Meeting Report: Evidence and Programmatic Considerations for the Use of Small-Quantity Lipid-Based Nutrient Supplements for the Prevention of Malnutrition

FANTA

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Contents

Abbreviations and Acronyms

AA	arachidonic acid
AGP	alpha-1-acid glycoprotein
ALA	α-linolenic acid
BMI	body mass index
CRP	c-reactive protein
CSB	corn-soy blend
DHA	docosahexaenoic acid
EFA	essential fatty acid
EPA	eicosapentaenoic acid
FANTA	Food and Nutrition Technical Assistance III Project
IFA	iron-folic acid
iLiNS	International Lipid-Based Nutrient Supplements project
IYCF	infant and young child feeding
LQ-LNS	large-quantity lipid-based nutrient supplement
MMN	multiple micronutrients
MN	micronutrients
MNP	micronutrient powder
MQ-LNS	medium-quantity lipid-based nutrient supplement
PLW	pregnant and lactating women
PROCOMIDA	Programa Comunitario Materno Infantil de Diversificación Alimentaria (Mother-Child Community Food Diversification Program)
RBP	Retinol Binding Protein
RUTF	ready-to-use therapeutic food
SBCC	social and behavior change communication
SQ-LNS	small-quantity lipid-based nutrient supplement
TfR	transferrin receptor
USAID	U.S. Agency for International Development

WASH	water, sanitation, and hygiene
WFP	World Food Programme
ZPP	zinc protoporphyrin

Introduction

The U.S. Agency for International Development (USAID) through the Food and Nutrition Technical Assistance III Project (FANTA), in collaboration with the Bill & Melinda Gates Foundation's International Lipid-Based Nutrient Supplements (iLiNS) Project, convened a technical meeting in Washington, DC from October 14–16, 2015 to take stock of the varied research and programmatic experiences using small-quantity lipid-based nutrient supplements (SQ-LNS) to prevent malnutrition[1].

The objectives of the meeting were to:

- Share the evidence to date on the efficacy and effectiveness of SQ-LNS for the prevention of malnutrition
- Discuss and summarize experiences on key operational topics related to the use of SQ-LNS for the prevention of malnutrition, including challenges and lessons learned
- Outline the key operational conditions needed to roll out programs using SQ-LNS
- Identify an implementation research agenda

The meeting was attended by 44 participants, including researchers, programmers, LNS producers, and donors involved with projects that have used SQ-LNS for preventing malnutrition (see Annex 1 for participant list).

The agenda was organized around four main topic areas: social and behavior change communication (SBCC) related to SQ-LNS, use of SQ-LNS, economics of SQ-LNS, and logistics of SQ-LNS. The agenda was designed to allow for formal presentation of scientific information and programmatic experiences and to foster significant dialogue and exchange among participants (see Annex 2 for the agenda).

This report provides a synthesis of the presentations and discussions from the meeting. The report is divided into three main sections: 1) a summary of the evidence to date on the efficacy and effectiveness of SQ-LNS for preventing malnutrition, 2) a synthesis of the challenges and lessons learned from programs using SQ-LNS, and 3) an outline of the research needs related to SQ-LNS.

During the meeting, SQ-LNS was defined as a lipid-based product used for preventing malnutrition and promoting growth and development—with a typical daily ration of about 20 g, providing around 110 kcal/day—that is intended to complement the nutritional content of the local diet and leave enough room for other foods in the diet. Lipid-based products designed for treating moderate acute malnutrition and for preventing malnutrition in food insecure populations and seasonal wasting —typically given in doses of 45–90 g/day (providing 250–500 kcal/day)—were referred to as medium-quantity lipid-based nutrient supplements (MQ-LNS) (see Annex 3 for a glossary of terms used during the meeting).

[1] SQ-LNS in programs and research has been used with the purpose of preventing stunting, wasting, low birth weight, intrauterine growth retardation, small for gestational age births, micronutrient deficiencies, and overweight and obesity.

Evidence of the Efficacy and Effectiveness of SQ-LNS for the Prevention of Malnutrition

There is a growing body of research related to the efficacy of SQ-LNS for preventing malnutrition, and the meeting provided an opportunity for results across studies to be shared with participants. Tables 1–3 summarize the SQ-LNS studies conducted to date.[2] Table 1 describes the main study design elements for each SQ-LNS study. Tables 2 and 3 summarize the results of these studies. Table 2 focuses on results for the maternal and birth outcomes for studies that provided the mother with SQ-LNS during pregnancy and early postpartum. Table 3 summarizes results for the main child outcomes for studies that provided SQ-LNS either only to the child starting 6 months of age, or to both the mother during pregnancy and early postpartum and to the child starting 6 months of age. The references for all the results presented in Tables 2 and 3 can be found in the Annex 4 (Bibliography).

