Home Fortification with Micronutrient Powders (MNP)

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Cover photo: Rumi, 18, feeds her niece, Shanta, a meal mixed with micronutrient powder in their home in the slum district of Bau Bazaar in Dhaka, the capital of Bangladesh.

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Introduction

The provision of micronutrients is ranked as one of the most cost-effective interventions for economic development according to the 2012 Copenhagen Consensus. Provision of micronutrients to specific target groups has been facilitated by the development of micronutrient powders (MNP) that can be readily added to semi-solid foods in the home or at point-of-use.[a] With the current prices, the product cost for one child receiving 180 sachets of MNP in one year is 4.50 USD. The programming cost, based on existing programmes in Kenya and Rwanda, adds another 4 to 5 USD per child per year.[b] MNP contains 15 vitamins and minerals that are essential for a child's development and survival. MNP improves the quality of the typically plant-source based diet of young children, who have very high micronutrient needs, and typically is accompanied by key messages to support optimal infant and young child feeding practices.

Notable progress has been made with implementing MNP interventions over the past 10 years. From only a few programs in 2000, 14 million children aged 6–59 months were reached in 22 countries worldwide in 2011. Key to this success was alignment of programming approaches at the global level which has resulted in joint statements, evidence-based and programmatic guidance, improved standardized formulations and packaging, and scaling-up of production by existing and new manufacturers. Partnerships and coordination among key stakeholders in nutrition played an essential role in achieving this. In an increasing number of countries, governments are now taking on the distribution of MNP in their national health programs.

It is foreseen that in the coming years large-scale MNP interventions will be initiated to reach even more children and other target groups including children and adolescents in schools.[c] These interventions will be linked to other nutrition, health, social protection, and education intervention packages. Challenges will continue to exist. Going to scale through different delivery channels supported by social marketing will need to be tackled through cross country exchange of experiences and continuous adaptation of guidance to obtain workable models.

Other promising home-fortification options such as Small-Quantity Lipid-based Nutrient Supplements (SQ-LNS, <20 g/dose, <120 kcal) containing micronutrients as well as essential fatty acids and macro-minerals for brain development and growth, and powdered complementary food supplements containing micronutrients, soy powder, milk powder or other ingredients are also being developed, piloted and evaluated. Home-fortification is an important intervention supported by the Scaling Up Nutrition (SUN) movement and the 1000 Days Partnership.

Knowledge generation from home fortification programming is important, especially because home fortification is a new concept and is rapidly evolving. An overview of what has been accomplished to date in different settings (refugee camps / emergency relief / development / market-based / schools), and a guide to future programmes are presented in this publication. This publication has been put together by key stakeholders involved in MNP interventions, many of whom are also members of the Home Fortification Technical Advisory Group (HF-TAG). Case studies and key lessons about policy, production, delivery, monitoring, and behavior change communication are illustrated using programming examples from across the globe providing interesting insights for those considering programming among comparable circumstances. Furthermore, results from five regional home fortification workshops designing MNP scale-up plans in 66 countries are summarized. Finally, areas for further research that can strengthen the implementation and effectiveness of MNP interventions are outlined.

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[a] In case of institutional feeding, such as day-care or schools.

[b] Programming cost vary by location.

[c] UNICEF-CDC. Global Assessment of Home Fortification Interventions, 2011. Geneva: Home Fortification Technical Advisory Group, 2013.

The Home Fortification Technical Advisory Group (HF-TAG)

The Home Fortification Technical Advisory Group (HF-TAG) is a global network comprised of organizations implementing or supporting the scale-up of home fortification programs. It includes UN agencies, NGOs, manufacturers of home fortification products, and academic institutions.

The mission of the Home Fortification Technical Advisory Group is to facilitate implementation of well-designed and effective home fortification interventions at scale, based on sound technical guidance and current practices, integrated into comprehensive nutritional strategies for children. The HF-TAG does not implement projects or programs, but provides guidance based on evidence and current best practices, and acts as a resource for documentation of projects and materials used, as well as research findings. The group aims to scale-up home fortification by developing and providing standards.

The HF-TAG website **(http://hftag.gainhealth.org/)** provides access to implementation guidelines for home fortification programs, guidance for formulation, packaging and production of products for home fortification, frequently asked questions and answers, as well as information and links for information on specific programs in specific locations.

Eating noodles mixed with MNP during launch event in the Philippines

HF-TAG Home Fortification Technical Advisory Group

Home Fortification in Refugee Camps

Micronutrient Powder Supplementation Program for Bhutanese Refugee Children in Jhapa and Morang Districts, Nepal

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Program description

Approximately 100,000 Bhutanese of Nepali ethnicity, who are highly dependent on food relief and rations from the World Food Programme (WFP), live in seven refugee camps in southeastern Nepal. In light of the results of a 2007 survey conducted by the US Centers for Disease Control and Prevention (CDC) which indicated a high prevalence of anemia (43.3%) and stunting (39.2%) amongst children aged 6–59 months, a comprehensive micronutrient powder (MNP) program was initiated in 2008 to supplement the food rations in the camp.[1]

The MNP program, started by WFP in coordination with UNHCR in the Jhapa and Morang districts of Nepal, aimed to reach all 8,500 children aged 6–59 months living in the camps. Mothers/caregivers were instructed to add a single one gram sachet, called *Vita-Mix-It*, into the child's home-prepared food every other day. *Vita-Mix-It* was especially formulated for children in the camps and contains 15 vitamins and minerals based on the WHO/WFP/UNICEF joint statement.[2] Vitamin K was added to the formulation because vegetable intake was low.[3] As the standard food rations distributed in the camp contained iodized salt, vitamin A-fortified oil and fortified wheat soy blend, the formulation was adjusted to contain lower levels of iodine and vitamin A. A 2009 survey identified high tea intake among young children during the previous 24 hours; as a result, the amount of vitamin C in the sachet was increased from 30 mg to 60 mg to enhance iron absorption and mitigate the negative effect of tannin in the tea on iron bioavailability.

In addition to WFP and UNHCR, other partners made important contributions to this program. The Association of Medical Doctors of Asia (AMDA) was responsible for implementing, monitoring and reporting for the program. UNHCR provided financial support to AMDA to carry out nutrition-related activities through regular programs. DSM, WFP's private sector partner, provided an in-kind donation of the MNP distributed through this intervention. *Sight and Life*, the humanitarian nutrition-focused think tank of DSM, provided technical assistance on the design of the program.

A social marketing campaign was a key component of the intervention

Behavior change communication (BCC)

The development of a comprehensive social marketing campaign to introduce *Vita-Mix-It* to the population was considered a key component of the intervention. WFP and its partners developed a package of Information, Education and Communication (IEC) materials such as posters and brochures that provided information about vitamin and mineral deficiencies, as well as their causes and consequences and ways to combat them. They also provided information on who should receive *Vita-Mix-It,* how it should be administered, and how frequently.

A Community Health Supervisor and Bhutanese Incentive Volunteer instructs women on how to use *Vita-Mix-It*

Posters were placed at strategic locations inside the camps and brochures were provided to mothers and caretakers of the children. Flipcharts utilizing graphics and text were developed to be used by nutrition workers to train mothers and caretakers. These provided information not only on *Vita-Mix-It,* but also on general nutrition education topics including child health, nutrition and development, and infant and young child feeding practices (exclusive breastfeeding, complementary feeding, consumption of iodized salt and vitamin A-rich foods, as well as key messages on tea consumption).

Trained nutrition workers held demonstration sessions to inform mothers/caregivers of the purposes, benefits, correct use, and storage of *Vita-Mix-It*. Mothers were instructed to add the entire contents of one sachet to a portion of food that their child aged 6–59 months usually consumed, after it had been cooked. Instructions on use and storage in Nepali were displayed on the sachets. From February 2009 onwards, education for mothers also included the advice to reduce children's tea intake because high levels of tea consumption were previously reported among children. (It was found that 75% of children aged 3–4 years had consumed tea in the past 24 hours).

Delivery

All children under five years of age in the camps were registered and *Vita-Mix-It* was distributed to registered mothers and children in the health centers of camps where growth-monitoring measurements were also conducted. From March 2008 till September 2010, all children aged 6–59 months attended a monthly activity that consisted of growth monitoring and *Vita-Mix-It* distribution. From October 2010 onwards, the growth monitoring modality changed; children 6–23 months of age were monitored every month, and children 24–59 months of age were monitored every two months. *Vita-Mix-It* distribution was adjusted accordingly. Thus, children 6–23 months old

A mother adds *Vita-Mix-It* to her four-year-old daughter's meal

received 15 sachets per month (for one month's consumption) and children 24–59 months old received 30 sachets every two months (for two month's consumption).

Program monitoring and impact assessment

Program monitoring

Program monitoring was conducted twice yearly in the refugee camps to assess the outputs of all WFP programs. Monitoring was conducted among WFP beneficiaries from selected households. Indicators were included to assess the coverage, consumption, and caretaker-perceived benefits of *Vita-Mix-It*. Monthly home visits were also conducted with approximately 50% of enrolled children on a rotating basis by community health workers, community nutrition workers, and/or nutrition-focused persons to monitor and assist with any issues associated with MNP use. At the time, MNP counseling included discussions of problems, encouragement of continued MNP consumption, and recommendations for regular child health care via health care centers.

Impact assessment

The effectiveness of the program in reducing the prevalence of anemia and malnutrition among children aged 6–59 months was assessed annually through an analysis of data from the already ongoing annual health and nutrition surveys carried out between 2007 and 2010.[a,4] The survey conducted in 2007, prior to the start of the intervention, served as a baseline for MNP effectiveness evaluation. Cross-sectional surveys were carried out jointly by UNHCR/WFP and AMDA, with technical support from the CDC. Data on hemoglobin concentration, anthropometric indicators, morbidity, feeding practices, and the receipt and use of *Vita-Mix-It* was collected. Given that Vita-Mix-It was introduced simultaneously in all camps, there was no control group for comparison purposes.

[a] Data showed was from 2007–2010 surveys only, because in 2011 the composition of the camp's population changed drastically due to the resettlement of more than 50% of the population.

Key findings

Coverage and acceptance

Data from program-monitoring and impact assessments showed that coverage and use were high, and that more than 90% of households reported receiving MNP for their children during the most recent distribution.[1,4] At the time of the cross-sectional impact surveys, more than 90% of caregivers reported that their children were currently consuming *Vita-Mix-It*.[1] Eighty to 85% of caregivers reported perceived positive changes in their children's health, energy levels and appetite after the children started receiving *Vita-Mix-It*. As was reported, the observed changes motivated mothers to continue providing *Vita-Mix-It* to their children. Reported tea consumption was high in 2007 and 2008 in younger children (30–33%) and older children (62–69%).

There was a significant reduction in the reported tea consumption among younger children from 30% in 2007 to 1.5 % in 2010, and among older children from 62% to 8.3%.[1] This change is assumed to be attributed to the ongoing BCC awareness campaign as there were no other concurrent strategies to decrease tea consumption among children in the camps between 2007 and 2010. The percentage of children for whom the mother or caregiver reported any perceived negative health effects (diarrhea, vomiting, black stool, constipation, etc.) attributed to *Vita-Mix-It* decreased progressively from 11.6% in 2008 to 2.9% in 2010.[1]

The prevalence of stunting decreased significantly

Nutritional status

The overall prevalence of anemia in children did not change significantly between baseline (43.3%) in 2007 and endpoint (40.2%) in 2010. However, the prevalence of moderate anemia decreased over the same period from 18.9% to 14.4% ($p < 0.05$). The prevalence of stunting decreased significantly from 39.2% at baseline to 23.4% in 2010 ($p < 0.001$), a relative decrease of 40%.[1] Diarrhea morbidity decreased significantly from 30% in 2007 to 13% in 2010. The decreases in both stunting and diarrhea suggest that other micronutrients in the formulation

(specifically zinc) may have had a positive impact on child health and development.[1] Given the design of the evaluation, it is difficult to assess to what extent reductions in stunting and diarrhea can be attributed to the use of MNP and/or other possible factors such as improved child feeding practices because of the introduction of MNP. Well-controlled intervention studies conducted over a longer period of time (at least 12 months) and monitoring of the same indicators in other large-scale, multi-year MNP programs should indicate how plausible it is that these changes are related to MNP use.

Lesson learned

Delivery

- Providing MNP to beneficiaries in a refugee setting is feasible, and good coverage can be achieved when all of the refugee population is registered and eligible children are from families that receive food rations.
- Linking MNP distribution with growth monitoring activities at the health centers in a refugee camp is feasible and mutually beneficial. Most registered households with children under the age of five visit the health centers in order to receive *Vita-Mix-It* and other health services.

Behavior change communication

- The behavior change communication strategy developed was effective in improving positive perceptions of *Vita-Mix-It* and in educating people about its potential perceived side-effects. Given the success of BCC, a similar strategy (e.g., posters, brochures, and interpersonal communication) was used to introduce MNP to the Food Insecure Districts of Nepal and to further the national scaling-up program for MNP. Although existing experiences can inform future BCC strategies, BCC must be adapted to the specific contexts of areas where programs will be implemented.
- Continuous interpersonal communication, or counseling, by community health/nutrition workers during home visits was instrumental in communicating facts about *Vita-Mix-It* to beneficiaries, and for achieving high coverage and sustained adherence among children.

The *Vita-Mix-It* distribution program can serve as a model

Monitoring

- The *Vita-Mix-It* distribution program can serve as a model for a well-planned, well-implemented and well-monitored supplementation program. Necessary adjustments were made based on monitoring results. For example, when results showed that the prevalence of anemia had not improved between 2007 and 2008, and that tea consumption among children was high, the vitamin C content of *Vita-Mix-It* was doubled (from 30 mg to 60 mg), and BCC messages and counseling were revised to encourage reduced tea consumption in order to mitigate the negative effects of tea on iron absorption.

Collaboration

- The UN agencies of WFP and UNHCR, local partner AMDA, CDC, *Sight and Life* and DSM all worked together to ensure that the MNP program was implemented in a timely manner and that adjustments were made as needed to achieve the desired impact on the nutritional status of children 6–59 months of age.

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Home Fortification in Emergency Situations

Distributing a Micronutrient Powder to Tsunami-Affected Children in Indonesia

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Program description

Indonesia was the country worst affected by the Indian Ocean tsunami which claimed 230,000 lives and left 750,000 people displaced and homeless.[1,2,3] From January 2005 to May 2007, Helen Keller International (HKI) implemented a tsunami relief and recovery program focused on supplementation with micronutrients (SUM) in Aceh and North Sumatra, Indonesia, to assist in the overall relief, rehabilitation and reconstruction effort led by the Government of Indonesia and the United Nations.

In the context of emergency situations characterized by poor sanitation and limited food availability, micronutrients (vitamins and minerals or VM) in powder, capsule, tablet or fortified condiment form offer an unparalleled combination of six key advantages as a first-line response:

1. High impact;
2. Low cost;
3. Minimal storage space requirement;
4. Little or no preparation;
5. Easy transportation, and;
6. A gateway to the affected community and individuals to carry out other types of assessments and the delivery of other key interventions.[4]

The SUM relief initiative had three specific objectives: first, to lower the risk and severity of morbidity; second, to reduce mortality, and finally; to enhance the ability to reconstruct livelihoods in tsunami-affected areas of the province of Aceh and North Sumatra.

Indonesia's experience with SUM illustrates that this nutrition strategy is one of the most cost-effective ways to save lives

As part of the SUM program, HKI supervised and coordinated the distribution of four VM preparations in 15 tsunami-affected districts in Aceh and North Sumatra from January 13, 2005 to April 30, 2006 (**Table 1**). After this date, the SUM program continued in two districts in Aceh until May 2007. *Vitalita*, a micronutrient powder (MNP), was one of the four VM preparations distributed in the SUM program targeted specifically at children from 6 months to 12 years of age, along with vitamin A capsules, zinc tablets as adjunct treatment for diarrhea, and iron-fortified soy sauce for household use. Indonesia's experience with SUM illustrates that in the context of an emergency, this nutrition strategy is feasible and is one of the most cost-effective ways to save lives and prevent disease.[5]

Policy

Vitalita MNP was approved by the Indonesian Food and Drug Administration (or BPOM, the acronym for *Badan Pengawasan Obat dan Makanan*), and included in the National Ministry of Health Plan of Action for Nutrition in Emergency. *Vitalita* contains one Recommended Nutrient Intake (RNI, a combination of 14 vitamins and minerals for children aged 6–11 months and 1–3 years).[6] *Vitalita* MNP was made available free of cost to more than 250,000 children between the ages of 6 months and 12 years from 2005–2007.

TABLE 1: Summary of VM preparations distribution in all SUM areas in January 2005 to April 2006

Supplementation with Micronutrients (SUM)

Distribution	Vitamin A capsules (100,000 IU blue)	Vitamin A capsules (200,000 IU red)	Zinc 20 mg dispersible tablets	*Vitalita* MNP sachets	Iron-fortified soya sauce (IFSS) sachets
Distributed by HKI	**8,120**	**60,657**	**860**	**17,352,780**	**29,877,744**
Distributed via partners	**151,992**	**1,129,862**	**1,555,330**	**10,746,420**	**9,868,300**
Partners	**Ministry of Health:** Ministry of Health RI; Provincial Health Offices NAD and North Sumatra; District Health Offices of Banda Aceh, Aceh Besar, Aceh Selatan, Kota Lhokseumawe, Pidie, Nagan Raya, Bireun, Aceh Jaya, Aceh Utara, Aceh Timur, Aceh Barat, Aceh Barat Daya, Simeulue, Nias Selatan and Nias; **NGOs:** CARE, PLAN International, Terre des Hommes, SurfAid, CWS, The Habibie Center, Medicines du Monde (MDM), World Relief, *Ibu for Aceh, Bumi Sehat, Obor Berkat Indonesia, Pelkesi, PKPA-Nias*, Save the Children, PCI, CARDI, WVI: various *Puskesmas* (Community Health Center) in tsunami-affected areas, Clinic Mercy, Puskeslit Aceh Besar, **Multilateral agencies:** UNICEF				
Remarks	• Zinc supplements were distributed to health facilities for administration as part of treatment for diarrhea, as per the WHO/UNICEF guidelines and the recommendation of MOH/RI. • Guidelines and/or educational materials in Indonesian language were distributed along with all vitamin A, zinc, and *Vitalita* MNP. • Training and promotion materials were produced in collaboration with MOH/RI and were provided to all partners who were distributing micronutrients.				

HKI Field worker introducing *Vitalita* MNP to mothers and health staff at the IDP settlement

Quick roll-out and partnerships

HKI's previous work in Indonesia – developing *Vitalita* MNP together with manufacturer Heinz ABC, and conducting pilot studies – allowed for the timely mobilization of resources to use the innovative product to enhance the nutritional quality of survivor populations' food aid rations. Partnerships and coordination were vitally important for the timely inclusion of *Vitalita* MNP with these food aid rations and other SUM interventions. HKI's partnerships with Heinz ABC enabled local production of MNP and its quick deployment to Aceh and North Sumatra through partnerships with other NGOs. Key partners for these activities included the Ministry of Health, the Provincial Health Office, District Health Offices, UNICEF, WHO, WFP, Plan, CARE, the Church World Service (CWS), SurfAid International, the Indonesian Medical Association, and other organizations. Without previous experience and partnerships, the introduction of MNP would have been more challenging and would have taken longer to implement.

Behavior change communication is a key component of any home fortification strategy

Behavior change communication

Behavior change communication is a key component of any home fortification strategy. Prior to the tsunami, HKI had conducted formative research on names, packaging, social marketing strategies, messages, and promotional material development; their acceptance and impact on nutritional and health status among target groups had already been tested in efficacy and effectiveness studies.

As part of the SUM rollout and in collaboration with the Ministry of Health, HKI developed extensive guidelines and training and promotional materials to educate health personnel, mothers and children about good nutrition practices and about *Vitalita* MNP and the three other VM preparations and their benefits. The guidelines, brochures, and flyers explained VM deficiencies, their causes and consequences, and

TABLE 2: Micronutrient content of *Vitalita* MNP

Vitamin A, µg RE	375
Vitamin D, µg	5
Vitamin E, mg	6
Vitamin C, mg	35
Thiamine (vitamin B_1), mg	0.5
Riboflavin (vitamin B_2), mg	0.5
Niacin (vitamin B_3), mg	6
Vitamin B_6 (pyridoxine), mg	0.5
Vitamin B_{12} (cobalamine), µg	0.9
Folic acid, µg	150
Iron, mg	10
Zinc, mg	5
Copper, mg	0.6
Iodine, µg	50

Promotion materials placed at IDP settlement

ways to combat them. They also provided information on who should receive VM preparations, how these should be given and the recommended intake frequency. Flipcharts using graphics and text were developed for training of personnel and provided information on VM preparations, child health, nutrition and development, exclusive breastfeeding, complementary feeding, and consumption of iodized salt and vitamin A-rich foods.

Delivery

HKI, government bodies, and local and international NGOs were responsible for product distribution through the local health system and other channels. More than 17 million sachets of *Vitalita* MNP were distributed by HKI teams and over 10 million sachets were distributed by partners. To support this task, HKI trained over 7,500 people from the provincial, district and subdistrict levels in 15 districts of Aceh and North Sumatra on good nutritional practices and the benefits and appropriate use of VM preparations.

