *Multiple answers*	1. Observing positive effects in other children 2. Approval from my husband or in-laws 3. My child not rejecting the food with Baal Vita 4. Information about the benefits of Baal Vita/why my child needs		77observe 77husb 77reject 77benfits 77use 77SE 77other 77DK 77Refuse

		5. Information about how to use Baal Vita 6. Information about how to resolve side effects of Baal Vita 7. Other (describe): 88. Do not know 77. Refuse to answer		
78.	Would you be willing to purchase Baal vita sachets in order to give to your child 2-5 years of age?	1. Yes 2. No 88. Do not know 77. Refuse to answer		78 willing
79.	What do you think of the price of 150 Rupees for 60 sachets if you were to purchase for your child 2-5 years of age? **Read responses aloud**	1. Price is OK 2. Price is too high 3. Price is too low 88. Do not know 4. 77. Refuse to answer		79PRICE
G: KNOWLEDGE ABOUT MICRONUTRIENTS				
80.	Have you heard about anemia?	1. Yes 2. No 88. Do not know 77. Refuse to answer	If no Go to 84	ANEMIA
81.	From what source did you hear about anemia? *Multiple answers*	1. Implementing organization/field worker 2. Mother's Group Meeting 3. Husband/ wife 4. Other family members/relatives 5. Friends/ neighbor 6. FCHV 7. Health facility/ health workers 8. School/ teacher 9. Social mobilizer 10. Flipchart 11. Pamphlet/ Brochure 12. Radio 13. Television 14. Flex banner 15. Poster 16. Sticker 99. Other (specify)…		81implem 81mgm 81spouse 81family 81friend 81FCHV 81HF 81school 81social 81flipchart 81pamph 81radio 81TV 81flex 81poster 81sticker 81other 81DK 81Refuse

		88. Do not know 77. Refuse to answer		
82.	What is anemia? (Rakta- alpata, Ragatko kami) *Multiple answers*	1. Paleness 2. Disorder of the blood/lack of blood 3. Kind of disease, specify _____ 99. Other…… 88. Do not know 77. Refuse to answer		82PALE 82Blood 82DISEASE 82Other 82DK 82REFUSE
83	What are the negative consequences of anemia in children? *Multiple answers*	1. Decreased ability to learn 2. Decreased ability to read and write 3. Brain does not develop well 99. Other……. 88. Do not know 77. Refuse to answer		90learn 90read 90brain 90other 90DK 90Refuse
84	Have you heard about iron?	1. Yes 2. No 77. Refuse to answer	If no, Go to 86	iron
85.	Why is iron required? *Multiple answers*	1. Make blood 2. Brain development 3. Transport oxygen in the body 4. Improves ability to learn/read and write 99. Other…… 88. Do not know 77. Refuse to answer		85blood 85brain 85oxygen 85ability 85other 85DK 85Refuse
86.	What are good sources of vitamins and minerals? *Multiple answers*	1. Fruits 2. Vegetables 3. Meat, Fish and Eggs 4. Food fortified with vitamins and minerals 5. Vitamin and mineral supplements (tablets or liquids) 6. Baal vita (not other supplement) 99. Other…… 88. Do not know 77. Refuse to answer		86FRUIT 86VEG 86MEAT 86FORT 86SUPP 86BV 86OTHER 86DK 86REFUSE
87.	Why is it important to eat a variety of food? *Multiple answers*	1. To get sufficient vitamins and minerals for health (balanced diet) 2. Mental development		87VM 87MENTAL 87Growth 87IMMUN 87STRONG

		3. Physical growth 4. Improve immunity/Prevent disease 5. Strength/strong body 6. Taste 99. Other_____ 88. Do not know 77. Refuse to answer		87TASTE 87OTHER 87DK 87REFUSE
88.	What are the main food sources of iron? *Multiple answers*	1. Meat , fish, egg 2. Pulses 3. Green leafy vegetables 4. Liver 5. Fruits 6. Foods fortified with iron 99. Other_____ 88. Do not know 77. Refuse to answer		88MEAT 88PULS 88GREEN 88LIVER 88FRUIT 88FORT 88OTHER 88DK 88REFUSE
89.	Is [CHILD'S NAME] currently taking iron syrup? If yes, may I see the bottle?	1. Yes, observed 2. Yes, not observed 3. No 88. Do not know 77. Refuse to answer		SUPPLEMENT
90.	Did [CHILD'S NAME] receive vitamin A capsules the last vitamin A distribution in April 2010 [November 2010]?	1. Yes 2. No 88. Do not know 77. Refuse to answer		VITA
91.	Did [CHILD'S NAME] take any drug for intestinal worms during the last campaign April 2010 [November 2010]?	1. Yes 2. No 88. Do not know 77. Refuse to answer		WORM
Time ended interview: …….Hr : ……..**Min**				

Appendix 2: Baal Vita Brochure (English Draft Version)

What is Baal Vita?