As noted in Table 1, most of the SQ-LNS research has been conducted in controlled settings (i.e., randomized clinical efficacy trials). Only one out of the 10 studies included in that table evaluated the effectiveness of SQ-LNS in a programmatic context.[3] In terms of the impact of SQ-LNS, the results have been mixed. Differences in study design and the contexts in which the studies have been conducted make it difficult to generalize the extent of the impact attributable to SQ-LNS. For example, across studies, there is variability in the composition of SQ-LNS, the dose of SQ-LNS provided, the package of interventions, the demographic group(s) targeted for SQ-LNS, and the length of time SQ-LNS was provided. In addition, when reviewing the results across the various studies, it may be necessary to consider the potential of a specific population to benefit from SQ-LNS (e.g., the extent of nutrient gaps in the diet, the extent of wasting) and the potential of a specific population to respond to SQ-LNS (e.g., the extent of inflammation, infection). These characteristics are likely to differ across the various contexts where the studies were implemented and could be important factors influencing the potential for SQ-LNS to demonstrate impact in a given context.[4]

At the time of this report's publication, several additional analyses were being conducted and prepared for publication from the below studies; as such, more results on the efficacy and effectiveness of SQ-LNS are expected to be available soon. In addition, several key studies on the efficacy and effectiveness of SQ-LNS for preventing malnutrition are currently in the data collection phase. These studies are also expected to contribute further important insights to the body of evidence on the impact of SQ-LNS on nutritional and other health and development outcomes.

[2] In an effort to present a comprehensive picture of the evidence of the impact of SQ-LNS, the results in this report reflect a broader set of outcomes than those presented at the meeting, and an additional study. These represent all the published evidence on the efficacy and effectiveness of SQ-LNS to date. See Annex 4 for a bibliography of the publications associated with the studies presented in Tables 1 to 3.

[3] FANTA and University of California, Davis. *Effectiveness of Lipid-Based Nutrient Supplements in Bangladesh.* Available at: http://www.fantaproject.org/research/lipid-based-nutrient-supplements-bangladesh.

[4] This was a consideration raised by Kay Dewey in a presentation entitled "Synthesis of What Has Been Learned to Date from the iLiNS Project and Implications for Programs and Policy."

Table 1. Design of Studies Assessing the Efficacy and Effectiveness of SQ-LNS for the Prevention of Malnutrition

Country, study name (or region), intervention years	Study design	Study arms	Age of target group at start of intervention	Duration of intervention	Total number enrolled
Ghana Koforidua 2004–2005	Randomized, controlled, outcome researcher-blinded trial	• SQ-LNS to children • Micronutrient powder (MNP) to children • Crushable micronutrient (MN) tablet to children • Control: No intervention	6 months	6 months	409 children
Malawi Lungwena 2004–2005	Randomized, controlled, outcome researcher-blinded trial	• MQ-LNS to children • SQ-LNS to children • Fortified corn-soy blend (CSB) to children	6 months	12 months	182 children
Haiti Cap Haitien 2011–2012	Randomized controlled trial	• SQ-LNS for 3 months to children • SQ-LNS for 6 months to children • Control: Integrated package of well-baby services (reproductive health services, vaccinations, vitamin A supplementation, minimal nutrition education, growth monitoring, and referrals for rehabilitation of severe acute malnutrition [SAM]))	6—11 months	3 or 6 months	589 children
Ghana iLiNS-DYAD-G 2009–2014	Randomized, controlled, partially double-blinded trial	• SQ-LNS to pregnant/lactating women (PLW) and children • Multiple micronutrient (MMN) tablet to PLW, no supplements to children	• As early as possible in pregnancy • 6 months for children	• Varied in pregnancy, through 6 months postpartum • 12 months for children	1,320 women, 1,185 children

Country, study name (or region), intervention years	Study design	Study arms	Age of target group at start of intervention	Duration of intervention	Total number enrolled
		• Control: Iron-folic acid (IFA) to pregnant women, placebo to lactating women, no supplements to children			
Malawi iLiNS-DYAD-M 2011–2015	Randomized, controlled, outcome researcher-blinded trial	• SQ-LNS to PLW and children • MMN tablet to PLW, no supplements to children • Control: IFA to pregnant women, placebo to lactating women, no supplements to children	• As early as possible in pregnancy • 6 months for children	• Varied in pregnancy, through 6 months postpartum • 12 months for children	1,391 women, 869 children
Malawi iLiNS-DOSE 2009–2012	Randomized, controlled, outcome researcher-blinded trial	• 40 g SQ-LNS not containing milk to children • 40 g SQ-LNS containing milk to children • 20 g SQ-LNS not containing milk to children • 20 g SQ-LNS containing milk to children • 10 g milk SQ-LNS containing milk to children • Control: Delayed intervention, CSB to children from 18 months of age	6 months	12 months	1,932 children
Burkina Faso iLiNS-ZINC 2010–2014	Cluster-randomized, controlled,	• SQ-LNS containing no zinc to children • SQ-LNS containing 5 mg zinc to children	9 months	9 months	3,220 children