Monitoring

HKI personnel closely monitored the SUM program every three months to determine coverage, the need for micronutrients among target groups worst-affected by the tsunami, and to assess the impact of the distribution of VM on their health status. In tsunami-affected districts, HKI conducted visits to the camps, barracks and host communities where internally displaced persons (IDPs) were accommodated, and questionnaires were administered to mothers, caretakers and the heads of shelters, camps, barracks and clinics. Mothers reported on the number of sachets received and consumed, and on knowledge, attitude, and practice with regard to *Vitalita*. They also reported on the incidence of diarrhea and other infections in targeted children. Anthropometry and hemoglobin levels were measured directly from the children.

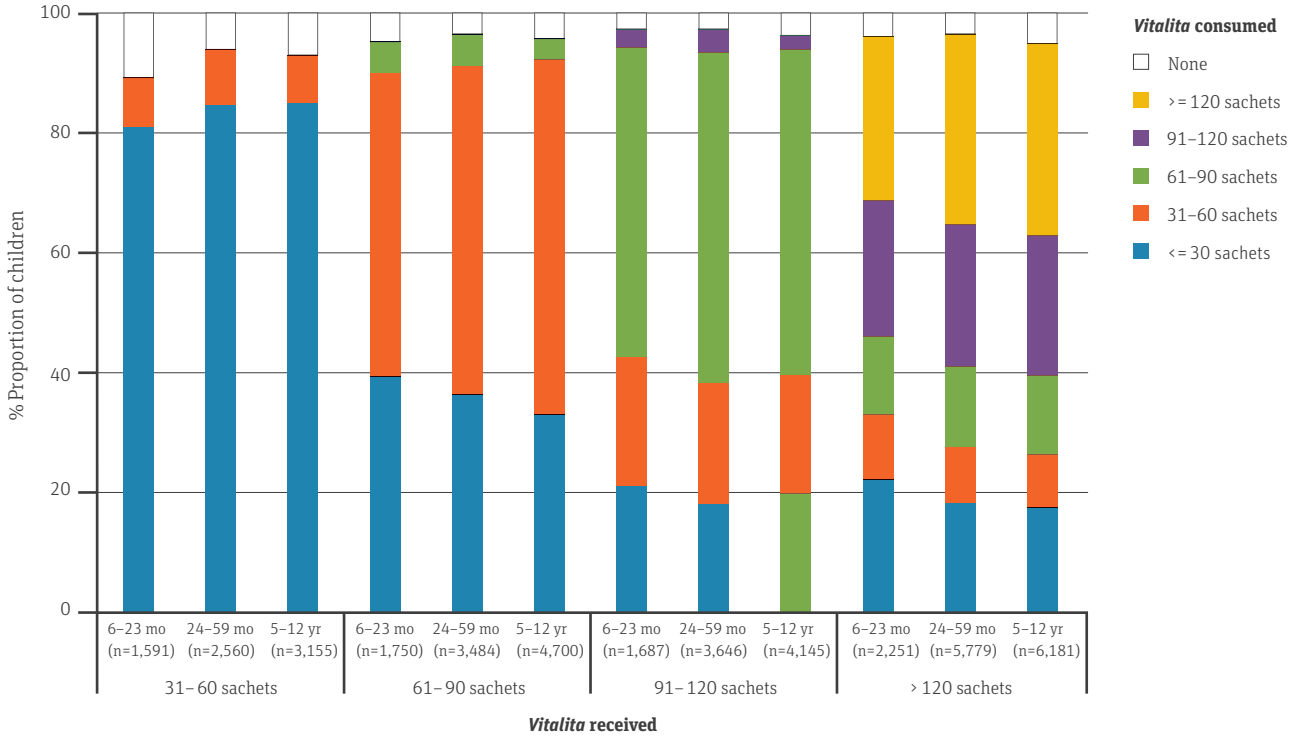
Key findings

Evaluation findings showed that *Vitalita* was distributed to 97% of targeted children aged six months to 12 years old in Aceh and North Sumatra, reaching more than 250,000 IDP children. More than 28 millions sachets of *Vitalita* were provided directly to caregivers by HKI teams (30–180 sachets per child for once-daily consumption), or provided by public health centers or other partner agencies. The number of *Vitalita* sachets consumed by children as reported by mothers/caretakers was high. **Figure 1** shows that the more sachets children received, the more they consumed, suggesting that MNP was well received. More findings are reported in de Pee et al.[7] Findings from a UNICEF-supported assessment also showed that IDPs who received *Vitalita* had lower rates of anemia than non-IDPs who had not received *Vitalita*.[8]

The SUM program markedly improved the quality of the diets of hundreds of thousands of IDPs

The SUM program markedly improved the quality of the diets of hundreds of thousands of IDPs by adding much-needed VM to their daily intake. The program drew significant attention and stimulated the formulation of the WHO/UNICEF/WFP joint statement[9] for the provision of VM preparations, including MNP, to vulnerable groups such as children under five years of

FIGURE 1: Proportion of children aged 6 months – 12 years consuming *Vitalita* by number of sachets received per age group



age, pregnant women and breastfeeding women in emergencies. Populations affected by an emergency in Indonesia and other countries will now receive MNP as a matter of course.

At the end of the program it was recommended that MNP should be available to children for the long term (either free of cost or at affordable rates) to reduce the prevalence of anemia and its consequences. Although the SUM program, which included MNP, contributed to the improved health and nutrition of IDPs, it should be noted that micronutrient supplementation programs alone cannot eliminate VM deficiencies. Thus, SUM was a worthwhile contribution and its recommendation was to continue the SUM to cover non-IDPs as well as to extend coverage to other areas of Indonesia with a high prevalence of VM deficiencies.[10,11]

Key lessons learned

Production

- The existing partnership of HKI and Heinz ABC for the development and use of *Vitalita* MNP prior to the tsunami enabled the local design and packaging of MNP and the rapid deployment of existing stock by HKI teams to Aceh and North Sumatra.
- The VM powder (premix) for *Vitalita* had to be produced in, and imported from, Malaysia – which required two to three months' lead time. Also, the production capacity of Heinz ABC for toll packaging in Indonesia had to be scaled-up in order to meet the sudden high demand for the product during the tsunami emergency response. Hence, there were significant delays in the procurement of *Vitalita* MNP which delayed expansion to more areas. A large production capacity is required to reduce the procurement lead time in large-scale programming.

Delivery and behavior change communication

- Formative research and a pilot of MNP conducted prior to the emergency – in which its acceptance among target groups and impact on nutritional and health status were tested, and social marketing and training materials were developed – enabled HKI to rapidly initiate and mobilize resources to distribute MNP within weeks of the tsunami. In emergency settings, use of MNP is feasible and can be rolled out quickly when previous or ongoing program experiences are available.
- Staff involved in the distribution of VM preparations should be trained on the rationale for MNP, on how to appropriately use the product, and to address potential side effects. HKI trained its own staff, health sector staff, volunteers and the staff of other NGOs to distribute the MNP according to strict safety guidelines. Food demonstrations and the tasting of preparations were highly appreciated by the staff because these improved their skills.
- Partnerships with many organizations (including the Ministry of Health, Provincial Health Office, District Health Offices,

UNICEF, WHO, WFP, Plan, CARE, CWS, SurfAid International, the Indonesian Medical Association, and other organizations in the field) helped to facilitate the rapid and wide distribution of MNP among the target beneficiaries in tsunami-affected areas. Coordination among organizations was needed to ensure that health workers would not be overloaded with added tasks.

- "Sweeping" for eligible individuals who had been missed or overlooked during the first round of MNP distribution in camps and host communities was important in increasing coverage.
- In a number of affected districts, program activities were delayed or discontinued because of security concerns. The security levels of program areas should be closely monitored because this may affect program implementation.

Monitoring and evaluation

- Monitoring should include program activities, both planned and implemented, and acceptance among target populations. The rigorous and continuous monitoring and evaluation conducted by HKI throughout the program period ensured the quality and effectiveness of program activities (see also de Pee et al.[7]).

Conclusion

Micronutrient supplementation including MNP at large scale proved to be a feasible and beneficial intervention in the tsunami emergency response in Aceh, Indonesia and one of the most cost-effective ways to save lives and prevent the outbreak of diseases.[5] Existing experience with MNP in-country accelerated the roll-out of MNP as part of the emergency response. Promotional materials, guidelines, and the training of all personnel involved are very important when introducing MNP among various target groups to ensure acceptance, adherence and successful distribution. In large-scale disaster relief efforts, a coordinated response among various agencies for MNP programming is possible and these programs, if implemented appropriately, will achieve high coverage.

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How Introducing MNP in the Philippines in 2009 Guided the Provision of MNP in Development Settings and the Design of the National Supplementation Program

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Project description

The vast damage of typhoons Ketsana and Parma – in North Luzon in September and October 2009 respectively – increased the population's vulnerability to micronutrient deficiencies. This emergency situation caused deterioration of pre-existing nutritional deficiencies, compromised the population's food security and increased the likelihood of consuming an unbalanced diet, as well as creating a need for additional micronutrients due to increased risk of infectious diseases. National nutrition data from 2008 showed that the prevalence of anemia among infants aged 6–11 months (55.7%), 12–23 months (41.0%) and pregnant women (42.5%) were significant public health problems before the typhoons. Prevalence of anemia among children 1–5 years old was 20.8%.

An estimated 970,000 children 0–5 years old were affected by the typhoons. In response to this disaster, and as part of the public private partnership between WFP and DSM called 'Improving Nutrition – Improving Lives', a micronutrient powder (MNP) supplementation project was initiated in the Philippines in December 2009. From January 2010 until the end of January 2011, the project was implemented in Central Luzon by WFP in collaboration with the Department of Health, The Department of Social Welfare and Development (DSWD), the National Nutrition Council (NNC), Helen Keller International (HKI) and Local Government Units (LGU). HKI and LGUs were the main program implementers.

The project objective was to enhance micronutrient intake among 16,600 children aged 6–23 months in selected areas of Central Luzon (Region III), in the form of MNP provided in single-dose sachets. The local product name was *Vita Sangkap*.

Before the typhoons, MNP for home fortification of complementary foods of infants and young children was identified as program component in development settings of the Millennium Development Goals Achievement Fund for Child Food Security and Nutrition (MDGF 2030) for three years starting in November 2009. The MDGF 2030 is a joint program of UN (UNICEF, WHO, WFP, FAO and ILO) and Government agencies led by the National Nutrition Council, which aims to complement the government's nutrition efforts for children 0–23 months for improving breastfeeding and complementary feeding practices in selected areas of Luzon, Visayas and Mindanao regions.

MNP distribution was planned as a pilot project under MDGF 2030 to be added to the program as implemented in Mindanao, namely in Zamboanga City and in Aurora municipality of Zamboanga Del Sur. Details of the pilot's design and implementation were being discussed when the MNP emergency response was launched. Experiences from the Luzon MNP emergency response project contributed significantly in the final design of the MNP component of MDGF 2030.

As the emergency response was ending in late 2010, the national guidelines for micronutrient supplementation were updated based on experiences from the response, and the Department of Health issued an Administrative Order for national supplementation of MNP among children 6–23 months in order to prevent anemia. Children 6–23 months receive 60 sachets for consumption over 6 months, for a total intake of 180 sachets between the ages of 6–23 months.

MNP formulation and source of supplies

a. Agreement on MNP formulation

An agreement was reached among the National Nutrition Council of the Philippines, WFP, WHO and UNICEF to use the MNP formulation recommended by the WHO/WFP/UNICEF joint statement on micronutrients in emergencies.[1]

b. Source of supply and registration concern

The MNP supplies used for the emergency project in 2010 were donated in kind by DSM, produced in Europe, and delivered to the Philippines. For the MNP project under Millennium Development Goals Achievement Fund for Child Food Security and

Local box design

National box design

Nutrition 2030 (MDGF 2030), supplies for 2011 to 2012 were procured by World Food Programme with approval from the Department of Health, National Nutrition Council and the Food and Drug Administration, which are also part of the joint program. In 2012, the Philippines government used its own funding to procure MNP for about 550,000 young children for the national program and is planning to increase program coverage to more children 6–23 months of age throughout the country in the coming years.

c. Formative research

Before ordering the supplies for the emergency project, formative research was conducted to develop local branding and key promotional messages that would explain the nutritional benefits of MNP, who should consume the product, and how to prepare and appropriately use the MNP. The research included a small usability trial to develop the local box design (see illustration) that displayed a local product name, key messages and instructions for use.

The name used for the MNP was *Vita Sangkap*, and the key message on the box that contains 30 sachets was "for your child to become strong and healthy". For the sachets, a standardized design was used which had been developed to enable quicker ordering, for the Philippines, but also for other situations where supplies are needed quickly.

Based on experiences from the pilot MNP projects, further formative research and stakeholder discussions, a final packaging design for the box and sachet was developed for the National Program on MNP supplementation, which carries the brand name "*Vita Mix*".

The results of the formative research were also used to develop flyers and stickers for the mothers of intended beneficiaries.

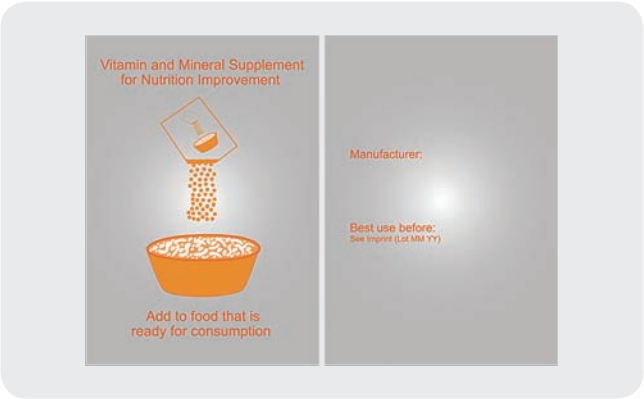
Implementation of the project in response to the emergency

To develop the MNP program in response to the typhoons, the first 6 months were dedicated to advocacy meetings, formative research and the development of information materials, as well as the delivery of supplies to the intended distribution areas. The training of health and nutrition workers at the local government units and villages was carried out during this 6 months period as well. In June 2010, eight to nine months after the typhoons, MNP distribution commenced.

The introduction of MNP as a product for home fortification needed appropriate messaging and explanation for different levels of implementers. Advocacy meetings were conducted at national and subnational levels. Three-day training was conducted for the direct implementers, doctors, nurses, nutritionists, midwives and barangay (community) volunteers for health and nutrition activities.

The training presented the nutrition situation in the country and at subnational level and the consequences of micronutrient deficiencies especially in emergency situations. The trainings described MNP, its benefits and the proper utilization in the context of infant and young child feeding. A list of frequently asked questions was also prepared for the health and nutrition workers to build the capacity to respond to queries and concerns of mothers in relation to the use of MNP.

Children 6–23 months old received 180 sachets for six months for daily use through the local health system. This regimen was chosen because of the short program duration and to address high levels of micronutrient deficiencies that existed prior to the typhoons. At that time the national policy was not in place yet. Trained Barangay Health Workers and Barangay Nutrition Scholars were in charge of the distribution and the Rural Health Centers were the main distribution points. Mothers of the children participating in the program received the supplies during visits for regular immunization and check-up, or through delivery to their houses during scheduled immunization days, or through delivery of other health and nutrition services at village (barangay) level. Flyers and stickers were disseminated during distribution together with the MNP.



Standardized sachet design for children ages 6–59 months

Monitoring and evaluation

WFP, HKI and the local health workers jointly carried out monitoring activities. Monitoring of selected households took place every two months in all project areas, using structured questionnaires. Information was collected on key outcome indicators, including knowledge and practices on breastfeeding and complementary feeding, knowledge/awareness of MNP, MNP supply and consumption, observed benefits of MNP utilization, and effects of MNP on food.

The actual number of children aged 6–23 months reached by the project was 12,249 because this was the total number of children living in the municipalities in the program area.

At endline, all mothers in the project areas were aware of the *Vita Sangkap* product. They had good knowledge of *Vita Sangkap* being a product that provides vitamins and minerals, increases appetite, improves the body's ability to fight against infections, and will make the child healthy and strong, as presented in the *Vita Sangkap* IEC materials.

Findings also showed that MNP acceptance was high. The main reasons why mothers reported giving *Vita Sangkap* to their children was: **1)** promotes physical development, **2)** improves the body's immune system, and **3)** increases appetite. Positive changes observed by the mothers in their children as a result of consuming Vita Sangkap were: **1)** children became more energetic/active, **2)** increased appetite and **3)** gained weight. These changes motivated the mothers to continue providing *Vita Sangkap* to their children.

Results of monitoring showed that the consumption of *Vita Sangkap* increased from 18.3% in the first round of monitoring to 59% in the second round. The majority of the mothers received *Vita Sangkap* from Barangay Health Workers. The other mothers received it from Barangay Nutrition Scholars and Rural Health Midwifes.

Distinct changes in the food observed when *Vita Sangkap* was added were change of color and taste. Majority of the interviewed mothers observed the change of color, while a minority observed the change in taste. Despite these changes, the majority of those mothers continued to give the Vita Sangkap to their children, following a clear communication response implemented by Barangay Health Workers and Barangay Nutrition Scholars. Explanation and demonstration of proper mixing of MNP to foods were found to be helpful to increasing mothers' acceptance of the product.

Dissemination of experiences and lessons learned

a. Contribution to enhance supplementation of MNP under MDGF 2030 Joint Programme

Lessons learned were the following:

- Local name adds "face value" to the product, which gives an initial idea of what the product is and adds to its recognition.
- All health and nutrition workers of the Local Government Units should be given training on MNP to ensure proper coordination and participation during the implementation phase.
- There is a need to demonstrate how to add MNP to a child's food in the context of IYCF training, which provided health and nutrition workers with first-hand experience. This builds the confidence of health and nutrition workers to teach mothers on proper utilization of MNP to improve quality of complementary foods.
- During the first two months of the implementation, a monitoring priority is to quickly identify any immediate concerns with distribution at health center level and utilization at the beneficiary level.

b. Dissemination of results

- Results of the emergency experience were widely disseminated by various stakeholders in the country and used as a reference during MNP trainings and lectures for health and nutrition officials and community workers.
- In 2011, the experience of using MNP as part of the emergency response program was presented and shared to a number of public nutrition practitioners during the 64th Philippine Association of Nutrition in the Philippines.

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Home Fortification in Large-Scale Programs

Introducing a Micronutrient Powder Program in Mongolia

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Program description, target population, and MNP formulation used

Since the 1990s, Mongolia has made significant progress towards achieving the targets of the Millennium Development Goals (MDG).[1] Among children less than five years of age, underweight declined from 12.6% in 2000[1] to 6.7% in 2004;[2] wasting from 3.7% in 1999[1] to 1.7 % in 2010;[3] stunting from 24.6% in 1999[1] to 21% in 2004[2] and to 15.7% in 2010.[3] Goiter rates decreased from 28% in 1992 to 7.3% in 2010 among 7–11 year-old children, which is the result of high use (75%) of iodized salt by households.[3]

These achievements were made possible through the promotion of breastfeeding, supplementation of vitamins A and D for children aged 6–59 months, universal salt iodization, improved food security and supply, and various community development and poverty reduction programs supported by the state, international partners, the private sector and NGOs. Economic development of the country has been progressive during the last two decades from 0.384 MNT ($2,132 [US]) GNI per capita in 1990 to 0.675 MNT in 2010.[4]

However, as revealed by the *"3rd and 4th National Nutrition Surveys"*[2] conducted in 2004 and 2010 in children under five years old, micronutrient deficiencies are highly prevalent among this age group of children and among pregnant and lactating women. Among children 6–59 months old:

- One in five (21.8%) had severe vitamin D deficiency.[2] This is particularly high (61%) among children 6–12 months old.[5]
- 28.5 % were anemic and 21.4% suffered from iron deficiency.[2]
- 36 % of children aged 6–35 months had deficiencies of at least two micronutrients, namely: zinc (74.7%) and selenium (57.7%). Vitamin A deficiency was 33.7%.[5]

Micronutrient deficiencies are highly prevalent among young children

Despite the continued and high coverage of supplementation of single micronutrients such as iron and vitamin D, no reduction was achieved on anemia and vitamin D deficiency. A micronutrient powder (MNP) locally named *"Sprinkles"* was introduced in 2000 with support from World Vision International (WVI). A successful pilot was conducted among 13,000 children aged 6–36 months in three provinces between 2000 and 200[36] and 90% of eligible children received MNP for 13 months. The MNP used by WVI contained six micronutrients (**Table 1**). WVI implemented the program in partnership with local health departments and recruited additional community health and nutrition coordinators, and volunteer mothers. The intervention was integrated with a young child feeding and nutrition education component.[6] The evaluation showed that anemia dramatically decreased from 46% to 25% among children aged 6–59 months, but it declined very little among children aged between 6–18 months, as parents of children in this age group were very cautious and did not comply with giving the new product to their children. Also, there was no change in the level of rickets among children who used MNP; therefore, it was recommended to increase the vitamin D content up to 800 IU.[6]

In 2007, after several consultations among lead nutrition experts of the Ministry of Health (MOH), UNICEF and WVI, chief

7 month old E. Erkhemsaykhan, and her mother Gantuul, 23, are being helped by A. Munkhtsetseg, a soum vaccinator nurse, with Micro Nutrient Powder intake at the Renchinlumbe soum (sub province) hospital, Khuvsgul province, Mongolia. 16 October 2012

TABLE 1: Micronutrient Powder (*Sprinkles*) for Mongolia: Micronutrients per sachet used by WVI between 2000 – 2008

Micronutrients	Contents
Vitamin D	400 IU
Vitamin A	600 IU
Vitamin C	50 mg
Folic Acid	150 µg
Iron *(encapsulated ferrous fumarate)*	40 mg
Zinc *(zinc gluconate)*	10 mg

pediatricians and decision makers, the MOH agreed to introduce the standard 15 micronutrient formulation. Vitamin D was increased to 600 IU.[7,8] Moreover, the content of the 15 component formulation included B vitamins, copper, and significantly, selenium and zinc – important given the high levels of deficiency of the last two nutrients among children.