Baal vita is the mixture of 14 different micronutrients including Iron and Vitamins. It is added in regular food of the children.
Baal Vita is an authorized product of the Government of Nepal.

What is the target age of children?

Target age children are children of 6 months to 2 years

Why Children in Nepal need Baal Vita ?

- Each 8 out of 10 children under 2 years suffer from Anemia and 50 % of the children are suffering from dwarfness
- 6 out of 10 child death in Nepal is caused by Malnutrition
- Children from 6 months to 2 years are found suffering from anemia and malnutrition
- The main reason of Anemia is caused by lack of iron and essential Vitamins in their food
- 8 out of10 part of brain development takes place under the age of 2 years. After 2 years we cannot improve brain development even by improved food habits.

How to use Baal Vita?

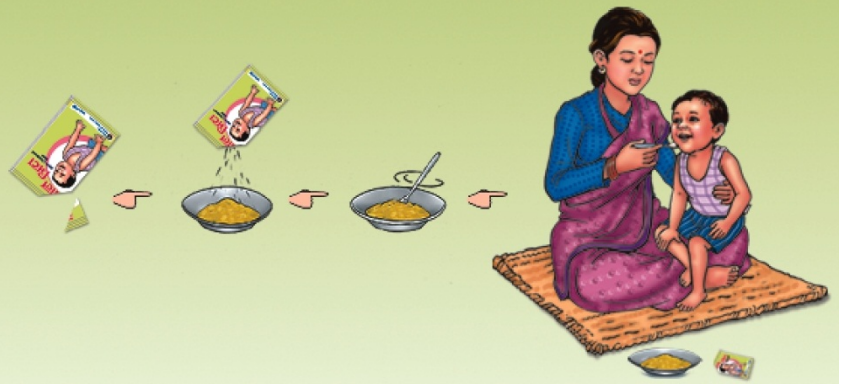
- Baal Vita should be feed by adding in luke-warm soft food like porridge of Sarbotam Pitho , mashed rice and dal (Joulo)
- Baal Vita should be added to that amount of food only which a child can eat at a time.
- One sachet of Baal Vita should be given to a child adding it in the food once in a whole day. One sachet of Baal Vita is for one child only.
- The food mixed with Baal Vita should be fed within half an hour.
- It does not bring any change in taste and color of the food.

What are the effects after using it?

- Color of the stool may be black
- May cause constipation
- May cause diarrhea but it will be managed after few days if not, need to consult with FCHV or health post.

What are the benefits from Baal Vita?

- Baal Vita supplies the daily required amount of vitamin and minerals to the children.
- It helps in physical growth and mental development of children
- It makes children healthy, strong and active.
- It helps to increases immunity power of children
- It also increases appetite of the children



Target age Children
6 to under 2 years

Appendix 3: Baal Vita Reminder Card (English Draft Version)

What are the benefits of Baal Vita ?

- Baal Vita supplies the daily required amount of vitamin and minerals to the children.
- It helps in physical growth and mental development of children
- It makes children healthy, strong and active.
- It helps to increases immunity power of children
- It also increases appetite for food of children

From where do we get Baal Vita ?

Baal Vita is receivable at Female Community Health Volunteer (FCHV). Health Service Centers can provide more information, if needed.

अनुगमन गर्ने व्यक्तिको नाम	संस्था	दर्जा	अनुगमन मिति	हस्ताक्षर

Compliance Card

बाल भिटा

Baal Vita Makes Food Nutritious & Helps to Grow Your Children Active & Strong

Children Date of Birth/Age _____

Guardian Name _____

Receving Date _____

✓	✓	✓	
✓	✓	✓	
✓	✓	✓	
✓	✓	✓	
✓			

नेपाल सरकार
स्वास्थ्य तथा जनसंख्या मन्त्रालय
unicef

Please mark (✓) every day after feeding your child adding Baal Vita