Country, study name (or region), intervention years	Study design	Study arms	Age of target group at start of intervention	Duration of intervention	Total number enrolled
	partially blinded trial	• SQ-LNS containing 10 mg zinc to children • SQ-LNS containing no zinc + 5 mg zinc tablet to children • Control: No intervention *All arms except the control arm received weekly morbidity surveillance and treatment for diarrhea and malaria			
Bangladesh Rang-Din Nutrition Study (RDNS)* 2011–2014	Cluster-randomized, controlled, researcher-blinded trial	• SQ-LNS to PLW and children • IFA to PLW, SQ-LNS to children • IFA to PLW, MNP to children • Control: IFA to PLW, no supplements to children	• As early as possible in pregnancy • 6 months for children	• Varied in pregnancy, through 3 months postpartum if in IFA arm (IFA to be taken daily in pregnancy, every other day postpartum), 6 months postpartum in SQ-LNS arm • 18 months for children	4,011 women (results for children not yet published)
Peru Huánuco 2013–2014	Pre-post intervention comparison	• SQ-LNS to children	• 6 months	• 6 months	160 children

* The Bangladesh RDNS is an effectiveness study; all others in this table are efficacy studies.

Table 2. Maternal and Birth Outcomes of SQ-LNS Interventions

Country, study name (or region), intervention years	Mothers (Biochemical outcomes)	Mothers (Other outcomes)	Child at Birth (Anthropometric outcomes)
Ghana iLiNS-DYAD-G 2009–2014	No significant difference in salivary cortisol at 28 or 36 weeks gestation in overall sample; significantly lower salivary cortisol in women < 26 years of age in the SQ-LNS vs. control arm at 36 weeks gestation (n=758). Significantly lower mean hemoglobin (Hb), higher mean zinc protoporphryrin (ZPP), and transferrin receptor (TfR), and greater prevalence of anemia, elevated ZPP and TfR in the SQ-LNS and MMN vs. control arm (received IFA). No significant difference in markers of inflammation (c-reactive protein [CRP] and alpha-1-acid glycoprotein [AGP]) (n=1,057). No significant difference in vitamin A breast milk concentrations (n=756).	n/a	Significantly greater birth weight and newborn weight-for-age and BMI-for-age z-scores, and among infants of primiparous women, greater newborn length-for-age and head circumference-for-age z-scores (in addition to weight-for-age and BMI-for-age z-scores) in the SQ-LNS vs. control arm (n=1,057). No differences in child birth anthropometric outcomes between MMN arm on one hand, and the SQ-LNS and the control arm on the other.
Malawi iLiNS-DYAD-M 2011–2015	No significant difference among the control (IFA) and treatment groups (SQ-LNS and MMN) in anti-malarial antibody responses (n=1,009). No significant difference in maternal cortisol or perceived stress (n=1,372, 906 and 1,049 women at baseline, 28 weeks and 36 weeks of gestation, respectively).	Significantly higher caries prevalence and mean number of caries lesions in the SQ-LNS and MMN vs. control arm. No significant difference in the periodontal parameters (n=1,024).	No significant differences in birth outcomes (n=1,089).
Bangladesh RDNS 2011–2014	No significant difference in Hb levels or risk of low or high Hb levels at 36 weeks of gestation between the SQ-LNS and IFA groups. Significantly lower iron status and higher risk of iron deficiency and iron deficiency anemia in SQ-LNS vs. IFA arms (n=843). No significant difference in markers of inflammation (CRP	No significant difference in maternal weight gain per week or low weight gain per week (n=2,877). No significant difference in the proportion of women with high blood pressure at 36 weeks	Significantly greater birth weight, weight-for-age z-score, head circumference-for-age z-score, and BMI-for-age z-score and a lower prevalence of stunting, small head circumference, wasting, and

Country, study name (or region), intervention years	Mothers (Biochemical outcomes)	Mothers (Other outcomes)	Child at Birth (Anthropometric outcomes)
	and AGP) (n=843). No significant difference in the average Retinol Binding Protein (RBP) concentration or prevalence of low RBP (n=1,125). No significant difference in the average urinary iodine concentration (n=1,128).	(n=2,931) or any childbirth complications (including C-section, episiotomy, prolonged labor, early rupture of membranes, convulsions, high blood pressure in labor, obstructed labor, and antepartum hemorrhage (n=3,747))	small-for-gestational-age at birth in the SQ-LNS vs. IFA arms (n= 3,449).