Subsequently, in 2008 the MOH decided on a national program providing MNP to children aged 6–23 months, and to pregnant and lactating women. This was decided based on widespread micronutrient deficiency and the prevalence of stunting (at 24%). The target age of children was debated between the MOH, the Asian Development Bank (ADB), WVI and UNICEF, and an agreement was reached – based largely on the Lancet Nutrition Series of 2008 – to select children aged 6–23 months due to their vulnerability and growth and development needs. Cost and other logistical aspects were factors against expanding the program to all children aged 6–59 months. Targeting only the poorest and most undernourished segments was considered, but abandoned because of difficulties in targeting and distribution. A blanket universal approach was therefore agreed upon. The MOH guidance prioritizes children aged 6–23 months but allows for the inclusion of children 24–59 months of age, especially in emergency situations.

TABLE 2: Use of MNP in previous 6 months by region among children aged 6 – 59 months

Regions	Number of children	Percentage	95% CI
Western	132	47.0	36.0 – 58.3
Khangai	130	46.9	36.5 – 57.6
Tuv	103	32.0	19.8 – 47.4
Eastern	138	34.1	21.9 – 48.8
Ulaanbaatar	120	30.8	21.1 – 42.6
Total	**623**	**37.2**	**31.7 – 43.2**

TABLE 3: Percentage of children ever used MNP during the last 6 months by age group

Age of children (months)	Number of children	Percentage	95% CI
6 – 23	270	51.0	42.9 – 59.1
24 – 59	353	26.8	21.2 – 33.2
Total	**623**	**37.2**	**31.7 – 43.2**

Integrating MNP with social protection programs

The MNP program was linked with the development program and the emergency response to H1N1 in 2009 and the severe winter *("Dzud")*[a] in 2010. Furthermore, anemia, diarrhea and stunting were more prevalent than the national average in the poorer Western provinces and those in the poor peri-urban areas. The causes are attributable to internal migration of herder and migrant families from the rural areas; unemployment, poor access to water and sanitation, food insecurity and poor hygiene, feeding and care practices compound their situation. The MOH plans to provide a household food supply package including MNP as part of the "Reach Every *Soum* and District strategy."[10,11]

National MNP program

In September 2008, the Minister of Health issued a decree to approve a guideline for health workers on use of MNP among children aged 6–23 months old and pregnant and lactating mothers.[8] However, there was, at the time, no program management guideline available, nor program funds, to scale-up nationwide. The workshop organized by UNICEF/CDC on "Scale-up MNP to improve quality of complementary feeding" in Bangkok in April 2009 was very timely in addressing these questions. Following the workshop, the MOH organized a meeting among stakeholders and partners on the management of the MNP scale-up. The workshop helped to design the program management, and following the workshop in September 2009, the Minister of Health signed a decree on MNP scale-up. The decree spells out the framework for program management at national and local level, supply and logistics, reporting, monitoring and evaluation, training and behavior change communication.[12]

Soum (district) doctors are trained on infant and young child feeding (IYCF) counseling using the WHO/UNICEF manual. Parents are given leaflets on the benefits of MNP and health facilities display informational posters about MNP. Television spots have been aired regularly (once every 2–3 months) since late 2010. The program needs to be integrated with the IYCF program at the community level. Community nutrition counseling is key, since nurses and *bagh feldshers* (health care professionals) of each district's health facilities are able to reach children more frequently.

Funding for the national program was achieved via international agencies collaboration between ADB, UNICEF, and WVI. Three major international organizations agreed to cover the respective provinces: UNICEF four *aimags* (provinces), WVI four *aimags* (part of Ulaanbaatar city) and ADB 13 aimags including Ulaanbaatar city.

MNP program implementation began primarily in response to emergency operations and the outbreak of H1N1 in 2010. In 2010, UNICEF expanded the national program to all 10 *dzud*-affected *aimags* in the Western and Khangai regions for the early recovery phase of the emergency mitigation. WVI started its program in 2009 due to the widespread outbreak of H1N1 and the related increase of acute respiratory infection (ARI) complications among young children. In 2010, due to logistics issues, only the emergency component of the MNP program (more frequent, smaller amounts of MNP provided than in the usual program) could be implemented. Routine distribution started in June 2011. This means that all estimated 90,000 children between 6–23 months of age living in Mongolia will receive MNP.

Other financing mechanisms explored include MNP procurement through health insurance targeted at underprivileged mothers and children. There is also the intention to sub-

[a] "Dzud" is a natural disaster characterized by a drought during the summer followed by a heavy winter.

Munkherdene Tsendayush 21 months old, with his father Tsendayush Byabasuren and mother Batsetseg Sanjaannyam, in their home in the 26th Khoroo (subdistrict), Songinokhairkhan district, Ulaanbaatar city, Mongolia

sidize sale of MNP in the future. Major international partners such as ADB (13 provinces or 45% of total children), WVI (five provinces or 40% of total children) and UNICEF (four provinces or 15% of total children) will be funding the MNP program for at least three years (between June 2010 and June 2013) in their selected areas. The government's target is to cover 80% of children aged 6–23 months by 2011, and to reach 100% of targeted children by 2015 as per the approved decree of the Minister of Health.

Key findings, effectiveness, acceptance and consumption rates

In August 2010, Mongolia conducted its Fourth National Nutrition Survey. Findings of MNP coverage and acceptance are promising; 37% of children 6–59 months old (**Table 2**) and 51% of children 6–23 months old had been given MNP during the past six months. Seventy four percent of children aged 6–59 months old were given up to 30 sachets, while only 26% were given 60 sachets or more during the past six months. Children from the Western region between the ages of 6–59 months were seen to have the highest coverage (47%).

76.6% of parents/caregivers of children who used MNP were willing to continue their use

The survey sought to establish parents' and caregivers' willingness to continue to give MNP to their children. Acceptance was quite high with 76.6% of parents/caregivers of children who used MNP being willing to continue their use. Reasons for this included observed increased appetite, improved mobility, timely teething and less frequent illness among their children.[3]

Key lessons learned

- *The logistics of the MNP program need to be carefully reviewed.*

  Mongolia made a significant achievement by signing a strategic partnership agreement[12] between the MOH and a private drug supply company, Mongol Emimpex (MEIC) Co. Limited[b] for the storage and transport of MNP. However, payment for MNP transportation was not planned from the outset of the program, which resulted in transportation delays to some of the more remote *aimags*. The MOH is now gradually picking up the cost of the transport. Initial support for transportation by partners would have been needed, particularly to remote aimags, due to the large volume of MNP.

- *Integration of the MNP program is key for its success.*

  Although the program aimed to be integrated within the community-based nutrition and young child care and feeding program, in reality, the integration remains weak since community based nutrition counseling and Integrated Management of Childhood Illness programs were not readily available when MNP scale-up began. Recently, UNICEF developed and introduced materials on community-based nutrition counseling which proved very useful for the integration of MNP. In 2010, ADB revised a handbook of community-based

[b] The company was selected via competitive bidding due to its comparative advantages of having branches in all provinces of Mongolia, with adequate means for storage and transportation. This is one of the best examples of public-private partnership in the country, however, funding of the agreement remains unclear.

Joint MOH/UNICEF/WVI/ADB leaflet on Micronutrient Powder for 6–24 months children. The National Center for Health Development and the MoH, Mongolia, 2009.

IMCI with updated nutrition recommendations, and trained health workers on the use of MNP using the guidelines in their focus areas.[14]

- *Monitoring and evaluation of MNP usage needs to be strengthened.*
  Reporting on the use of MNP by family clinics unified in September 2012 is awaiting MOH approval along with the decision to include it in the routine statistics and reporting mechanisms of the MOH.
- *Need for streamlined communication strategies.*
  While the production of leaflets, posters and television spots to promote MNP usage was in fact streamlined, partners' efforts to coordinate on communication should be strengthened. Different communication strategies and channels need to be explored in order to increase coverage. Further, as some parents do not comply with MNP use, more effort is needed to improve interpersonal communication channels and counseling.

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Integrating Micronutrient Powder into a Broader Child Health and Nutrition Program in Kyrgyzstan

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Introduction

Iron deficiency anemia is prevalent among young children in Kyrgyzstan. In the 1997 Demographic and Health Survey, the prevalence of anemia was 50% in children 6–36 months of age.[1] Several non-nationally representative surveys undertaken since 1997 suggest that the prevalence of anemia has not declined.[2,3,4,5] Additionally, preliminary data from the 2009 nationally representative nutritional status survey indicates that about 40% of children 6–24 months of age in Kyrgyzstan have anemia. Iron deficiency anemia is a serious public health issue in Kyrgyzstan, and is jeopardizing the health and development of young children, as well as the human and economic development of the country.

To identify an effective intervention for anemia prevention, in 2007 the Swiss Red Cross conducted a study on the efficacy of micronutrient powders (MNP) in reducing the prevalence of iron deficiency anemia among young children in Kyrgyzstan. The community-based study demonstrated that daily use of *Sprinkles™* MNP (containing 12.5 mg iron as ferrous fumarate, zinc 5 mg, folic acid 160 µg, vitamin A 300 µg, and vitamin C 30 mg) for two months resulted in a 28% reduction in the prevalence of anemia among children 6–36 months of age.[7] Based on these positive results, the Kyrgyz Ministry of Health (MoH) decided to implement a pilot MNP home fortification program for children 6–24 months of age. UNICEF, the US Centers for Disease Control and Prevention (CDC), and the Swiss Red Cross partnered with the MoH to support this pilot program, which was launched in the Talas region of Kyrgyzstan in June 2009. The intervention consists of free distribution of MNP to all children 6–24 months old in Talas, as well as early childhood development (ECD) activities designed to teach parents simple ways that they can improve the cognitive stimulation and development of their children. These were integrated into an existing community-based nutrition education program that promoted a good quality diet during pregnancy, as well as exclusive breastfeeding of the infant and improved complementary feeding through two years of age.

> The objective of the pilot MNP home fortification program is to reduce the prevalence of iron deficiency anemia

Program objective and target population

The objective of the pilot MNP home fortification program is to reduce the prevalence of iron deficiency anemia among children 6–24 months old in the Talas region by at least 20% (to be achieved within one year after implementing the program). The Talas province was selected for the pilot program because the region was found to have the highest prevalence of growth stunting in children under five years old (27%).[8] Additionally, a UNICEF/CDC nutritional status survey, representative of children 6–24 months in Talas province, found that the prevalence of anemia among children in this age group was 50.6%.[9] The target population for the pilot program consists entirely of children 6–24 months old in the Talas region. The program has reached 18,300 children in Talas during the initial 18 month intervention period, which represents 7–8% of the targeted age group.

MNP intervention and distribution strategy

In Talas, MNP is distributed free of charge to all children 6–24 months old through the governmental primary health care (PHC) system. The dosing regimen is 30 sachets given every two months (flexible administration). Therefore, a child will consume a total of 270 sachets within an 18 month period (starting

[a] Disclaimer: Arnold Timmer is staff of UNICEF. This author alone is responsible for the views expressed in this publication, which do not necessarily represent the decisions or policies of UNICEF.

After demonstration of food fortification with *Gulazyk* to mothers in Talas, 2009

at six months of age when the child begins consuming complementary foods and ending at 24 months). Each one-gram sachet of MNP contains 12.5 mg iron (microencapsulated ferrous fumarate), 5 mg zinc, 160 µg folic acid, 300 µg vitamin A, and 30 mg vitamin C. The MNP has been re-branded for use in Kyrgyzstan. A new package design was created featuring a face resembling that of a typical infant in Kyrgyzstan, and the name of the product was changed to *"Gulazyk,"* a Kyrgyz word which has historically referred to a dried meat product that is rich in nutrients and energy, and is eaten by warriors or travelers to give them strength. Local branding of the product was carried out to enhance acceptance among the population.

Gulazyk sachets are distributed by trained primary health care providers at family health clinics in Talas province. Caretakers visit the local health clinic once every two months to receive a package of thirty sachets. The reach of primary health care (PHC) clinics throughout the country is quite extensive, as all regional and district centers in Kyrgyzstan have PHC clinics, and a majority of villages have a PHC post. In Kyrgyzstan, caregivers and children have frequent contact with local health care providers, for reasons including preventive care, and immunization and treatment, making them the ideal channel through which to distribute *Gulazyk* to the population. This distribution mechanism ensures a high degree of coverage for the intervention.

Three main communication channels were used: primary health care providers, village health committee volunteers, and mass media

Communications and social mobilization

To reach the primary audience of caretakers and families for the *Gulazyk* program, three main communication channels were used: primary health care providers, village health committee volunteers, and mass media.

Primary healthcare providers

Primary healthcare providers (doctors, nurses, and *feldshers* [nurse practitioners]) are the main conduit through which caregivers receive information and counseling on the use of *Gulazyk*. As the sole distributors of *Gulazyk*, and a trusted source of reliable health information at the community level, primary healthcare workers serve as a valuable channel through which *Gulazyk* use can be promoted in both rural and urban settings. Primary healthcare providers were extensively trained on the distribution procedures for *Gulazyk*, and on counseling caretakers on the use of this product. The training sessions also included information on managing the potential side effects of iron supplementation with MNP, and counseling caretakers who are reluctant to use MNP. Primary healthcare providers work closely with caregivers to ensure that they are using the product properly, and that any side effects of iron supplementation are appropriately managed. At the clinic, healthcare providers give caretakers a *Gulazyk* flier with usage instructions, and a reminder card, which states the date on which they should return for their next package of *Gulazyk*. Patient registration journals kept at the clinics (which are a part of the internal monitoring system for the program) allow healthcare providers to track children who stopped using *Gulazyk*, children who had side effects, and children whose caretakers refused to try *Gulazyk*.

Village health committees

Village health committees (VHCs) are a very important and effective method of interpersonal communication to promote the use of Gulazyk among rural populations. VHCs, which work in over 1,400 villages throughout the country, including all 96 villages in the Talas region, make home visits to families with children 6–24 months of age in the village to inform and educate caregivers about *Gulazyk*, and encourage them to visit their local health clinic to receive *Gulazyk* for their children. Members of the Gulazyk Action Group within each Village Health Committee are trained to identify families with children in the target age range, discuss *Gulazyk* with caretakers, counsel caretakers on its use, and monitor adherence to the intervention. Throughout the program, as children in the village turn six months of age, VHC members refer the families to the local health clinic for *Gulazyk*. In this way, VHCs are a critical channel through which to inform families of the availability of *Gulazyk* in their village, and encourage them to obtain *Gulazyk* at the local health clinic (note that only health care providers are authorized to distribute MNP and health clinics keep special records on MNP supplies distributed). VHC volunteers use illustrated flip charts and brochures to aid them in discussing key messages with caretakers. Additionally, they provide caretakers with a *Gulazyk*-branded children's book, which they can read to their children. VHC volunteers use these visits to parents as opportunities to discuss ways that caretakers can engage in learning activities with their children to improve cognitive stimulation and development.

The *Gulazyk* intervention has been integrated into an existing community-based nutrition education program, which is implemented by health care providers and VHC volunteers in Talas province. This community-based nutrition education program consists of three components: the promotion of proper diet during pregnancy, exclusive breastfeeding, and improved complementary feeding. The improved complementary feeding component aims to enhance dietary diversity for young children, increase consumption of foods rich in iron and other micronutrients, promote timely introduction of complementary foods, and increase the frequency of meals given to young children. VHC volunteers also promote improved hygiene and sanitation practices within the community.

> The mass media is an important communication conduit for the *Gulazyk* program

Mass media

The mass media is an important communication conduit for the *Gulazyk* program, especially in the urban areas of Talas, which lack VHC. In urban areas, radio broadcasts are the primary mechanism to encourage caretakers to visit clinics to receive *Gulazyk*. Print and radio mass media were invited to attend program advocacy meetings, as well as the campaign kick-off event, and journalists were provided with press kits containing information on the program. *Gulazyk* advertisements and jingles are aired on Radio Most, a public radio station that reaches the majority of towns and villages in the Talas region. Interviews during which MoH nutrition experts answered questions about VHC nutrition and *Gulazyk* were also aired.

Integration of early childhood development activities and a nutrition intervention

In addition to adequate nutrition, cognitive stimulation and learning activities improve the cognitive development of a young child, and these two factors work together to produce benefits far beyond that of either intervention alone.[10] Thirty years of research suggests that integrating child nutrition interventions with activities to promote early childhood development (ECD)

Baby's first try of food after fortification with Gulazyk, 2009

produces an additive, and probably synergistic, effect on cognitive development and long-term productivity.[11] "Numerous studies demonstrate that the behavioral effects of malnutrition, including apathy, irritability, and poor attention span, interfere with learning processes. Both, good nutrition and opportunities for learning, are critical for a child's adequate growth and development."[12] Therefore, UNICEF and its partners are committed to integrating messages that encourage parents to enhance learning opportunities for their infant or young child, into nutrition programs.

Early childhood development (ECD) messages were incorporated into the communications materials for the pilot *Gulazyk* program in Talas province. The ECD messages include the promotion of certain learning activities, such as talking to your baby and encouraging his/her communication, reading to your child, and singing and playing with your child. Communications materials used by VHCs contain information on ways that parents can enhance learning opportunities for their children. Preliminary feedback from caregivers suggests that they very much appreciate and enjoy receiving information and recommendations on how to enhance meaningful interaction with their children, stimulate cognitive development, and create learning opportunities.

Kyrgyzstan was uniquely positioned to be one of the first countries to implement a comprehensive monitoring and evaluation system

Program monitoring and evaluation

There is significant published evidence that home fortification with MNP is effective for improving micronutrient intake and status in a controlled, trial setting. The next step in MNP research is to support program evaluations, which demonstrate that the MNP home fortification intervention is also effective in a large-scale programmatic setting. Kyrgyzstan was uniquely positioned to be one of the first countries to implement a comprehensive monitoring and evaluation system to demonstrate the effectiveness of the MNP intervention in a programmatic setting. To this end, a comprehensive monitoring and evaluation plan for the pilot program in Talas has been developed through a partnership between UNICEF and the US Centers for Disease Control and Prevention's International Micronutrient Malnutrition Prevention and Control (IMMPaCt) Program. Monitoring indicators include: supply of product; coverage; adherence; number and percentage of medical workers and Village Health Committee volunteers trained; quality of trainings; quality/effectiveness of communication and educational activities and materials for caretakers; and supply, coverage, and quality of mass media.

There are two forms of monitoring: internal and external. Internal monitoring includes ongoing, routine collection of data for the aforementioned indicators (primarily through the health care system records). External monitoring includes twice-yearly household surveys conducted by trained surveyors using Lot Quality Assurance Survey (LQAS) methods. National scale LQAS external monitoring in 2012 showed that coverage reached approximately two-thirds of the target population. Ongoing adjustments to the program are made if monitoring reveals deficiencies in supply (i.e., clinic stock-outs), distribution, coverage, adherence, or caretaker knowledge, attitudes and practices. For example, adjustments were made to how messages were delivered, with more radio messages on how to use MNP being aired.

Additionally, UNICEF and CDC have conducted an assessment of the nutritional impact of the pilot *Gulazyk* program in Talas. In 2008, UNICEF and CDC conducted a baseline assessment of the nutritional status of children 6–24 months of age in Talas province. Capillary blood samples enabled an assessment of the prevalence of anemia, iron deficiency, and iron deficiency anemia. This assessment was repeated in July 2010 (one year after the initiation of the pilot *Gulazyk* program). Among all children in rural areas, there was a borderline statistically significant decline in the prevalence of anemia from 50.6% at baseline to 43.8% at follow-up. The prevalence of iron deficiency (as measured by serum ferritin) decreased by 8.8 percentage points (PP); iron deficiency (as measured by soluble transferrin receptor [sTfR]) prevalence decreased by 24.2 PP; and iron deficiency anemia prevalence decreased by 12.1 PP (from 45.5% to 33.4%). The latter is equivalent to a relative decline of 26.6%.[13]

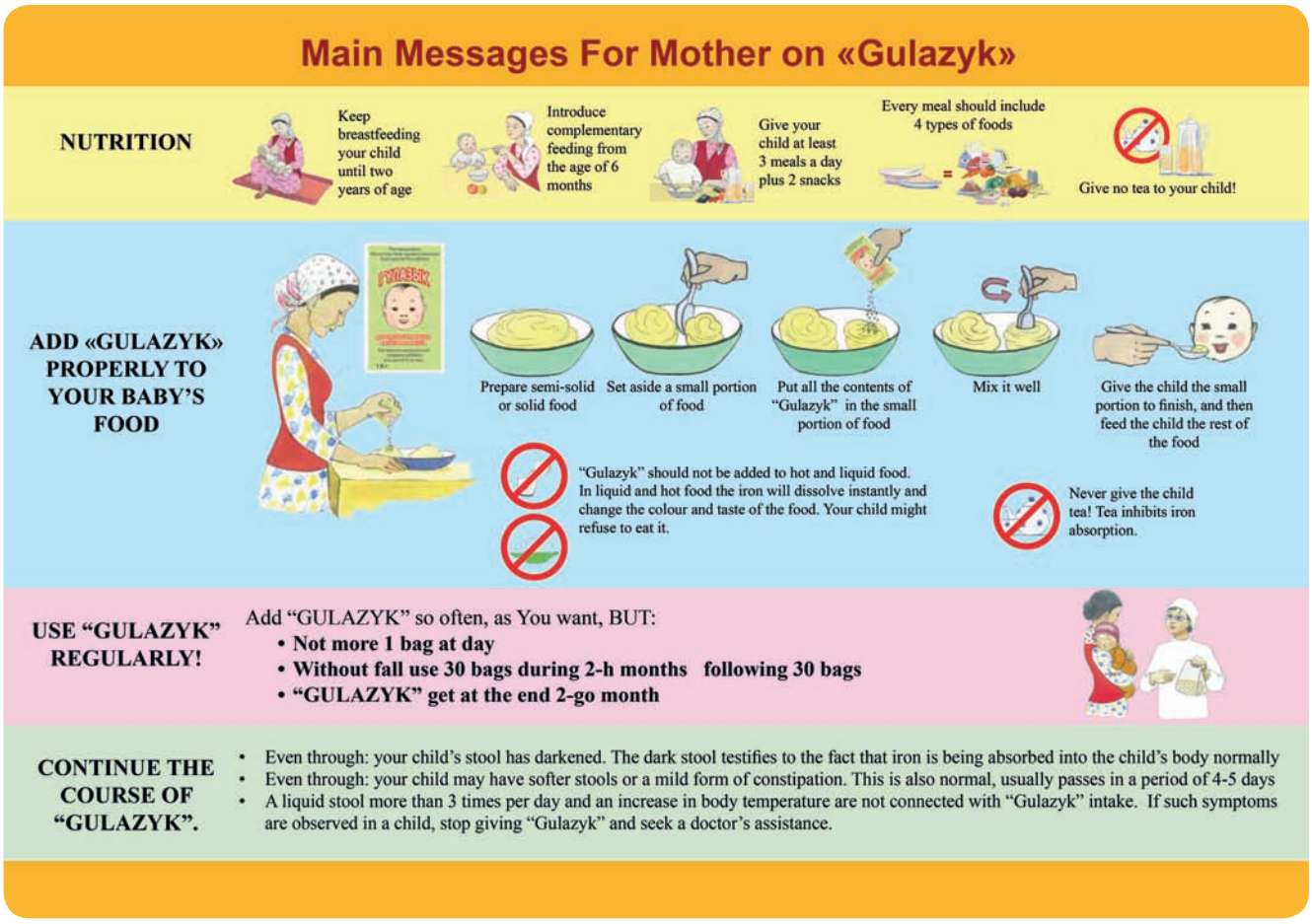
Parents and caregivers in Talas responded very positively to the pilot MNP program

Lessons learned from the pilot Gulazyk program

After the first year and a half of the Gulazyk pilot program in Talas province, several conclusions and "lessons learned" have been identified:

- Overall, parents and caregivers in Talas responded very positively to the pilot MNP program and there was a high degree of acceptance and use of this product. Caregivers were very excited to receive an easy-to-use product that could improve the nutrition and health of their children. Parents also expressed enthusiasm for the ECD information that was provided with the MNP. However, there were some parents who were skeptical of the MNP and had concerns about the safety of this product. Some expressed concerns that the product was synthetic/artificial, and said that they would prefer for their children to receive natural vitamins and minerals from food. Convincing skeptical caretakers required additional outreach and communications from VHC volunteers and healthcare providers. This additional outreach was generally effective, and in some cases, there were incredible "*Gulazyk* Success Stories" within the communities that helped convince hesitant caretakers of the immense benefits of this product.
- Launching the *Gulazyk* program during the summer months in Talas proved to be challenging, as the launch coincided with the time of year when the incidence of diarrhea is high due to acute gastrointestinal infections. There were reports of caretakers abandoning the use of *Gulazyk* because they attributed their children's diarrhea episodes to using *Gulazyk*. If a caretaker stops using *Gulazyk* early on due to safety fears, it is very difficult to convince him/her to start using it again. Therefore, it is important to inform caregivers that children will continue to have normal childhood disease episodes. It is critical for the success of a home fortification program to distribute accurate information on the management of diarrhea (both infectious and that caused by iron intake) in young children. The timing of the initial start of the MNP program is therefore important, and if possible, it is better to avoid initiating MNP programs during months that coincide with highest rates of diarrhea.

An English translation of information given to mothers when using *Gulazyk*



Grandmother and her grandson is leaving opening ceremony with pack of Gulazyk sachets, 2009

- After the first few months of the *Gulazyk* pilot program, we found that many medical workers were visiting the homes of children enrolled in the program to deliver a two-month supply of *Gulazyk*. This was necessary because some caretakers were failing (or forgetting) to come to the clinic every two months to receive a new supply of *Gulazyk*. The reasons behind this problem need to be explored in greater depth, and solutions identified, because these frequent home visits place an additional burden on medical workers who are already overworked. If visiting the clinic every two months to receive a new supply of *Gulazyk* is proving to be too great a burden for families, then program adjustments may be necessary so that caretakers can receive a four month supply each time.
- Developing a simple internal monitoring system for the program is critically important if health care providers are expected to take time out of their busy schedules for data collection and reporting. Two types of *Gulazyk* program journals were used:

1. To track the overall receipt and distribution of *Gulazyk* packages each month (the purpose of this journal is transparent accounting of the receipt and distribution of medical humanitarian aid); and
2. To record children enrolled in the program and their receipt and use of *Gulazyk* (this journal enables medical workers to track their patient population and to assess adherence). Overall, these journals were found to be acceptable and easy to use, however, there were problems with the aggregation of the data at each level of the health system, and with reporting of these data using standardized summary forms, which were quite complicated and burdensome for clinic staff to fill out every two months. The summary forms were revised to include simple indicators, and the forms were then pre-tested with medical workers in Talas, to ensure that the documentation and reporting requirements were feasible.

- A key factor in program success was gaining full support from the Ministry of Health for the distribution of *Gulazy* through primary care clinics and the development and use of clinical protocols, which included the distribution of *Gulazyk*. The process of developing these government-endorsed procedures and protocols brought together representatives of different groups of specialists, and ensured the support of key stakeholders, including pharmacologists and others within the scientific community.
- When the *Gulazyk* program was initially launched in Talas, many families in ethnic minority communities were reluctant to give *Gulazyk* to their children. To address this issue, meetings were held between respected medical specialists and leaders from the communities, to discuss the *Gulazyk* program and explain the benefits of using MNP for home fortification. The comprehensive communication plan should take into consideration any tailored communications activities that need to be planned to reach out to minority groups, who are often the most vulnerable and may present the greatest need for nutritional interventions.
- In addition to the focus on caretakers and families (primary audiences), the comprehensive communication plan should consider whether any other influential audiences should receive orientation or training about the new program before the program starts, as well as the need for advocacy events. Although hospital staff members are generally not responsible for distributing *Gulazyk* to the population, it was important to conduct informational sessions where hospital healthcare providers could learn about the *Gulazyk* program. In Talas, within a few months of the start of the program, medical workers at the hospital level who were unaware of the *Gulazyk* program were discouraging caregivers from using *Gulazyk* when these caregivers brought their children to the hospital for diarrhea or other health issues. As the hospital-based healthcare providers did not know about *Gulazyk* MNP, they assumed that the diarrhea or other problems were caused by *Gulazyk*. Therefore, UNICEF and technical experts from the MoH Nutrition Department implemented training sessions for medical workers at hospitals in Talas to learn about the *Gulazyk* program. This emphasizes the need for raising awareness among all healthcare workers who are likely to have contact with young children.
- Some of the stakeholders in Talas were concerned that the

program was only being implemented in the Talas region of Kyrgyzstan. They worried that perhaps MNP was highly experimental, instead of being an evidence-based, proven intervention. It was important to address these concerns, as such rumors can be highly detrimental to the success of a program. Therefore, influential leaders and government officials were provided with the international evidence for the safety and efficacy of MNP, and were told that Talas had a unique opportunity to demonstrate that the MNP intervention could work in a programmatic setting in Kyrgyzstan (which would help facilitate scale-up of the program nationally).

- Significant advocacy efforts were needed to secure the support of key stakeholders, including national and provincial authorities, healthcare providers and administrators, community-based groups, and the media. These advocacy efforts occurred in stages. A series of round table meetings with MCH and medical specialists from the MOH, donors, partners and CDC were conducted to discuss the use of MNP as a part of the broader national anemia prevention and control strategy. Presentations were made on the global and national evidence of MNP efficacy and its use in programs after which MOH approved a pilot in Talas province solidified in a MOH Order in April 2009. Advocacy meetings were conducted in Talas to gain support for the pilot MNP program from local government officials, health system administrators, community and religious leaders, and the media. While these extensive advocacy meetings required a great deal of effort, they proved to be essential in securing commitment from key stakeholders within the healthcare system, and national and local governments, who have become vocal and enthusiastic supporters and have thereby contributed to a successful pilot program. The program became quite popular and healthcare providers, parents, and, upon hearing about the program, government officials from other regions requested to be included as well.

Scaling-up the *Gulazyk* program

After monitoring surveys revealed positive results in Talas, the Swiss Red Cross began implementation of a second pilot *Gulazyk* program in Naryn province, which started in June 2010. Currently, the *Gulazyk* program is implemented nationwide by Ministry of Health with support of UNICEF and reaches around 250,000 children aged 6–23 months with *Gulazyk*. The program is supported by the Emergency Fund of the Open Society Foundations Network, DFID, and WB.

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The Three-Year History of *Gulazyk*

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The *Gulazyk* program was initiated by UNICEF and the Ministry of Health of the Kyrgyz Republic in 2009 in response to the high prevalence of anemia among young children. *Gulazyk* is a small sachet of vitamins and minerals that can be added to the food of young children to enrich their diet with essential micronutrients.

The three-year history of *Gulazyk* has seen its ups and downs. Like many other innovations, *Gulazyk* had more opponents than supporters at the beginning. Mothers were suspicious, and decision makers reluctant to endorse the product tried to slow down the program's progress. However, a group of dedicated local scientists and specialists supported by UNICEF and the CDC worked patiently to answer questions and spread information from door to door.

In June 2009, the *Gulazyk* program was inaugurated in the Talas province with large public events. These focused on two key areas: nutrition and early childhood stimulation. Mothers learned how to add *Gulazyk* to their children's food, and how to stimulate their children's cognitive development. Communication materials, including books for children, introduced *Gulazyk* to families. Older siblings participated in contests where they were awarded prizes for the best poems or stories involving *Gulazyk*.

After a difficult start, families eventually began to share the progress in their children's health and development. A year after its launch, *Gulazyk* was praised for reducing anemia in children by more than 25% in the Talas province. *Gulazyk* was also used as part of the emergency response in Osh and Jalalabad provinces. These success stories encouraged major donors including UNICEF National Committees and the Soros Foundation to help spread *Gulazyk* nationwide.

Despite these remarkable results, *Gulazyk* did not immediately gain national acceptance. In some areas, it was discovered that parents refused to use the supplement regularly. In medical facilities, doctors seemed to lose interest in the product and as a result, *Gulazyk* was often distributed by medical nurses without proper consultations. Some mothers from minority ethnic groups did not trust *Gulazyk*, and often refused to give it to their children.

A turning point – the "rebirth" of *Gulazyk* – occurred following two major events which were made possible thanks to donations from the Australian Committee for UNICEF: the national launch of a report analyzing the state's nutritional status in June 2011, and a round table conference on internal monitoring in Talas town in October 2011.

The June meeting brought together high-ranking government leaders, parliamentarians, active NGOs and the donor community, headed by UNICEF Executive Director Anthony Lake. For the first time, Kyrgyzstan widely acknowledged a nutrition problem that was the cause of 22% of national child deaths and which represented an enormous economic burden for the country. In this scenario, the 25% reduction in anemia achieved in Talas thanks to Gulazyk was eye-opening; it was an evidence-based, cost-effective solution which had been already acknowledged in Kyrgyzstan.

The October 2011 event took *Gulazyk* a step further. Discussion of internal monitoring meant that the *Gulazyk* program ceased to be a donor-supported program for the population. Rather, it became a national program driven by a wide range of local alliances across sectors. Ryskeldy Botikov, the Deputy Governor of Talas Province, headed the discussion and questioned all participants on their personal roles in making *Gulazyk* work for children. Attokor Shadiev, Healthcare Coordinator for Talas province stated, "Internal monitoring made us think what we really have and how we can improve the situation. We cannot sit idle and wait for donors to come and help us. They are our children and we should be responsible." Encouraged by this, the round table participants generated ideas on how to include internal monitoring as an important tool into the budgets of district primary healthcare facilities, how to mobilize partners and the population, and how to make *Gulazyk* a truly national program.

By the end of 2011, *Gulazyk*-filled trucks referred to as "caravans of health" were travelling the whole Republic, reaching every village and town. The mechanisms of internal control and motivation had finally been set into motion.

Chispitas in Bolivia: Experience and Case Study

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Project description

Until 2006, ferrous sulfate syrup had been the major source of iron supplementation for Bolivian children. Although not systematically documented, it was generally believed that local acceptance of the syrup was low due to undesirable taste and frequently reported side effects. This reality compounded by the persistently high prevalence of anemia (over 80% for children under two years old) provided the case for seeking alternative approaches to iron supplementation.

Stressing the importance of anemia prevention and control among children 6–59 months of age in Bolivia, the Pan American Health Organization (PAHO) and the Micronutrient Initiative (MI) proposed to the Ministry of Health and Sports (MSD) to replace syrup with micronutrient powder (MNP) at the national level. The distribution of MNP in Bolivia was integrated into the *Desnutrición Cero* (Zero Malnutrition) program, an integrated strategy to combat malnutrition in Bolivia launched in 2006. The Desnutrición Cero program takes a multi-sectoral approach to reducing malnutrition in children under five, and within the health sector, this includes micronutrient supplementation, promotion of breastfeeding and counseling to caregivers on feeding.

MNP gradually replaced ferrous sulfate syrup in public health centers and, by 2007, emerged as the national-level anemia control program for children aged 6–23 months. This age group was prioritized for the initial roll-out of the program given its higher risk of anemia. MI provided an initial donation of six million MNP sachets to Bolivia, and worked via PAHO with PSI to design the sachet and select a name. The local name, *Chispitas* was chosen after conducting focus groups with caregivers. The product consists of the standard five micronutrient formulation: 12.5 mg of ferrous fumarate, 30 mg of vitamin C, 200 µg of vitamin A, 160 µg of folic acid and 5 mg of zinc gluconate. The *Centro de Abastecimiento de Suministros de Salud* (CEASS), a national procurement agency for the MSD, managed the distribution of the sachets to all nine departments on behalf of the MSD.

A young child receives Chispitas at a Nutrition Unit inauguration ceremony, in a suburb of La Paz, Bolivia

The *Chispitas* program currently targets approximately 400,000 children aged 6–23 months, reaching an estimated 40–65% of the target population every year. Annually, the program aims to reach 80% of children in the 6–23 month range. The government also hopes to expand the program to include children from 24–59 months of age, as anemia is also high in this group. The Nutrition Unit within the MSD implements the program with support from agencies, which have included MI, PAHO, UNICEF, WFP, and PSI. The Canadian International Development Agency (CIDA) has been a major donor for this effort.

The program was designed with careful attention to distribution, training, monitoring and communications

In collaboration with the MSD, PAHO designed the program with careful attention to distribution of sachets, training of staff, monitoring program activities, and developing communications materials. The distribution of *Chispitas* was integrated into the health insurance package for free distribution to beneficiaries through the government's universal healthcare program, *Seguro Universal Materno Infantil* (SUMI). Each child aged 6–23 months is provided with 60 Chispitas sachets annually to replace the syrup that was previously supplied for the same period. Each child is therefore expected to receive a total of 120 sachets between the ages of 6–23 months; 60 sachets are received between 6–12 months and another 60 between 12–23 months.

The communication materials provided included pamphlets, posters developed by PAHO, flipcharts, radio spots and calendars prepared by MI and WFP. The main channel of communication was the public health system. Caregivers were provided informational handouts by health center workers which included a mini calendar to check off each day of consumption as a reminder. Caregivers are recommended to provide one sachet every day for 60 days to their children.

The regulation also allowed municipalities to purchase MNP directly from manufacturers at prices ranging from 14.50Bs ($2.07 [US]) to 15Bs ($2.15) for a box of 60 sachets. Three companies (SIGMA, Lafar and INTI) currently package the MNP locally. In addition to distributing to the public health system, the companies can also sell directly to private pharmacies, making *Chispitas* available for purchase in the private sector at approximately 24Bs ($3.42) per 60 sachets alongside the free distribution to beneficiaries through SUMI. No data is available on private pharmacy distribution or sales. The program was further strengthened by legislative changes in 2007 that included in the Paquete de Prestaciones (package of services delivered) of the SUMI insurance scheme. This transition from syrup to *Chispitas*, however, has been made by gradually replacing the depleting stocks of syrup with *Chispitas* in public health centers. The equity in price, i.e., 15Bs ($2.15) for three jars of syrup versus 14–15Bs ($2.00–2.15) fo 60 sachets of *Chispitas*, further supported the smooth transition and encouraged municipal governments to purchase the product.

Process evaluation and program review workshop

The private firm *Asociación de Instituciones de Promoción y Educación* (AIPE, or Promotion and Education Institutions Association) conducted an external process evaluation in 2008, which involved a survey and use of program monitoring data. The evaluation objectives were to:

1. Assess the efficiency of logistics systems management across different departments and health districts;
2. Assess the acceptability of *Chispitas* by caregivers across urban and rural areas, and;
3. Determine the adequacy of *Chispitas* preparation by caregivers.

In addition, a workshop was conducted in September 2009 by researchers from Cornell University, MI and MSD to review the *Chispitas* program and provide feedback to further strengthen it. The workshop involved professionals from many levels of the health system (national, departmental, district, and health center level); participation was based on availability and was not nationally representative. Through a participatory process [a] this workshop gathered information on process indicators and identified key areas that needed strengthening both in program design and implementation.

Later in 2010, a study was conducted to provide data to help develop a communications strategy by a private firm (TICs Communications) contracted by MI, and to allow a comparison of demand and acceptability from pre- and post-implementation (focus groups were also conducted). All studies/reviews looked only at the public health system distribution point of view. The 2010 TICs study collected data from households and public health centers in both rural and urban municipalities in Bolivia, in each of the nine departments of the country. The sample sizes are not large enough to be nationally representative. Data on impact of the MNP program has not been collected so far.

Key findings and conclusions from AIPE and TIC studies

Logistics/supply chain:

The 2008 AIPE study concluded that the logistics system was not uniformly managed across all departments and health districts, resulting in stock outs and problems in the distribution chain. The TICs study in 2010 showed some improvement in stock management of *Chispitas* and a more uniform implementation system across departments.

Acceptability:

The 2008 AIPE study concluded that ineffective counseling to caregivers on the use of *Chispitas* was the greatest limiting factor to its adequate use and acceptability. Both the 2008 AIPE and the 2010 TICs studies concluded that health center personnel were the most common source of information on *Chispitas* for caregivers. About half of all caregivers who had received *Chispitas* for their children in 2008 reported to have doubts or uncertainties about the product, related to taste, effectiveness, correct preparation, etc. The study also indicated regional differences on the acceptability of *Chispitas* by care-

[a] Evaluation of Micronutrient Interventions: *Chispitas Nutricionales*; Facilitators Guide (Adapted for Bolivia), August 4, 2009, Cornell University with D. Cordero

givers. The 2010 TICs study also showed differences in correct knowledge about the product between rural (61%) and urban (50%) populations.

Adequacy of preparation:

According to the 2008 AIPE study, 91% of caregivers reported having received *Chispitas* (non-specified quantity) and having used the entire sachet at one time when giving the supplement to their children. More than two-thirds (69%) of caregivers reported continuing to give *Chispitas* to the children every day until the 60 sachets were used. Less than a fifth (17%) reported stopping it temporarily but re-initiated while about 13% reported stopping and never re-initiated. In rural areas, *Chispitas* are most commonly added to soup (despite indications that soup should not be used) while in the urban areas it was added mostly to puree/baby foods (which is consistent with the recommended use). The 2010 TICs study showed that about three-quarters (74%) of urban caregivers and four-fifths (82%) of rural caregivers who received *Chispitas* could demonstrate or explain how to adequately prepare the Chispitas. However, only about half of both urban (45%) and rural (52%) caregivers reported that their child consumed all 60 sachets, possibly due to sharing with other children in the household. Most caregivers (90%) said that they learned the preparation of *Chispitas* from health personnel while the rest reported to have learned from other parents or from the instruction on the package.

Demonstration of Chispitas preparation at health centers and explaining the benefits of Chispitas were identified as key strategies to improve acceptance

Recommendations from the 2009 Workshop:

Demonstration of *Chispitas* preparation at health centers and explaining the benefits of *Chispitas* to caregivers were identified as key strategies that could be implemented to improve acceptance among caregivers. The workshop also concluded that the capacity of health personnel, availability of promotional material, incentives and support to staff, and availability of the product itself at the local level were the primary factors that affect the demand for *Chispitas*.

The workshop also identified important roles for municipalities, community leaders, and churches and schools as venues for promoting of the use of *Chispitas*. In addition, suggestions were made to develop a process for reviewing progress of the program as well as identifying areas that could benefit from strengthened design and implementation. Unfortunately, due to a number of factors including lack of clarity on responsibility, the specific recommendations from the workshop were never operationalized.

Lessons learned from program implementation

- Rapid staff turnover at all levels of the public health system affected program implementation and limited the optimal incorporation of recommendations from the process evaluation studies and the workshop. On the other hand, the legal framework, i.e., change of the regulation and inclusion of *Chispitas* in the insurance commodity package, was an important step towards national implementation of the program.
- While the *Chispitas* program was implemented at-scale from its inception (due to the fact that the Bolivian authorities were convinced as to its effectiveness and that there was a general acceptance of the product over ferrous sulfate syrup), the program encountered some limitations. The lack of formative research and/or a pilot phase limited the ability to identify problems with regard to design and implementation. The decision to immediately implement at scale diverted financial and human resources from these necessary start-up activities and left little room for the in-depth monitoring required for the timely identification and resolution of problems with the program design and barriers to appropriate implementation. Identifying and resolving such issues when a program is running at a national scale is extremely challenging, and has not happened successfully in this context.
- Broader issues that exist in the MSD in Bolivia, i.e., high staff turnover and administrative/contractual bureaucracy, have also affected the *Chispitas* program. These problems are not specific to the *Chispitas* program and the ability of the Chispitas program to advance in resolving these is very limited.
- Inclusion of *Chispitas* in the *Desnutrición Cero* strategy strengthened nutrition policy and dialogue in Bolivia generally, and the *Chispitas* distribution program took advantage of that for immediate national implementation. Smaller-scale initial implementation with good quality monitoring may have facilitated the identification and timely resolution of problems related to supply, knowledge, acceptance and utilization.

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Home Fortification using Market-Based Approaches

The Potential of Market-Based Approaches to Complement Free Public Distribution of Micronutrient Powders (MNP)

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Background and introduction

Home fortification products such as micronutrient powders (MNP) and small quantity lipid-based nutrient supplements (LNS) for older infants and young children (IYC) aged 6–59 months are generally delivered free-of-charge through public delivery channels. As experience with these products is generally positive,[1] demand is growing and consumers are seeking ways to provide these products to children that are often not covered by free distribution programs. For example, where free distribution programs target only young children aged 6–23 months, public health advocates would like caregivers to be able to access MNP for their older children aged 24–59 months, who can also benefit from use of these products.

This paper focuses on market-based distribution of MNP, where the consumer/beneficiary pays a fee, which may or may not be subsidized, depending on the context, program objectives and target population. In this paper, the terms "market-based approach" or "market-based channel" mean that the MNP is available for purchase via a variety of access points: from door-to-door salespersons, markets, pharmacies, health centers, or other places where consumers access goods and services. Market-based approaches can increase access, coverage and use of home fortification products and complement other types of distribution systems. This is especially important when the public delivery system, most commonly the health system, does not reach everyone, or where the programs delivering home fortification interventions are doing so only in limited geographical areas of a country. It should be noted that an approach being market-based does not necessarily mean that it will be implemented through a private sector delivery mechanism. It can also use the public health delivery system to sell the intervention.

> A market-based approach plays an important role in increasing access to products in remote locations

In some specific contexts, a market-based approach has already been shown to play an important role in increasing access to products in remote locations. For example, in Bangladesh, government front-line workers rarely reach all of Bangladesh's rural villages. Therefore, an NGO called BRAC, which has community-based entrepreneurs called *Shastya Shebikas*, is selling products in the majority of Bangladesh's more than 80,000 villages. By including MNP in the basket of goods sold by these *Shastya Shebikas*, infants and young children are receiving products that impact their health and development, and these community-based entrepreneurs are able to generate income.

For home fortification to have its intended public health impact, not only does the product need to be sold, but it also needs

[a] Disclaimer: Arnold Timmer is staff of UNICEF and Laura Irizarry is a consultant of UNICEF. These authors alone are responsible for the views expressed in this publication, which do not necessarily represent the decisions or policies of UNICEF.

Mother giving complementary foods with micronutrient powders

to be delivered along with specific messaging on appropriate use of the product accompanied by behavior change communication related to complementary feeding, hygiene, and other relevant issues. The targeted beneficiaries of home fortification interventions are typically infants and young children in settings where complementary foods lack essential nutrients required for optimal growth and development, particularly nutrients from animal-source foods such as iron, zinc, and vitamins A, B_2, B_6, and B_{12}. These settings can be low- or middle-income countries, where incomes and purchasing power are low and fortified complementary foods are not widely consumed due to high cost, or poor market access. The reason home fortification is a more viable alternative in these settings is because animal-source foods and fortified complementary foods are generally too expensive to be consumed at a frequency necessary to meet nutrient requirements. Hence, relative to the costs of consuming animal-source foods and fortified complementary foods, fortifying the usual complementary foods at home is a more affordable strategy to help infants and young children meet their nutrient needs.

Even low-income families purchase products specifically for their children

Why market-based approaches?

Despite the economic challenges faced by many families around the world, even low-income families purchase products specifically for their children. Many factors influence the decisions made on what is purchased. Some purchases might be aspira-

Mothers adding micronutrient powder to the child's complementary foods

tional. Particularly in urban areas, families might buy snack foods or sugary drinks for their infants and young children – such products are nutritionally sub-optimal and cost precious money without addressing nutritional needs. Even if a caregiver wanted to purchase a product with the potential to impact their child's nutritional needs, in the developing world, there are virtually no affordable products for sale that are specifically designed to meet the nutritional needs of infants and young children.

In view of the issues previously discussed, market-based channels have been considered for delivery of home fortification products, to complement the existing public health system and make good-quality, affordable products that can improve nutritional intakes and contribute to the health and development of children widely available. Market-based delivery of MNP has already become a reality in Bangladesh, western Kenya, and Bolivia. In discussions at a recent workshop,[2] countries mentioned interest in market-based distribution for multiple reasons: **1)** to complement the existing free distribution for infants and young children aged 6–23 months; **2)** to increase sustainability if donors will no longer support MNP distribution; and **3)** to meet the demand for other populations that might benefit, such as children 24–59 months who often are not targeted in free distribution programs.

The aim of this paper is to highlight considerations around MNP distribution using market-based approaches for the purposes of complementing a free public distribution system or increasing access to these products.

A market-based approach can decrease the burden on the public sector

Market-based distribution of home fortification products

In both free and market-based distribution approaches, the requirements for delivery are fundamentally the same – any delivery channel must be capable of delivering a home fortification product to intended beneficiaries as well as ensure its appropriate use through effective behavior change communication strategies. While there is extensive experience delivering MNP free of charge,[3] there has been little research on market-based approaches to support delivery and appropriate use of these products.

Another reason to consider a market-based approach is to decrease the burden on the public sector, which at a point might no longer have to fund provision of products to those who can afford them, thus saving resources for the poorest of the poor who depend entirely on public assistance. Additionally, through economies of scale, the more products that are produced and sold, the lower the unit cost for everyone, including government or donors that bankroll free distribution programs.

One of the earliest studies of a market-based approach to distributing MNP was the Nyando Integrated Child Health & Education (NICHE)[4] Project in western Kenya. Community-based entrepreneurs in the Safe Water and AIDS Project (SWAP) sold the MNP along with other products. The SWAP implementation model involved social marketing, community-based entrepreneurship, and community mobilization for behavior change. Training was provided to the entrepreneurs on the appropriate use and rationale for using MNP, and the products were sold door-to-door and through a variety of channels in the communities.

An evaluation of the feasibility and effectiveness of this distribution model found that NICHE improved nutritional status and created demand for MNP. Although sales were high immediately following promotion activities for MNP, ongoing promotion and support were needed to sustain sales.

The situation discussed above emphasizes that making a market-based distribution system operational and sustainable long-term requires significant investments upfront. Social and behavior change efforts require on-going support and actions to maintain awareness and continued motivation to purchase MNP for the target population. Ideally, those who sell MNP or other home fortification products need to know how to explain

the rationale for using the product and support the appropriate use among those who purchase it.

It is important that the consumer purchases enough MNP to achieve the desirable nutrition impact, which is estimated at 2–3 sachets per week.[5] Subsidizing the product to make it more affordable increases the chances of this happening. However, if a donor stops the subsidy, the sustainability of the subsidized product can be undermined. Furthermore, even if products are made more affordable through subsidies and sold below actual program delivery cost, they might still be too expensive for the very poor consumers who need them most. In settings where a large percentage of the population is too poor to purchase products through market-based channels, free distribution might be the only option for reaching target beneficiaries. By carefully studying and mapping the needs, ability to buy, and reach of existing public sector programs, one can evaluate whether combining free distribution with market-based approaches makes sense.

Another approach for increasing access to MNP via market-based distribution system is to provide vouchers or coupons to purchase the product at a discounted price to consumers who could otherwise not afford them. Such an approach has been used successfully for other products . A downside of vouchers is that they can have fees as high as 20% levied by those issuing them or by the places that accept them.

Social marketing will be a critical success factor for market-based approaches

Social marketing

Social marketing, which is the application of marketing along with other concepts and techniques to achieve specific behavioral goals for a social good, will be a critical success factor for market-based approaches; in the absence of nutrition campaigns, there is usually a general lack of awareness across income tiers on nutrient deficiencies and the effect of home fortification.

For new consumers who are not familiar with the product and its benefits, introducing this approach will require significant demand generation and behavior change support strategies. When free distribution is already in place and where the product is already known, the social marketing approach will benefit from the pre-existing knowledge among consumers of its effects, which will make introducing the product easier and more acceptable. Interpersonal methods, such as home visits, are most effective for familiarizing and influencing behavior change, but are very labor intensive and expensive.

As examples, in Kenya, community-based entrepreneurs selling MNP motivate and support caregivers, resolving problems; in Bangladesh, BRAC salespersons convey information directly to caregivers who purchase the products while the pharmaceutical company that both produces the MNP in its factories and sells MNP in its pharmacies trains the pharmacists who sell MNP in their pharmacies. These examples from both countries rely on donors to subsidize these informational and behavior change social marketing activities.

Based on experience to date, in places where the scope of demand generation is limited by resources or regulation, where the government lacks resources for a social marketing campaign and MNP producers lack sufficient incentives to invest, success has been modest. Without an enabling environment that includes a comprehensive behavior change package involving strategies supporting coverage and sustained appropriate use, one can only expect modest success.

In countries that have been initially introduced to home fortification interventions via free distribution through public sector channels, and where the experience has been positive, recipients value the products and their impacts, and demand is strong, market-based channels can tap into this existing demand and complement the existing free distribution programs. Market-based channels can be more easily developed once there is sufficient demand for these products. Additionally, home fortification products can be added to existing micro-franchising programs have strong social marketing components. Later, kiosks and other points of access of goods and services by target consumer beneficiaries could be identified and explored as potential distribution points too.

Critical success factors

Several success factors for market-based approaches, not limited to home fortification, have been identified so far:[6]

- *Affordability.* In low-income settings, a necessary first step in planning a market-based approach is to understand ability and willingness to pay, and testing price points. Efforts to reduce the product's selling price, such as subsidies or vouchers, might be particularly effective for stimulating sales, assuming behavior change communication activities are in place.

- *Behavior change.* The local context and preferences must be considered when considering the home fortification product and the design, labeling, sizing of packaging, and behavior change strategies. These factors can drive coverage and adherence. Further, the initial and ongoing communication and marketing activities are critical to create awareness and demand for the product. These activities can be aimed at multiple levels, including those involved in distribution (e.g., private and public channels) as well as consumers. Person-

to-person marketing can lead to a high-yield in increasing awareness/buy-in and how to appropriately and successfully use the product.

- *Availability.* There is a need for consistent availability (avoiding stock outs) and quality of the home fortification products, such that demand can be met and sustained. By increasing access to home fortification products through diverse channels, one can reach different population segments, depending on the population that is targeted. Additionally, the same target populations can purchase the product at multiple access points. It is particularly important to avoid stock outs in order for consumers to continue the established habit of purchasing and using the home fortification products on a regular basis.

- *Regulatory environment.* In order to have successful behavior change communication activities, it is essential to be able to communicate about the rationale for use of home fortification products including nutrient content and health outcomes (e.g., prevention and treatment of anemia; cognitive development). Home fortification products can be registered as pharmaceuticals, food supplements, or foods, and there are regulatory requirements for each of these classifications. If registered as a food, home fortification products can be subject to the Code of Marketing of Breast-milk Substitutes and subsequent World Health Assembly resolutions, which do not permit nutrition or health claims, if aimed at infants and young children. It is important to understand this and engage those who can help ensure the strategy is consistent with the Code, national laws and regulations.

On-going projects in Bangladesh and Madagascar and elsewhere will yield valuable lessons

On-going projects

At this time a few ongoing projects are looking at developing this type of approach. Specifically, in Madagascar, a UNICEF-supported and government-led 18-month pilot project involving a branded MNP in two rural areas (Vavatenina and Fénérive-Est) and in two urban areas (Antananarivo and Fianarantsoa) is underway. The pilot aims to improve complementary feeding practices through targeted social and behavior change communication activities and by increasing access to, sale and use of MNP through community health workers in rural areas and health clinics in urban areas.

The MNP is being sold for a subsidized price to caregivers of children 6–23 months. In the rural areas MNP is available to community health workers at community supply points (small privately run shops) supported by PSI and at public health centers. For children 6–23 months in urban project areas, promotional activities and sales of the product have started. Revenues from the urban sales will be reinvested into additional promotion and communication activities for the rural areas.

Summary and conclusion

While still limited, experience to-date with market-based delivering of MNP to complement existing free distribution programs provides valuable experiences. On-going projects in Bangladesh and Madagascar and elsewhere will yield valuable lessons on use, sustainability, cost, health impact, and the success factors. Close monitoring, documentation and sharing lessons learned from these early experiences are key to advance this innovative approach.

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Home fortification in School Feeding

Using Micronutrient Powder as a Strategy to Strengthen School Feeding Programs in Afghanistan

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School lunch in Jalalabad

Project description

The nutrition situation in Afghanistan is characterized by an extremely high prevalence of stunting and widespread micronutrient deficiencies. Political unrest and instability have seriously disrupted formal and informal schooling in Afghanistan, especially for girls and women. The objectives of this pilot project were to:

1. Increase access to education for girls and boys in World Food Programme (WFP)-assisted schools;
2. Address micronutrient deficiencies through the provision of food fortified with micronutrient powder (MNP) among 46,000 students in grades one through nine.

This school feeding pilot started in 2009, implemented under Food for Education, a constituent component of WFP's Afghanistan Protracted Relief Operation. The pilot design consisted of a school-centered development approach that integrated school feeding with other complementary activities to support health and nutrition, and quality education, i.e. the Essential Learning Package (ELP). This included construction of efficient and hygienic school kitchens and canteens – including repair or construction work on kitchens and food stores – by Department of Education engineers; education in health care, nutrition and community mobilization; and the provision of certain required non-food items (soap, water tanks and hand pumps) by UNICEF. Originally, WFP had planned to target 100,000 school children in 148 schools with the intervention, however, due to security concerns, this target was revised and the final pilot included 54 schools in 15 food-insecure districts across eight provinces, targeting 46,000 children.

In general, micronutrients are provided through school meals using various strategies including processed fortified commodities such as biscuits or fortified blended foods, or by having school cooks add multi-serving packages of micronutrient powders (MNP) to school meals. Adherence to school meals fortified with MNP in this way is high because the powders are added prior to serving, which, in turn, lowers the refusal rate among students.

MNP are particularly useful in situations where school meals are prepared from a food basket composed of locally available, unprocessed foods, or when fortified staples such as flour, oil or salt are used but in amounts too small to meet the vitamin and

mineral requirements of the students. In the pilot intervention, the food basket included fortified wheat flour, pulses, vegetable oil, iodized salt, and MNP. Micronutrient powder was added to the food to help improve children's vitamin and mineral status. Feeding took place during break time at schools, and was also an avenue to introduce the importance of nutritious foods.

MNP are particularly useful where school meals are prepared from locally available foods

The MNP brand name used in this context was MixMe™, provided in 10 g sachets that each serve 20 students. Each sachet contained: 10 mg of vitamin A, 100 µg of vitamin D, 140 mg vitamin E, 1.2 mg of vitamin K, 600 mg of vitamin C, 18 mg of vitamin B_1, 18 mg of vitamin B_2, 20 mg of vitamin B_6, 36 µg of vitamin B_{12}, 240 mg of niacin, 6 mg of folic acid, 250 mg of iron, 112 mg of zinc, and 12 mg of copper. The formulation was based on the Recommended Nutrient Intake (RNI) for school-age children.[1,a] In other current WFP school feeding programs, which also provide MNP, a standardized sachet design is now used which is available in English and French.

Policy

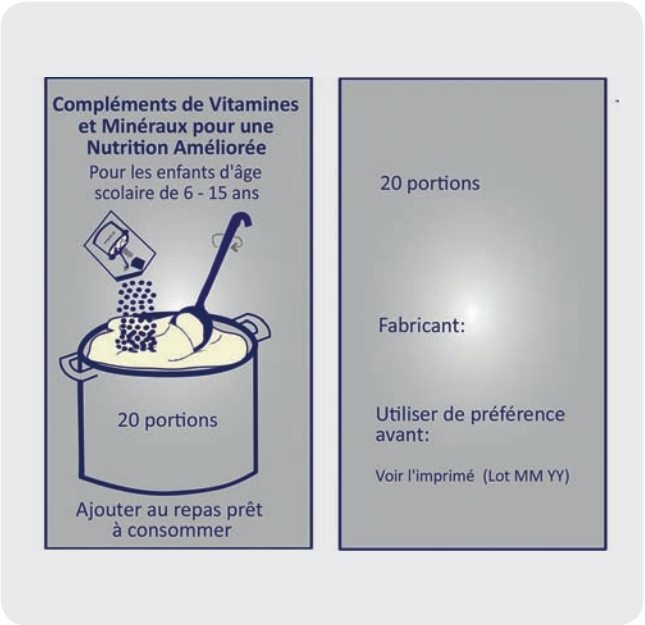
In January 2009, a letter of understanding was signed between the Ministry of Education of Afghanistan and WFP to guide the implementation of the pilot. Other collaborating partners were the Ministry of Health, UNICEF and the World Health Organization (WHO).

Behavior change communication

The MNP package design was the generic version provided by the supplier. School feeding focal points from the Department of Education were trained as trainers, and they in turn trained the focal points at district as well as school level. Parent Teacher Association (PTA) members and other community members who were participating in the food management process also received training on MNP, its benefits, and how to prepare food and mix in the MNP.

Delivery

At school, each student consumes a food basket including fortified wheat flour, pulses, vegetable oil, iodized salt, and MNP. Each child takes home the wheat flour, which is used by their parents at home to bake bread that is then taken to school by the child every day. The food to which the MNP is added is prepared at school. Green peas are soaked and then cooked using oil and salt. The cooked peas are left to cool, then mixed with MNP, and subsequently served to students. Children are provided with this cooked meal each day they attend school, usually 26 days out of every month for seven months, or 182 days in total.



Standardized sachet design for school age children / WFP

Monitoring

The project monitored the number of children receiving MNP-fortified meals, the number of feeding days versus school days, and the number of days MNP was used.

Overall, MNP acceptance and use was good

Key findings and next steps

A programmatic review of the school feeding pilot project in Afghanistan (2009–2010) was conducted in October 2010. Interviews were held with key informants from 16 schools delivering meals prepared with MNP and high-energy biscuits (HEB) to students. It was found that 30,580 children in 2010, of which 43% were girls, were reached with meals including MNP. Moreover, it was concluded that after the start-up phase, meals that incorporated MNP were less costly than HEBs.

Many key informants felt that there was a need for diversification of the school meal food basket to include locally available ingredients. Overall, MNP acceptance and use was good; children liked the food prepared at schools and in general no issues

[a] RDI for copper was based on WHO, WFP, UNICEF Joint Statement: Preventing and controlling micronutrient deficiencies in populations affected by an emergency, 2006

were reported with the use of MNP. However, in some parts of the country, school feedings including MNP were less positively perceived by parents due to security and possible safety reasons, such as fear of poisoning. This underscored the importance of a behavior change communication component in the program. Other challenges consisted of access and logistical issues, low community ownership, and labor intensiveness of food preparation by teachers and cooks compared to pre-prepared food.

The review recommended a cautious scaling-up of the pilot to reach 46,550 school-aged children from 2011 to 2013 in selected areas around Kabul and in the north of the country, as they were better placed in terms of capacity and access to ensure the quality and success of the program. It also advocated for the inclusion of school feeding in the national school program. In 2012 therefore, 36,812 students in 36 schools in the provinces of Saripul, Samangan, Dai Kundi, Panjshir, Hirat and Badakshan were targeted.

Security and perceived safety can be a critical factor

Key lessons learned

Project design

- Security and perceived safety can be a critical factor to the implementation of any intervention.
- There is a need for effective communication with teachers, cooks and parents (including a response strategy) to address acceptance issues and rumors.
- The initial program design consisted of an approach that integrated school feeding with other complementary activities to support health, nutrition and quality education, but the strategy was not adequate to fully materialize this integrated approach.

Partnership and stakeholder management

- Sufficient financial resources and time should be allocated to ensure that the adequate facilities and partnerships are in place in targeted schools prior to starting implementation.
- Advocating for the inclusion of school feeding with MNP in the national school survey would have strategically influenced a shift of resource allocations within the education sector.

Monitoring

- In the Afghanistan school context, monitoring indicators were selected to support good coverage and MNP intake among schoolchildren. For example, schools had to document that meals were being fortified as instructed, and to record the number of children consuming fortified meals.

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Home Fortification and Complementary Feeding

Regional Workshops to Scale Up Home Fortification to Improve Complementary Feeding: Collaboration Between UNICEF, CDC and Partners

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Introduction

Since its inception in 2000, the CDC International Micronutrient Malnutrition Prevention and Control Program (IMMPaCt) and UNICEF have collaborated to support countries in developing and scaling-up programs to prevent and control micronutrient malnutrition. Since then, UNICEF and CDC have also partnered at the global level to build capacity through technical workshops on monitoring and communication, to carry out technical consultations on micronutrient strategies, to develop monitoring and evaluation models for micronutrient interventions, and to strengthen global networks.

Home fortification, also called point-of-use fortification, aims to improve the nutritional quality of foods for individuals aged six months and older (usually children between 6–23 months old but can include children up to 59 months, or five years old; school-aged children; pregnant and lactating women, or other vulnerable groups). Foods are fortified with nutrients (micronutrients alone, or a mix of micronutrients and other vital nutrients including essential fats, protein and/or specific amino acids, and enzymes) that are typically in powder or paste form, and are mixed into food prior to consumption. They are available in single or multiple-serving packages. UNICEF and CDC's focus has been on children 6–23 months old (complementary feeding age), since this is the age group where irreversible chronic undernutrition (stunting) develops. Several types of complementary food supplements are used in home fortification including micronutrient powders (MNP), small quantity lipid-based nutrient supplements (LNS), and powdered complementary food supplements (CFS). During the last decade, the evidence base increased for the efficacy of home fortification to decrease anemia and iron deficiency in young children,[1,2] and there has been a rapid expansion of home fortification programs globally – particularly programs including MNP.

In light of this expansion, the UNICEF and CDC collaboration has supported the scale-up of home fortification interventions integrated into infant and young child feeding (IYCF) programs with the aim of preventing micronutrient deficiencies and undernutrition. Support of appropriate complementary feeding practices is part of the Scaling Up Nutrition (SUN) Framework

[a] Disclaimer: Arnold Timmer is staff of UNICEF and Laura Irizarry is a consultant of UNICEF. These authors alone are responsible for the views expressed in this publication, which do not necessarily represent the decisions or policies of UNICEF. Katie Tripp, Rafael Flores-Ayala and Maria Elena Jefferds are staff of the US Centers for Disease Control and Prevention. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention.

for Action[3] and a key intervention to reduce stunting. Improving complementary feeding through home fortification is currently one of the evidence-based scalable nutrition interventions[4] and an important intervention to be considered in national nutrition frameworks, national poverty reduction strategies, and sector-wide approaches in national development plans. Based on the benefit-to-cost ratio, in 2012 the Copenhagen Consensus Expert Panel[5] selected as their top priority bundled interventions to reduce undernutrition in preschoolers; these bundled interventions included the provision of micronutrients, complementary foods, treatments for worms and diarrheal diseases, and behavior change programs.

The overall objective of the regional workshops was to provide a program design framework

During the last decade, while the initiation and scale-up of home fortification interventions was gaining momentum, global guidelines published on the design, implementation and monitoring were not available. Moreover, because of the new concepts and behaviors associated with mixing powders or pastes into food, a myriad of challenges and inquiries were posed by countries interested in pursuing these approaches. The Home Fortification Technical Advisory Group (HF-TAG) was only just forming in 2009. UNICEF, CDC and many of the partners listed in **Table 1** provided technical assistance in specific countries, but the lack of guidance manuals combined with the broad demand for technical support led to the decision by UNICEF and CDC to use regional workshops for groups of countries as an efficient way to begin to address these requests. The focus of the workshops was primarily on MNP because the use of small-quantity (preventive) LNS and CFS was limited, and because research on LNS is largely still in the efficacy phase. This paper summarizes the experiences and outcomes of the five regional workshops (**Table 1**), the contribution of the workshops to advancing the home fortification global agenda, the gaps that remain and what is needed to move the field forward.

Development and content of the regional workshops

As home fortification interventions are still relatively new, the overall objective of the regional workshops was to provide a program design framework explaining how to position, plan, and implement successful home fortification interventions as part of IYCF programs. Participants applied this framework during the workshops to design or improve their home fortification interventions. The workshops also described the principles of how to manage, monitor, evaluate and document their implementation. Specific objectives included:

1. Providing a common framework for home fortification programs for children in the complementary feeding period from 6–23 months of age;
2. Strengthening implementation plans so that they are more effective, scalable and sustainable;
3. Developing and strengthening monitoring and evaluation systems for programs;
4. Identifying, prioritizing and addressing fundamental challenges in home fortification in the context of countries'

CDC/UNICEF Asia Regional Workshop on Scaling Up the Use of Micronutrient Powders to Improve the Quality of Complementary Foods. Bangkok, 2009

TABLE 1: Additional organizations involved in developing and facilitating the five regional UNICEF-CDC workshops to *Support the Scaling-Up of Home Fortification to Improve the Quality of Complementary Foods for Young Children*, by workshop location and year.

Organization	Asia (Bangkok, Thailand; April 2009)	Latin America and the Caribbean (Mexico City, Mexico; June 2010)	Sub-Saharan Africa (Dakar, Senegal; June 2011)	Sub-Saharan Africa (Lusaka, Zambia; May 2012)	Middle East and Northern Africa, Central and Commonwealth of Independent States (Antalya, Turkey; May 2013)
Foundation for the Nutrition of Central America and Panama (FANCAP)		X			
Global Alliance for Improved Nutrition (GAIN)	X	X	X	X	X
Helen Keller International (HKI)	X		X	X	
Institute of Nutrition of Central America and Panama (INCAP)		X			
Inter-American Development Bank		X			
Kyrgyzstan country delegation					X
Micronutrient Initiative (MI)	X	X	X	X	X
National Institute of Public Health in Mexico (INSP)		X			
Population Services International (PSI)				X	X
Sight and Life	X			X	X
Sprinkles Global Health Initiative (SGHI)	X	X	X		X
Swiss Red Cross	X				
United Nations High Commissioner for Refugees (UNHCR)	X		X	X	
United States Agency for International Development (USAID)	X				
University of British Columbia			X	X	X
University of California, Davis			X	X	
World Bank			X	X	
World Food Programme (WFP)	X	X	X	X	X
World Health Organization (WHO)	X	X			

current and evolving stages of social and economic development;

5. For countries with existing programs, sharing experiences and lessons learned with developing, implementing and scaling-up home fortification programs.

For each workshop, a planning committee led by UNICEF headquarters and CDC staff was established. Each planning committee included UNICEF Regional Advisers and Country Office staff at the location of the workshop, and other organizations implementing or supporting home fortification programs globally, regionally or in participating countries. **Table 1** lists the 19 organizations that participated in the planning and implementation of the regional workshops; among these, eight organizations participated in three or more workshops. The participation of staff from these organizations varied by region and year, but each workshop was enriched by the variety of organizations that were represented and the diverse experiences, perspectives and expertise they brought based on work carried out in development, emergency and refugee contexts, as well as research settings. As a part of their contribution, some organizations also provided financial support for travel, simultaneous translation, or other costs related to the workshop.

Starting six months prior to each workshop, the planning committee selected participating countries, developed the agenda, shaped workshop sessions, work group assignments and the flow of the workshop, and developed and reviewed workshop materials. Often, members of the planning committee gave presentations, but additional presenters were also invited including technical experts and resource persons from relevant regional bodies and from countries that have successfully implemented home fortification programs. Facilitators, assigned to a country delegation and tasked to guide them through the workshop, were also identified. Members of the Kyrgyzstan delegation attended the 2009 workshop as participants and then attended the 2013 workshop as facilitators, where they advised other country delegations and shared their experiences through formal presentations as well as informally during working groups or downtime. Once countries were selected and their teams composed, they were asked to carry out preparatory assignments prior to the workshop including the development of a poster presenting a situation analysis and describing the main elements of the design of their home fortification intervention. This process provided an opportunity for delegation members in each country to get familiar with each other and the content in anticipation of their participation in the workshop.

Two days prior to each workshop, all facilitators participated in a pre-workshop to jointly review, and if needed, revise presentations. The pre-workshops also served as a platform to update each other on the latest knowledge and program experiences, and identify unresolved technical issues and program approaches for which no guidance had been developed, or where differences in opinion existed. The goal of the pre-workshop was to have a common approach among all facilitators and presenters, and allow them to speak with one voice during the workshop. Facilitators assisted each country delegation during the entire workshop, especially during the group work sessions. Debriefings at the end of each day offered opportunities for feedback from group work and the need for clarifications for the participants.

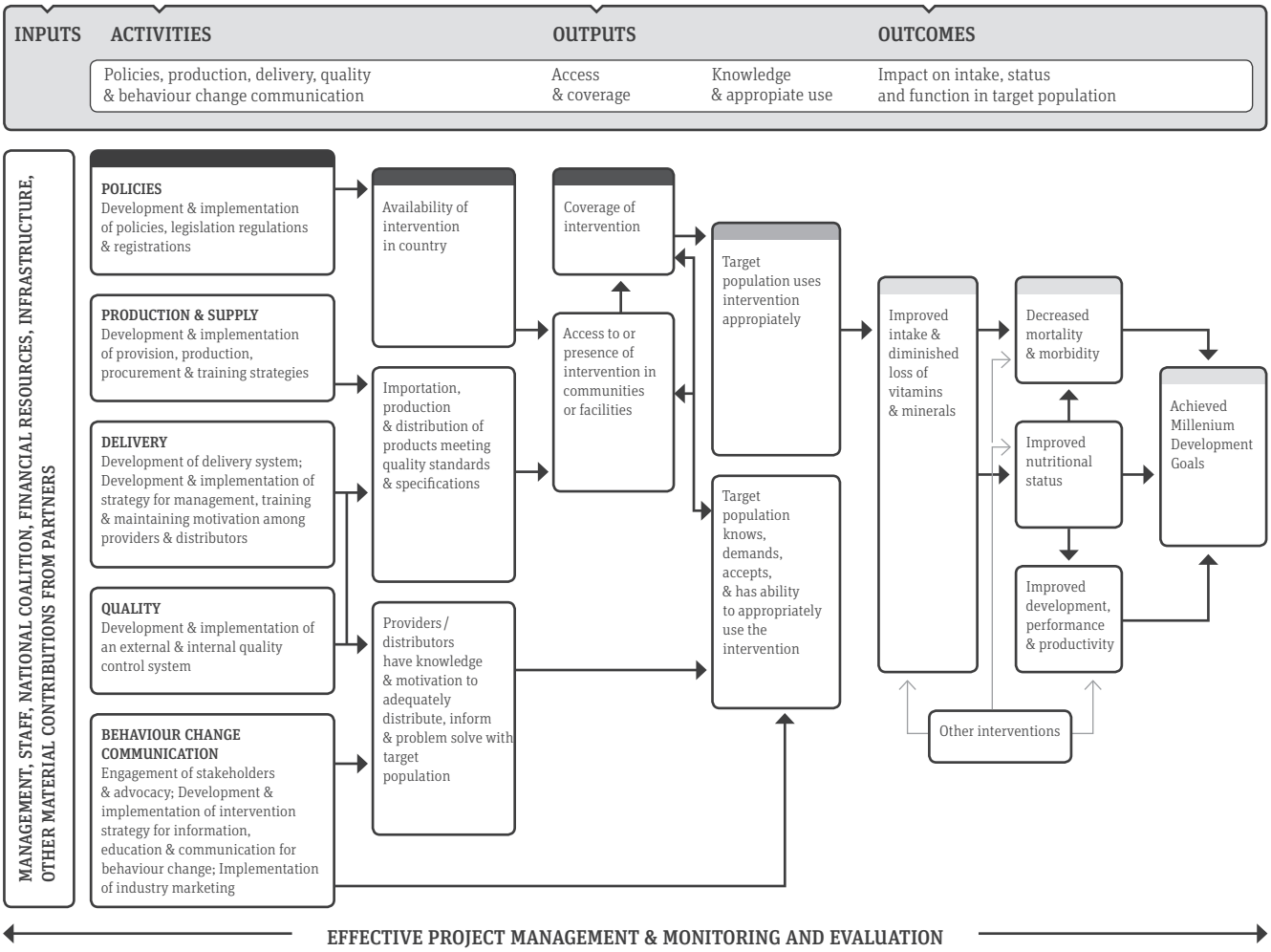
The pre-workshops served as a platform to update each other on the latest knowledge and program experiences

The workshops lasted 4–5 days each and the agenda included presentations of technical content, case study examples, plenary discussions, and country group work. The agenda followed the program theory outlined in the WHO/CDC Logic Model for Vitamin and Mineral Interventions[6] (**Figure 1**) and sessions addressed each of the components. When available, a country case study relevant to the topic was presented. The agendas of the workshops included the following session topics:

- Introduction to home fortification and IYCF;
- Review of the evidence for MNP and LNS interventions;
- Overview of designing an integrated home fortification program including all components and steps;
- Positioning home fortification in the policy arena and integrating home fortification into national policies and strategies;
- Defining program objectives;
- Production and supply of home fortification products;
- Selecting appropriate delivery platforms and distribution mechanisms;
- Behavior change communication;
- Planning, implementation and program management;
- Monitoring and evaluation; and
- Country presentations of home fortification plans developed during the workshop.

Throughout the workshop, each country team worked on the plans for their home fortification intervention following the steps for each defined program component. Typically, countries were in various stages of planning or implementing programs and this influenced progress made during the workshop. Any relevant literature or other resources needed to advance

FIGURE 1: WHO and CDC logic model for micronutrient interventions in public health.[6]



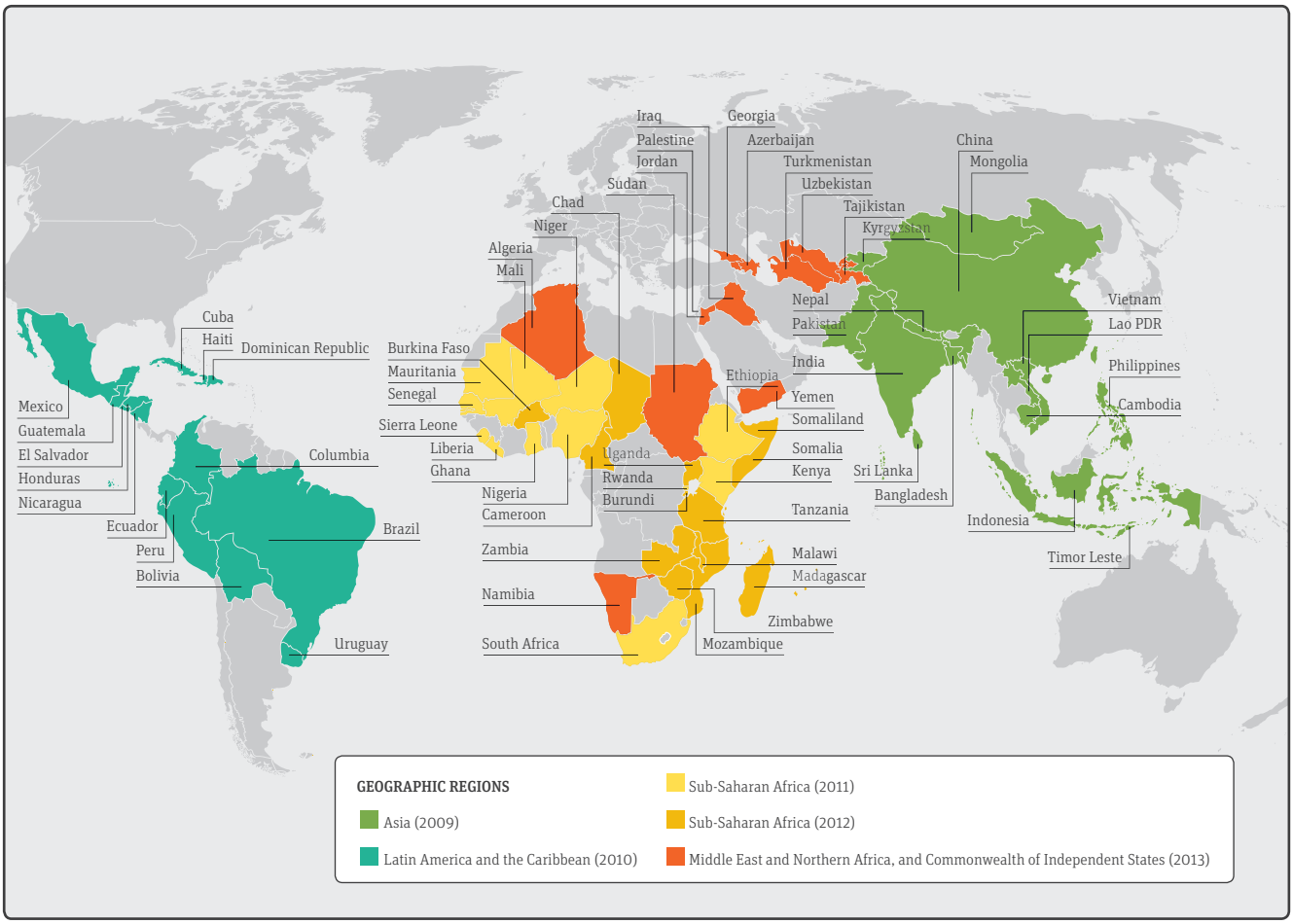
the country plans were provided to participants. All workshops included evaluations completed by participants and facilitators, which assessed the workshop content, presentations, flow, and facilities. Evaluations and other workshop feedback were used to revise and improve the following year's workshop content and agenda, as well as the common framework for home fortification programs for children in the complementary feeding period.

Country participation and delegations

Between 2009 and 2013, five regional workshops were organized in Asia (n=1), Latin America and the Caribbean (n=1), sub-Saharan Africa (n=2), and for countries in the Middle East and Northern Africa and the Commonwealth of Independent States (n=1). Delegations from a total of 66 countries participated (**Figure 2**). Countries in Asia and Latin America and the Caribbean were targeted for the first two workshops because they had the largest number of planned or existing home fortification programs. In contrast, in sub-Saharan Africa there were limited interventions at the time because of the uncertain safety of providing iron (such as through home fortification) in malaria endemic areas.[7] In 2011, a WHO guideline[1] recommended the use of micronutrient powders containing iron in conjunction with measures to prevent, diagnose and treat malaria in endemic areas. As an immediate result, sub-Saharan African countries started to develop plans for home fortification, and the third and fourth regional workshops were consequently organized for this region in 2011 and 2012 in order to meet the urgent need for support. Because of the early phase of home fortification programs in sub-Saharan Africa, the workshop format and agenda were adjusted with a focus on developing the initial program outline rather than developing a concrete program plan. Recently, interest in home fortification was seen to increase in the Middle East and Northern Africa and the Commonwealth of Independent States. Therefore, a fifth workshop was carried out in 2013 for these regions.

For all workshops, country teams were invited to participate in the workshops if they had concrete plans for, or had

FIGURE 2: Countries that participated in each of the five regional UNICEF-CDC workshops to support the scaling-up of home fortification to improve the quality of complementary foods for young children.



existing home fortification interventions to improve the quality of, complementary feeding. At the workshops, country delegations were asked to send 4–5 team members that included representatives from each of the following stakeholder groups:

- Government counterparts from line ministries responsible for policy and strategy development as well as program management and implementation;
- UNICEF and other agencies supporting and/or implement ing programs, such as other United Nations (UN) agencies or non-governmental organizations (NGOs), and;
- Other groups including nutrition or research institutes in volved in technical assistance and/or implementation.

It is important to note that not all country delegations included representatives from government. Due to the emphasis on emergency nutrition in some countries, additional country participants involved with, or knowledgeable about, emergency nutrition programs also attended. In addition, other development partners working at the national and regional level were invited when they could benefit from, or contribute to, the workshop.

The workshops were effective in helping develop and/or strengthen home fortification programme plans

Results of the workshops

The five regional workshops achieved the primary objective for most country teams to design or strengthen their home fortification program plans. This was documented in the initial poster presentations shared at the beginning of the workshop, the plans developed or strengthened during the workshop sessions, and the country plans presented at the end of the workshops, as well as through informal feedback and formal evaluations. In a few cases, country teams did not leave with a developed plan,

but they critically reflected on whether to develop home fortification programs, and what the considerations for implementation would be. Participants attending the Mexico 2010 and Senegal 2011 workshops were contacted between June and August 2012 to participate in a follow-up evaluation. They confirmed the workshops were effective in helping develop and/or strengthen home fortification in their countries and this happened in various ways. Their explanations most often focused on:

- Developing technical knowledge about home fortification programs and better understanding program issues and/or clarifying questions or doubts;
- Supporting the development or adjustment of program and monitoring and evaluation designs, plans of action, and work plans; and
- Expanding opportunities to advocate for home fortification in-country.

Furthermore, procurement information from UNICEF confirmed that countries who participated in the workshops started to order MNP supplies. Representatives of the main organizations involved in home fortification reported additional benefits in the evaluations including enhanced collaboration, coordination and information exchange among organizations. They also reported that between the first and fifth workshops, discussions during the workshops resulted in more harmonized approaches by, and more frequent interaction and collaboration among, organizations when implementing home fortification programs. Overall, the workshops advanced the home fortification global agenda and identified challenges, areas requiring guidance and support, and a number of best practices and lessons learned.

Workshop outcome: country-specific results

The workshops successfully introduced a common program framework for home fortification as part of IYCF programs, which included explaining the architecture of home fortification programs, the steps, and components. Countries used the framework to develop or strengthen plans for the implementation and scale-up of interventions. Countries with existing programs also shared successful practices and challenges with others in the region, and identified ways to improve their program implementation, and monitoring and evaluation. As reported through formal evaluations and informal feedback during and after the workshops, country teamwork usually enhanced collaboration, coordination and support mechanisms within the delegation, while the workshop itself gave participants the opportunity to network with others in the region and learn from their experiences.

Despite the contextual and programmatic differences among participating countries, most of the program challenges, solutions and lessons learned had common threads. They pointed to the need for clear guidance, technical support mechanisms, and networks that countries can access throughout the program design and scale-up process. While UNICEF, CDC and partner agencies supported countries with the development and implementation of interventions both before and after workshops, the demand for technical assistance remains high.

Some of the key lessons learned by countries who have implemented these interventions include the importance of piloting the intervention before scaling-up, and choosing appropriate distribution channels and delivery mechanisms for the integrated intervention package. Regional variation exists – for example, one of the distinctive features of existing projects in Latin America and the Caribbean is the distribution of home fortification products through social protection programs, such as conditional cash transfers, to promote the use of health, nutrition, and social services among disadvantaged populations. With global initiatives such as the SUN focused on the reduction of stunting, workshop discussions have focused increasingly on the contribution of home fortification towards achieving these global targets. Two projects in Asia illustrated the successful use of market-based distribution of MNP on a large scale, showing that it is a potentially feasible and sustainable distribution mechanism. In the last two workshops, workshop participants have shown growing interest in market-based approaches, and in the 2013 workshop, for the first time, a session was devoted specifically to market-based distribution strategies.

Another common observation was the need for direct and frequent contact with the target populations to deliver high quality locally adapted behavior change communication strategies and counseling support. There is a limited evidence base to provide guidance on the minimum behavior change and counseling needed to achieve and sustain impact, and some programs struggled to carry out behavior change and counseling with confidence and fidelity due to cost or difficulty with implementation.

The value of integrating home fortification as part of IYCF programs was evident as both programs can mutually benefit in joint delivery and result in an intervention package with enhanced results that typically would not be expected if each were carried out independently. Some countries were also integrating home fortification and IYCF programs with early childhood development (ECD) interventions. Combining more interventions in an integrated package leads to a greater burden on the system responsible for the delivery, which increases program complexity and cost, and risks compromising quality. Furthermore, countries discussed extensively the pivotal role of monitoring to improve program implementation and the use of evaluation to understand program impacts, but few projects had developed these components, and monitoring and evaluation were consistently mentioned as challenges requiring on-going technical assistance.

A common program framework for integrating home fortification into IYCF programs was developed from the first workshop and used in the succeeding workshops

Workshop outcome: global level results

In the absence of published global guidance and comprehensive programming tools, the workshops provided a platform for participants and facilitators to exchange the latest programmatic and scientific knowledge among themselves, and improved communication and collaboration among participating agencies. As a result of this, a common program framework for integrating home fortification into IYCF programs was developed from the first workshop and used in the succeeding workshops and by other countries and agencies around the world. The rich information shared by countries and the discussions during the planning phases, pre-workshops and workshops helped identify a list of challenges, areas requiring clarification, support and research needs, lessons learned and opportunities for documentation. The topics discussed covered a wide spectrum of issues, such as:

- Minimum required components and steps for developing a home fortification intervention in both development and emergency contexts;
- The importance of formative data collection to understand how to position and integrate home fortification into the cultural and complementary feeding context, and develop locally relevant packaging, product name, and messages;
- Formulations for home fortification products;
- Dosing regimens;
- Planning home fortification interventions in the presence of existing supplementation, fortification programs and other specialized foods, especially fortified blended foods, and ready-to-use supplementary food (RUSF);
- Managing environmental impact when disposing of prod uct packaging;
- Safety of iron- and folic acid-containing home fortification products in malaria-endemic areas.

The workshops have also influenced specific actions related to the development of global program guidance. For example, the decision to carry out the first Global Assessment of Home Fortification Interventions in 2011[8] was based on emerging issues identified during the regional workshops, and was informed by preparatory work carried out prior to each of the workshops. Also, after the Senegal workshop in 2011, the HF-TAG wrote a letter to the WHO to request official guidance on the safety and use of folic acid delivered in home fortification products in malaria endemic areas. Lastly, the workshops presented programmatic experiences and areas requiring further implementation research and provided a venue to help cultivate the development of the HF-TAG *Programmatic Guidance Brief on Use of Micronutrient Powders (MNP) for Home Fortification*[9] and other forthcoming HF-TAG guidance documents including monitoring of home fortification interventions[10] and program implementation (currently being written).

Looking ahead to advance the home fortification global agenda

Between 2009 and 2013, UNICEF, CDC and partners including the World Food Programme, Micronutrient Initiative, and the Global Alliance for Improved Nutrition (see **Table 1** for a complete list) organized and implemented a series of five regional workshops including 66 countries to address the high demand for technical support in the program design and scaling-up of home fortification interventions. The workshops successfully established a foundation for the introduction of integrated home fortification and IYCF programs in these countries, and while this was an effective and efficient mechanism to support countries with their intervention plans, a significant need for on-going, in-country technical support remains. With the important contributions of country teams and participating organizations, the workshops have provided a platform to identify scalable models for programming, prioritize research and program questions, and establish a basis for program guidance, reporting and case studies. Moreover, these workshops have enhanced communication and collaboration on home fortification programs among organizations and established a common approach based on best practices. The Global Assessment of Home Fortification Interventions[8] identified 91 home fortification interventions being implemented or planned around the world in 2011, underscoring the need for technical support, guidance, and engaging communities of practice.

There is a need for HF-TAG and global, regional and national organizations to develop and support programs

There is a need for HF-TAG and global, regional and national organizations to develop and support programs through clear program guidance, technical support mechanisms, and networks that can be accessed throughout the design, scale-up and maintenance process. A prioritized research agenda for

strengthening and scaling-up home fortification interventions is important for addressing gaps, while recognizing that as the field of home fortification interventions matures, the need for support and research focus may also change. Several mechanisms currently exist including the HF-TAG which has been set up to enhance coordination and collaboration, serve as a platform for information exchange, and develop several guidance documents. Furthermore, the re-emergence of the Micronutrient Forum can provide additional assistance in the broader program and technical context. Regional workshops will remain an excellent platform to help provide support and address gaps depending on program needs. Fostering a community of practice among those involved in developing and implementing home fortification interventions where practitioners can share experiences and provide mutual support, as well as increasing the number of people who can provide technical assistance to interventions directly, is being planned as well.

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Acknowledgements:
We are grateful to Amy Lang for assistance in creating the map.

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Micronutrient Powder Interventions

The Basis for Current Programming Guidance and Needs for Additional Knowledge and Experience

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Introduction

Home-fortification with micronutrient powders (MNP) has been recognized as an effective way to increase the micronutrient intake of young children 6–23 months of age and improve anemia and iron status.[1,2,3,4] Young children, especially those in the complementary feeding period between 6–23 months of age, have very high micronutrient needs relative to their energy needs.[5]

For home-fortification with MNP to result in improved micronutrient status of the target population and contribute to the reduction of the consequences of micronutrient deficiencies, the MNP should:

- Contain a mix of required micronutrients, in appropriate amounts, and in a bioavailable form;
- Be consumed by the target population in appropriate amounts, which requires receiving or purchasing the product, and consuming it according to the recommended frequency and duration of consumption;
- Not require changes to the typical diet, not affect existing dietary practices, or undermine exclusive and continued breastfeeding, and;
- Not result in adverse side-effects or have contraindications.

Over the last 10 years, studies have examined the efficacy of MNP interventions to improve micronutrient status and functional outcomes. As the evidence base built up for improved anemia and iron status among young children,[6,7] the number of programmatic MNP interventions implemented around the world increased. The aim of these interventions often went beyond reduction of iron deficiency and anemia to also improve intake of several other micronutrients at the same time. Related to the programmatic scale-up, there was also a growing interest in operational research to improve the delivery and effectiveness of MNP interventions.

The purpose of this article is to: **1)** briefly summarize the basis of current programming guidance for MNP interventions among young children using the existing literature as well as the MNP programming experience of the authors; **2)** highlight key issues for designing and implementing MNP programs; **3)** discuss lessons learned related to the delivery and acceptability of MNP; **4)** and suggest directions for future research to improve intervention effectiveness.

[a] Disclaimer: Saskia de Pee works for the World Food Programme. Laura Irizarry is a consultant of UNICEF. Klaus Kraemer works for *Sight and Life*, a humanitarian nutrition think tank of DSM, a manufacturer of vitamins. Maria Elena D Jefferds is staff of the US Centers for Disease Control and Prevention. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position, decisions, or policies of the WFP, UNICEF, *Sight and Life*, or the US Centers for Disease Control and Prevention.

MNP to improve micronutrient status and functional outcomes

The MNP product was conceived as an alternative to iron syrup, which was originally created to treat anemia among young children who cannot swallow tablets,[7] and most efficacy research has focused on assessing the impact of iron deficiency and anemia among young children. The efficacy of various MNP formulations containing iron to reduce anemia and improve iron status was proven.[1,3,4] In addition to iron, the MNP formulations used in the efficacy studies usually contained other micronutrients that play a role in nutritional anemia. As a result of these studies, the first formulations used in public health MNP interventions usually included five micronutrients targeting anemia: iron, vitamins A and C, folic acid and zinc. However, few studies have assessed the impact of other micronutrients in MNP, such as vitamin A or zinc, on indicators other than iron deficiency anemia.[1,3,8] Reviews of the impact of MNP on such other indicators have hence been inconclusive.[1,3,8]

Micronutrient deficiencies rarely occur in isolation

Meanwhile, micronutrient deficiencies, including those of iron, vitamin A, iodine and zinc, rarely occur in isolation, given that usually the main cause for all of these is a lack of dietary diversity. While the evidence base is still being established for improved micronutrient status or functional outcomes for formulations including more than the five micronutrients targeting anemia, it was quickly realized that MNP could be used to deliver a wider range of micronutrients to vulnerable populations. Furthermore, according to manufacturers, the cost of MNP is largely determined by the packaging (> 65% of product cost), and minimal additional cost is involved in increasing content from five to 15 micronutrients.

The chemical forms of micronutrients in the MNP affect bioavailability and absorption. The chemical form of iron most often used, for example, is microencapsulated ferrous fumarate, but some interventions are beginning to use other forms of iron such as sodium iron ethylenediaminetetraacetic acid (NaFeEDTA), and micronized ferric pyrophosphate. The criteria used for deciding on the chemical form of the micronutrients are that the chemical form should be bioavailable, stable, should not interact with the other micronutrients in the powder, and not change odor, taste or appearance of the food to which the micronutrients are added.[9] For the amount of each micronutrient provided by a single dose of MNP, the most common practice is to include one Recommended Nutrient Intake (RNI) for the specific target group. For children less than five years of age, RNIs have been specified for three different age groups (0 < 12 months, 1–3 years, and 4–6 years), so an average has been recommended by HF-TAG.[2]

Assuming quality program implementation and fidelity leading to high MNP coverage, appropriate use and adherence, some of the other potential factors influencing the magnitude of impact include variations in baseline micronutrient status, the typical daily diet, and the amount of MNP consumed – all of which vary by individual, population and intervention package.[2,10] Assuming similar levels of MNP intake, those populations with a high prevalence of deficiencies and low dietary diversity resulting in poor quality diets are expected to show a greater impact compared to nutritionally better off populations.

Based on program experience, a pragmatic and logistically feasible regime is to consume MNP (one RNI of included micronutrients) every 2–3 days,[2] which is a modest (33–50%) addition to daily nutrient intake. In comparison, in efficacy studies the MNP is often consumed daily, and frequently these studies select subjects on the basis of being anemic, which is in many cases a reasonable proxy for being at higher risk of micronutrient deficiencies. Thus, in efficacy studies the MNP intervention will typically result in quicker and more significant change than in the case of a program situation where all children, irrespective of individual risk of micronutrient deficiencies, are eligible to participate and the dose consumed may be lower (2–3 sachets a week).

Improvements in micronutrient status may also impact functional outcomes

Improvements in micronutrient status may also impact functional outcomes, such as morbidity (diarrhea, fever), growth (stunting), appetite, cognitive performance/attention span, and exploration and physical activity levels (playfulness).[11] Evaluations have shown that when caretakers are asked whether they have noticed any change since their child started consuming MNP, they often mention some of these improvements such as increased appetite, less illness and more playfulness.[12–15] These tangible improvements in their child's health in turn often motivate them to continue to provide the MNP, therefore supporting improved adherence. This aspect of MNP consumption is particularly important given that the use of MNP is mainly a preventative measure and caretakers do not select it to address a specific health problem.

With regard to the impact of MNP on stunting, it is believed that it is primarily the zinc content of MNP that could have an impact on this factor. Nevertheless, in line with the results of zinc supplementation studies, impact appears to vary with the

child's age and duration of exposure to the intervention.[3,14,16] Moreover, there are several other nutrients that play a role in linear growth, such as magnesium, calcium and phosphorous, that are not contained in the MNP because larger amounts of these are required (hundreds of milligrams) than can be included in a one-gram serving of MNP. Thus, if these essential nutrients are not available in the diet in sufficient amounts, the additional zinc alone will not result in substantial improvement.[17]

For outcomes related to morbidity, initial use of MNP has been reported – both, in program reports and anecdotally – to be associated with side-effects such as dark stools, diarrhea, vomiting or nausea. For example, in Nepal 11.6% of mothers reported such side effects upon first use by their children.[14] Although these effects are transient, they can negatively affect acceptance, and should therefore always be clearly mentioned at the time of MNP distribution as possible transient and harmless side effects of initial use that should simply be treated as such. Studies show that after extended use, caretakers report that their child is sick less often,[12,13,14,15] and some studies and program evaluations found a reduction of diarrhea,[12,18] but reviews have been inconclusive about this impact.[1,3]

While this section considered the conditions under which MNP can be expected to have an impact, this can only happen when the product reaches beneficiaries, which in turn depends on program delivery and reach (whether or not the target group receives or obtains the product), and when beneficiaries consume the product as recommended.

MNP distribution is usually not a stand-alone program

Delivery and acceptance of MNP

MNP distribution is usually not a stand-alone program, but rather a component of existing infant and young child-feeding programs; it can also be integrated with other related health programs such as those dealing with water, sanitation and hygiene, immunization, and insecticide-treated bednets; or with multi-sectoral programs, social protection programs, or feeding programs at daycare centers and schools. Integration with other programs will support the sustainability and scale-up of MNP programs, while the integration of MNP distribution into an intervention package such as one that focuses on infant and young child feeding can also aid the delivery of other services and information, for example on appropriate breastfeeding practices and adequate frequency and diversity of complementary foods.

MNP can be delivered in different ways, including free distribution by the public sector or through sales, where consumers either pay the full market price of the product or a reduced, subsidized rate. Experience to-date is mainly with free and reduced-price distributions. Since many consumers can afford to pay for MNP (lowest costs are US $0.025 per sachet), development and implementation of a hybrid model where the poorest consumers receive the product for free, and low-to-middle and higher income consumers buy the product at a subsidized, no-profit – or commercial price – should be explored. The poorest consumers could, for example, be those that are already targeted by a social safety net program. By giving the poorest consumers a voucher to obtain the same product that other consumers can buy from the same stores, an economy of scale can be created with behavior change communication, packaging design and production, and supply chain logistics being the same for all consumers.

While much about how to design and implement an MNP intervention needs to be determined locally, many lessons have already been learned

By observing the guidance[b] on MNP composition, and recommended frequency and duration of consumption[2] and providing it to the most vulnerable target groups in a population (6–23 month-old children, particularly in areas or situations where dietary diversity is lowest), the likely impact of MNP is maximized, provided that the participants accept and consume the product as intended.

While much about how to design and implement an MNP intervention needs to be determined locally, many lessons have already been learned. Experiences from a variety of programs in countries across the globe, such as those presented in this issue[20,21,22,23,24,25] and many others available in peer-reviewed publications[12,13,14,15,16,18,26] and reports[27,28] attest to the lessons learned about designing and implementing effective MNP interventions. The challenges to successfully introducing MNP

[b] These guidance documents were developed by the Home Fortification Technical Advisory Group (HF TAG). Formed in 2009, the HFTAG is a community of diverse stakeholders involved in home fortification who aim to facilitate implementation of well-designed and effective home fortification projects at scale, based on sound technical guidance and best practices. The HF TAG has focused on developing guidance documents for designing and implementing MNP and other home fortification programs. The first document, the MNP programmatic note[2] was published in 2011, the monitoring manual[19] was just published in 2013, and a manual for designing and implementing programs is under development, in addition to other manuals.

include introducing a novel product that requires a new behavior (adding a virtually tasteless powder of micronutrients to a portion of food that is ready for consumption), does not treat an obvious or immediate health problem, and requires very regular use over a long period of time (often at least 2–3 times a week for many months). Therefore, any intervention package needs to include a behavior change strategy to raise awareness and encourage participants to acquire MNP and use it properly as recommended. An important component of the behavior change communication (BCC) strategy is to package and promote the MNP product in a way that is understood, accepted and well-regarded by the target population. It is also important to establish the ongoing monitoring of acceptance, questions, concerns and rumors about the MNP product among the target population as well as within the larger community. Distribution channels should be well known and well-spread across the target population, and stakeholders and community groups should be aware of, and where possible, involved with the program.

These experiences and lessons learned to date have contributed to the conceptualization of the existing brief MNP program guidance note,[2] and to a comprehensive HF-TAG implementation manual which is currently under development. The manual also specifically addresses the need for guidance in the area of delivery science, including issues related to designing the behavior change strategy such as developing locally-tailored packaging design and messages, as well as channels for social marketing.

In addition to the program guidance note[2] and the implementation manual under development, the HF-TAG website will, before the end of 2013, also offer manuals on the composition, production and quality control of MNP, as well as monitoring of home fortification interventions.[19] These manuals are expected to further facilitate and improve the design and implementation of delivery of MNP, usually as a component of other programs for infants and young children.

Increasing heterogeneity of programs requires programmatic guidance

The future for MNP programming and specific areas for further research and development

MNP interventions are increasing in number and reach, and the heterogeneity of programs continues to expand due to MNP integration with nutrition, health, social protection and education intervention packages. This increasing heterogeneity of programs requires programmatic guidance that is tailored to the specific circumstances of program implementation; this guidance should be based both on scientific evidence as well as lessons learned from earlier programming experiences.

One area of expansion has been the implementation of MNP programs in malaria endemic areas. As concerns about the interaction between iron and malaria have led to several reviews and consultations about the safety of iron supplementation in malaria endemic areas – including in the form of fortified foods and home fortificants[29,30] – agencies and governments refrained from implementing home-fortification interventions in malaria-endemic areas. However, the latest WHO guidelines on MNP state that these can be used in malaria endemic areas provided that there are malaria prevention, treatment and control efforts in place.[1] Hence, MNP programs have now also been implemented in African countries and other malaria-endemic areas, and are expected to increase in number rapidly.

Based on the above and the authors' programmatic experience, we believe research in the following areas would improve the effectiveness of MNP programs:

MNP formulation and packaging

- Efficacy could be further improved by increasing the bioavailability of nutrients, in particular iron and zinc (from both, the MNP as well as the meal to which it is added), for example by adding phytase to reduce inhibition of absorption by phytate or enzymes specifically degrading polyphenols or dietary fiber.[9,31,32,33,34]
- The amount of iron in MNP could be lowered to reduce potential negative impacts on malaria and gut microbiota,[35] but only if this can be done without limiting the amount of iron absorbed (this might be achieved by using better bioavailable iron, possibly in combination with phytase).
- MNP is typically added to starchy foods such as maize porridge. It would be worthwhile to assess the usefulness of amylases in reducing viscosity of the porridge to increase energy consumption.
- The possibility of adding other nutrients such as calcium, magnesium, phosphorous, and active ingredients could be evaluated. This would, however, require increasing the amount of powder to more than one gram.
- The addition of essential amino acids, such as lysine, to improve protein quality might be examined. These are frequently limited in monotonous cereal-based diets that contain little or no animal foods – the typical diet of many people in developing countries.[36]
- Evaluation of whether to add nutritional lipids, which would improve the nutritional value of MNP and may improve brain and learning development. A recent review concluded that docosahexaenoic acid (DHA) has an especially beneficial impact on visual and cognitive development, and recommends that infants should receive at least 0.3% of fat as DHA and that the ratio of arachidonic acid (ARA) to DHA should be greater than 1:1.[37]

- The development of more environmentally friendly and cost-effective packaging.

MNP dosing frequency, duration, and impact on micronutrient status and functional outcomes

- Assess the dose/response relationship between MNP intake and change of micronutrient status and functional outcomes (such as physical and cognitive development or morbidity), under different circumstances of micronutrient status and dietary intake, in order to provide more information to help determine the frequency and duration of MNP intake in different settings and for different outcomes.
- Evaluate the cost effectiveness of different MNP dosing frequencies and durations for specific outcomes.

MNP delivery, distribution models, target groups

- Further develop MNP delivery science to improve program delivery and effectiveness. A noted gap is the lack of rapid appraisal methodology for designing a behavior change strategy including locally tailored package design, print and other communication materials, and messaging and counseling components. This should be focused on integration with IYCF programming, which is a high priority.
- Evaluate experiences with HF-TAG manuals for program implementation and monitoring.
- Evaluate best practices on how to monitor and sustainably scale-up the intervention while maintaining adequate support for adherence and long-term adoption of MNP.
- Develop distribution models, such as market-based strategies, that differentiate consumers according to socio-economic status, where more wealthy consumers can buy the MNP at a commercial price, middle-income consumers can get it at a subsidized price, and the poorest receive it free of cost. While this model should work in theory, the crux is in finding delivery and sales channels that target these different consumer groups.
- Evaluate the cost and cost-effectiveness of delivery models.
- Document lessons learnt so far with use of MNP in institutional feeding such as at schools and daycare centers.

Furthermore, as the evidence base grows in regard to possible MNP composition and other relevant science (such as micronutrient bioavailability, micronutrient interactions, micronutrients and disease such as iron and malaria, and gut microbiota), the translation of this information for use within programmatic MNP interventions will fast become a priority.

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HF-TAG MNP Programmatic Guidance Brief

Programmatic Guidance Brief on the Use of Micronutrient Powders for Home Fortification

Partners involved in the production of this document

Centers for Disease Control and Prevention
Global Alliance for Improved Nutrition
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Micronutrient Initiative
Sight and Life
Sprinkles Global Health Initiative
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Home fortification with MNP: purpose and rationale

Home fortification is an innovation aimed at improving the diet quality of nutritionally vulnerable groups, such as young children. The term Micronutrient Powders (MNP) refers to sachets containing dry powder with micronutrients that can be added to any semi-solid or solid food that is ready for consumption. Home fortification with MNP aims to ensure that the diet, i.e. complementary foods and breast milk combined, meets the nutrient needs of young children.[1]

Home fortification is recommended where complementary foods do not provide enough essential nutrients. This occurs where one or more of the following apply:

a. Dietary diversity is low (due to limited availability or affordability);
b. Complementary foods prepared for the small child have insufficient nutrient content and density (for example, watery porridges and foods with too low micronutrient content);
c. The bioavailability of micronutrients is poor due to absorption inhibitors in the diet (fibre, phytate, tannin), which is especially the case in plant-source based meals.

These conditions are widespread in developing countries where the diet is predominantly based on staple foods, contains few animal-source and fortified foods, and where tea consumption is common.

Home fortification increases micronutrient intake, which leads to an improvement of micronutrient status, and can therefore improve child health, including reduced morbidity and mortality, improved growth, cognition, appetite and other functional outcomes.

Other commodities for home fortification include small-quantity Lipid-based Nutrient Supplements (LNS)(<20 g/d, equivalent to =120 kcal/d) and other complementary food supplements, such as soy-flour with micronutrients, or malt powder with micronutrients, essential amino acids and enzymes. These commodities provide some other essential nutrients in addition to micronutrients, such as macro minerals (calcium, magnesium, potassium, phosphorus), essential fatty acids and essential amino acids. As these products are undergoing further development and as there is less programmatic experience with their use, this document focuses on MNP.

History of MNP development

MNP was originally developed to provide iron and other nutrients required for treating nutritional anemia. This is because iron and folic acid tablets cannot be swallowed by young children and syrups had not been an effective intervention, likely due to poor acceptability related to a strong metallic taste, staining of teeth, bulky packaging, and the potential for overdosing. For this reason, the efficacy of MNP was evaluated regarding its impact on anemia and iron deficiency. The product was formulated with three to five micronutrients, known to be necessary for treating nutritional anemia. The efficacy of MNP to treat anemia has been confirmed.[2,3] This means that the MNP mixture of bioavailable micronutrients was effective to treat anemia, and that the mode of administration, i.e. a powder that is to be mixed with food, was feasible.

While this research was ongoing, the potential of MNP as a means of also preventing other micronutrient deficiencies became apparent. Based on the knowledge that complementary fee-

Cover photo of HF-TAG micronutrient powder programmatic guidance brief

ding diets are often low in many micronutrients, formulations containing a much higher number of micronutrients, typically 15, were developed for preventing micronutrient deficiencies in general.[4]

The concept of using MNP for home, or point-of-use, fortification to fill gaps in the diets of particularly infants and young children, is now widely accepted. This brief focuses on that purpose, i.e. using MNP to prevent micronutrient deficiencies in general, whereas the recent WHO guideline[2] is based on studies that focused on treating nutritional anemia.

Formulation of MNP

Currently, most countries use an MNP formulation containing 15 micronutrients, which is designed to provide one Recommended Nutrient Intake (RNI) of each micronutrient per dose for children 6–59 months old (see **Table 1**).[5] WFP and UNICEF, as the main procurers of MNP, almost exclusively procure the 15 micronutrient formulation. However, where specific information is available that warrants adjusting the formulation, this could be done.

Target groups

The target group should be those who are at risk of having an inadequate intake of micronutrients; evidence from multiple countries suggests that the period of highest vulnerability is 6 to 23 months of age when food variety and quantity are limited. Children 24 to 59 months of age may also be at high risk of inadequate dietary intake of some nutrients. When home fortification is being introduced in a population for a period of several years, children aged 24–59 months will have been exposed to MNP when they were 6–23 months of age. In that case, prioritizing the age range of 6–23 months may be a good choice. However, when the problem of micronutrient deficiencies is widespread, or the program will be implemented for a limited period of time, it might be better to target a wider age range.

TABLE 1: Recommended Nutrient Intake (RNI) of each micronutrient per dose for children 6 – 59 months old

Micronutrients	Children (6 – 59 months)
Vitamin A µg RE	400
Vitamin D µg	5
Vitamin E mg	5
Vitamin C mg	30
Thiamine (vitamin B_1) mg	0.5
Riboflavin (vitamin B_2) mg	0.5
Niacin (vitamin B_3) mg	6
Vitamin B_6 (pyridoxine) mg	0.5
Vitamin B_{12} (cobalamine) µg	0.9
Folate µg[a]	150.0
Iron mg	10.0
Zinc mg	4.1
Copper mg	0.56
Selenium µg	17.0
Iodine µg	90.0

Another target group for MNP can be school children, in particular those who receive school meals that have limited micronutrient content because they consist largely of staple foods, and protein and fat sources. The micronutrient content of MNP for school feeding should be age group appropriate. Preliminary experience from WFP with adding MNP to school meals by kitchen staff is that it is easy to implement and acceptance by pupils and staff is good. Sachets of MNP used for school feeding typically contain 10 or 20 dosages, which are cheaper per dosage compared to sachets containing one dose, due to lower packaging costs.

If increasing the micronutrient intake of pregnant and lactating women is desirable, this may best be done in the form of a capsule, rather than as MNP, because the relatively high dose of micronutrients that is required is more likely to change the taste of the food that it is added to, and limited programming experience shows that women may prefer swallowing a capsule instead of adding something to their food. The same may apply to adolescents.

Frequency and duration of taking MNP

In principle, the frequency and duration of using MNP should be such that it contributes enough of required micronutrients so that the combination of the diet and the MNP meets the RNI (i.e. the daily recommended nutrient intake) for all micronutrients. When the sachets contain one RNI for each micronutrient, giving 90 sachets for a six month period (providing on average 15 per month, i.e. 3–4 per week) would result in an average dose of 50% of the RNI/d, 60 sachets for a six month period (10 per month, i.e. 2–3 per week) would be equivalent to 33% of the RNI/d, and 120 sachets for a six month period (20 per month, i.e. 4-5 per week) would provide 67% of RNI/d.

It is important to keep in mind that, for some micronutrients, the typical diet may contain 80% of the RNI, whereas for others, it may only contain 20–40%. In particular, the intake of vitamins and minerals that are most abundant in animal source foods (vitamin B_6, vitamin B_{12}, zinc, iron) may be relatively low when these foods are consumed infrequently and in small amounts. The RNI has also been established for normal, healthy children, whereas children with micronutrient deficiencies or frequent illness may require a higher intake, above maintenance levels, in order to correct deficiencies and recover from illness.[6] And, finally, some minerals and vitamins are stored by the body, whereas for others, when intake exceeds needs, the excess is excreted rather than stored for periods when needs exceed intake. For nutrients that are not stored in the body, additional intake should be on an ongoing basis.

Since it will often not be possible to get a good estimate of the actual intake of specific micronutrients, and because this differs widely among micronutrients, among individuals, between seasons, and for other reasons, proxy indicators can be used to determine whether a population is likely to have micronutrient deficiency problems. Such proxy indicators can include the following: anemia prevalence (or, if available, prevalence of iron deficiency), which is also an indicator of micronutrient deficiencies more broadly; stunting prevalence; frequent infections; night blindness during previous pregnancy; lack of dietary diversity, in particular the consumption of animal source foods and fortified foods; inadequate nutrient density of typical complementary foods (this is common when young children eat from the family pot and do not receive foods specially prepared for them); and food insecurity.

As the upper tolerable intake level (upper limit, UL) for most micronutrients is well above the RNI, it is considered safe to consume an additional full RNI (as specified for the specific target group), i.e. one individual dose, every day (for more details, see Q&A section below).[7] Therefore, the needs of the beneficiaries with the lowest intake should guide the decision on how many sachets to give for a period of time.

A target of, for example, 90 sachets per six months period, i.e. 180 sachets per year, can be distributed at different frequencies (e.g. 90 at once every six months, 30 every other month, 60 every four months). The choice should be guided by programmatic feasibility, such as integration with twice yearly high-dose vitamin A capsule distribution, or monthly growth monitoring. It is important to note that more frequent contact with beneficiaries increases understanding and acceptance (see section on behaviour change communication below), but

[a] 150 µg folate is equivalent to 88 µg folic acid.

such contacts do not necessarily have to be linked to the actual distribution of the MNP.

The message that is given about frequency of consumption can also vary. For example, in the case of 90 sachets every six months, the instruction can be to consume 3–4 per week and no more than one per day, or specific days of the week can be designated to be MNP consumption days.

Furthermore, to spend resources most effectively, it is important to give priority to those individuals with the highest needs (i.e. at the greatest risk of micronutrient deficiencies). This can, for example, be done through geographic targeting to areas with the highest prevalence of anemia or stunting or the greatest food insecurity, or by linking the distribution, of MNP for young children to a social safety net program that targets the poorest. In this context, for those that are not targeted by the social safety net program but are also at risk of micronutrient deficiencies, MNP could be available through sales at a subsidized or commercial price. This combination of distribution strategies will reduce the burden on public delivery systems, while generating volumes of demand that can bring down the price of MNP for all.

In conclusion: Sachets should be made available throughout the year for the target groups, and should be no less than 60 / 6 months and no more than 180 / 6 months (no more than one sachet per day). A target of 90 sachets per six months period (equivalent to 15 per month, or 3-4 per week), which thus provides an additional intake of 50% RNI/d for each micronutrient, is likely to be reasonable for most situations.

Ultimately, the decision on which groups to target with how many sachets, over what period of time, and using which distribution strategies, should be based on the risk of micronutrient deficiencies, estimated micronutrient needs and available funds.

With regard to cost, even though product costs would increase with the provision of more sachets (e.g. by 50% when providing 90 instead of 60 sachets per six months period), it is important to note that the other program costs do not increase much when the number of distribution contacts is the same, and that training, promotion and program monitoring and evaluation are unchanged.

Key program components

Any program requires inputs, so that the activities needed to produce the expected outputs and outcomes can be implemented. For home food fortification with MNP, the following program components need to be in place: policies, packaging/labelling, production and/or supply, delivery system, quality control and behaviour change communication/demand creation. The expected coverage (reaching all eligible children) and adherence (using the MNP as promoted, e.g., by adding to foods just before consumption, appropriate frequency of use) will be achieved if effective activities are implemented in each of these components.

These aspects are discussed in detail in the Home Fortification Manual of the Home Fortification Technical Advisory Group, but some specific aspects, as well as Q&A for frequently asked questions, are described below.

Delivery system

It is also important to note that home fortification is best introduced as part of an infant and young child feeding strategy, because the primary aim is to improve nutrient intake from complementary foods by children as of six months of age. Thus, by providing guidance and counselling on exclusive breastfeeding for the first six months of life, and continued breastfeeding thereafter, together with complementary feeding combined with MNP, messages are best coordinated. Providing MNP can be an incentive to come to information sessions about infant and young child feeding. For this reason, contact points with the health care sector or community-based services that bring caretakers together to discuss health, breastfeeding and complementary feeding of young children are more appropriate channels for distribution and information dissemination about MNP than other points of contact with the family that do not include this focus, for example, the distribution of food rations or cash transfers for families.

Behaviour change communication (BCC)

As with any new product, a number of barriers may exist to its acceptance and utilization by the target population. This may be particularly true for child feeding, where habits and traditions may strongly dictate what is acceptable and appropriate to provide to small children. The regular and appropriate utilization of MNP by families for their children requires them to be knowledgeable about why they should do so and that they know how to use the product. It also must be clear for whom in the family the MNP is intended, and families must be motivated to use it.

Successful communication requires the development of a strategy intended to change behaviour related to child feeding in the target population that takes into account factors that might impede or facilitate appropriate utilization (i.e., local contextual and cultural knowledge). This knowledge should be taken into consideration in all aspects of program design and implementation, including the local name selected for the product and package specifications, selection and training of those who will be responsible for delivery of the MNP and any promotional materials that will be used. Experience suggests that utilization of the principles of social marketing can increase the effectiveness of BCC campaigns. The BCC campaign should ensure that information sources are available and easily accessib-

le so that questions and concerns related to MNP can be easily addressed. Public messaging, social marketing, and where relevant, commercial marketing should be harmonised to ensure that beneficiaries of MNP programs are not confused.

Training the media is also very important, so that they know what MNP is, who should use it, how it should be used and other aspects of MNP, so that they can write informative and accurate articles and support the messages of the BCC campaign.

Monitoring and evaluation

It is important, to assess provision, coverage, and adherence, changes of Infant and Young Child Feeding (IYCF) practices and impact on micronutrient intake (dietary diversity and MNP), status and function. Information on provision, coverage, and adherence should be collected regularly and, in particular, simultaneously with program initiation so that any issues that arise can be tackled immediately. Issues related to successful implementation, coverage and adherence should be resolved before assessing program effectiveness, i.e. before evaluating impact on biological outcomes such as micronutrient status, and morbidity. The issues identified, as well as how they have been addressed, need to be well documented. The objectives for implementing a home fortification program should be clearly stated and program appropriate targets, consistent with program design, should be specified before implementation. Program monitoring and evaluation should be designed to ensure that key information that is collected to assess whether these targets are being met is included in a timely fashion.

Questions and Answers

1. Can MNP be provided in combination with other fortified products and supplements, such as

- **a.** High-dose vitamin A capsules (VAC)
- **b.** Iodized salt
- **c.** General food fortification of flour, oil, salt etc
- **d.** Specially formulated products (LNS, RUTF, CSB+/++, WSB+/++, RUSF etc)

MNP can be safely provided in addition to twice-yearly high-dose VAC,[8] iodized salt and general food fortification.

Combining it with other specially formulated products, such as RUTF (ready-to-use therapeutic food) for treatment of SAM (severe acute malnutrition), RUSF (ready-to-use supplementary food) or fortified blended foods such as WSB++ (wheat-soy blend) or CSB++ (corn-soy blend) for treatment of MAM (moderate acute malnutrition), or small-quantity LNS (lipid-based nutrient supplement, = 20 g/d, providing = 120 kcal/d) is not appropriate, because those products already contain a similar or higher amount of micronutrients. In this case, one can recommend keeping the MNP for later, when the other products are no longer used.

2. Can the same amount of one sachet/d with the 15 micronutrient formulation be used by all 6-59 month old children, or should younger children use smaller portions?

All children, as of six months of age, can consume the full sachet once per day, because the RNI is actually designed to provide one RNI for children 6–59 months old.[5]

3. Is it harmful when some children reach an intake above the Tolerable Upper Limit (UL) from the combination of the diet and the MNP for one or more micronutrients?

The Tolerable Upper Limit (UL) is the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals (97.5%) in the general population and applies to daily use for a prolonged period of time.[9]

Furthermore, it is important to note the following about the UL:

- The UL is well above the RNI for most nutrients in the MNP.
- It is not the level at which adverse effects have been observed – it includes a safety margin and is conservative.
- The adverse effects that have been considered for setting the UL are associated with chronic intake, rather than with acute toxicity which occurs at much higher intake levels.
- Where nutrient-nutrient interactions determined the UL (such as a higher zinc intake affecting copper status, or higher folic acid intake affecting vitamin B_{12} status), a concurrent increase of the intake of both micronutrients involved would allow a higher intake.
- The UL applies to normal, healthy individuals with adequate stores and no deficits to be corrected.
- Recommended nutrient intakes for treatment of severe and moderate acute malnutrition exceed the UL for 3 nutrients that are also included in MNP (zinc, vitamin A, folic acid), which is considered safe and necessary for treatment.[6]

Thus, there is no immediate safety risk when an individualís intake occasionally exceeds the UL. Furthermore, consuming more than the UL is very unlikely to occur for most micronutrients.

4. Have adverse events been reported from the use of MNP?

Diarrhea is sometimes reported by caretakers when children start using MNP, usually by <1% of the population. Whether this is related to the MNP itself is not known. When a new product or treatment is introduced, consumers may ascribe any health problems that concurrently arise to the product or treatment. Communications messages when introducing the MNP should say that mild diarrhea may occur but one should not worry, that it should be treated as usual with increased liquids, and that MNP consumption does not need to be interrupted. When the diarrhea is severe, or is bloody or with mucus, care should be sought as it would have been without concurrent use of MNP.

5. Can MNP be used in malarial areas?

In malaria-endemic areas, the provision of iron-containing MNP should

be implemented in conjunction with measures to prevent, diagnose and treat malaria.[10] WHO will soon publish a specific guideline on the use of iron in malaria-endemic areas.

Notes and References

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Acknowledgements

The following individuals contributed to this note: Saskia de Pee, Arnold Timmer, Elviyanti Martini, Lynnette Neufeld, Joris van Hees, Dominic Schofield, Sandy Huffman, Jonathan Siekmann, Klaus Kraemer, Stanley Zlotkin, Akoto Osei and Kay Dewey.

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The Home Fortification Technical Advisory Group (HF-TAG) is a community of stakeholders involved in home fortification, comprised of members from the public, private, academic and non-governmental organization sectors. The initiative aims to build technical consensus on issues related to home fortification and to provide guidance on standards, guidelines and other resources to policymakers, non-governmental organizations, international organizations, corporations (manufacturers and suppliers), innovators/social entrepreneurs, academia and media. The group's mission is to facilitate implementation of well-designed and effective home fortification projects at scale, based on sound technical guidance and best practices, integrated into comprehensive nutrition strategies for children. Its vision is of a world without malnourished children.

Imprint

Publisher: *Sight and Life* on behalf of
the Home Fortification Technical Advisory Group (HF-TAG)

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S1 Communication Design, www.s1-buero.com

Layout and graphics:
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Printer:
Burger Druck, Waldkirch

ISBN: 978-3-906412-72-6

Photo Credits
Cover: © UNICEF/NYHQ2009-0604/Shehzad Noorani
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