Table 3. Child Outcomes of SQ-LNS Interventions

Country, study name (or region), intervention years	Anthropometric outcomes	Biochemical outcomes	Child development outcomes	Other child outcomes
Ghana Koforidua 2004–2005	Significantly greater length-for-age and weight-for-age z-score at 12 months in the SQ-LNS arm compared to the MNP and crushable MN tablet arms combined. No significant differences in length-for-age or weight-for-age z-score between the SQ-LNS and control arm (no intervention), neither between the MNP and the control arms, nor between the MN tablet and the control arms (n=375).	Significantly higher ferritin and lower TfR concentrations in all intervention arms combined vs. control arm. Significantly higher Hb in the SQ-LNS and the crushable MN tablet arms compared to the control arm but not in the MNP compared to the control arm. Significantly lower prevalence of anemia in all intervention arms combined compared to the control arm (n=394).	Significantly greater percentage of children in the SQ-LNS, MNP, and crushable MN tablet arms walking independently at 12 months compared to the control arm (n=370).	Significantly greater intake of energy in the SQ-LNS compared to the MNP and crushable MN tablet arms (n=228).
Malawi Lungwena 2004–2005	No significant difference in anthropometric outcomes at 18 months in the SQ-LNS arm compared to the CSB arm (n=176). Significantly lower incidence of severe stunting in the MQ-LNS arm compared to the CSB arm, with no other statistically significant differences in anthropometry between these two arms.	No significant difference in Hb or serum ferritin between any of the study arms (n=176).	No significant difference in overall child development, locomotor, personal and social, hearing and language, eye-hand coordination, or performance development between any of the study arms (n=163).	At 36 months of age, no significant differences in anthropometry in the SQ-LNS compared to the CSB arm . Significantly lower incidence of severe stunting in the MQ-LNS arm compared to the CSB arm (n=149).
Haiti Cap Haitien 2011–2012	Significantly greater length-for-age z-score among children 12–17 months when SQ-LNS given for 6 months compared to the control arm. No significant differences when SQ-LNS was	n/a	No significant differences in motor development (n=441).	No significant differences in morbidity (fever, cough, respiratory infection, diarrhea) (n=441).

Country, study name (or region), intervention years	Anthropometric outcomes	Biochemical outcomes	Child development outcomes	Other child outcomes
	given for 3 months compared to the control arm (n=441).			
Ghana iLiNS-DYAD-G 2009–2014	Significantly greater length-for-age z-score and weight-for-age z-score, and significantly lower prevalence of stunting at 18 months in the SQ-LNS compared to the control arm (n=1,185).	n/a	Significantly greater percentage of children in the SQ-LNS arm able to walk independently at 12 months compared to control arm (n=1,009). No significant difference in milestone acquisition by parent report or in any developmental scores at 18 months (n=1,173).	n/a
Malawi iLiNS-DYAD-M 2011–2015	No significant difference in growth outcomes at 18 months between study arms (n=656).	n/a	Children in the SQ-LNS arm attained 2 out of 11 assessed motor milestones (waving goodbye and walking alone) significantly earlier than the control arm (in which IFA was given to pregnant women) and were able to stand independently significantly earlier than the MMN arm (in which MMN were given to pregnant and lactating women). No other significant differences in timing of milestone acquisition and in milestone attainment at ages 6, 12, and 18 months (n=743). No significant differences in motor (n=670), language (n=675), socio-emotional (n=674), and	n/a

Country, study name (or region), intervention years	Anthropometric outcomes	Biochemical outcomes	Child development outcomes	Other child outcomes
			executive function (n=565) at 18 months.	
Malawi iLiNS-DOSE 2009–2012	No significant difference in length-for-age z-score (or stunting) at 18 months between any of the SQ-LNS arms and the control arm (n=1,427).	n/a	n/a	Energy, protein, and fat intake of children in all intervention arms significantly greater than in the control arm (n=748). No significant difference in children's physical activity (n=1,053). No significant difference in children's breast milk intake (n=376). Compared with control arm, significantly lower risk of hospitalization and deaths events in the 20g SQ-LNS/d arms. No significant differences between 10g SQ-LNS and the control arms, neither between the 40g SQ-LNS and the control arms, in terms of hospitalization risk and death events. No significant difference in malaria or other morbidity incidence (n=1932).

Country, study name (or region), intervention years	Anthropometric outcomes	Biochemical outcomes	Child development outcomes	Other child outcomes
Burkina Faso iLiNS-ZINC 2010–2014	Significantly lower prevalence of stunting and wasting at 18 months in all SQ-LNS (with or without zinc) arms combined vs. control arm (n=2,626).	Significantly higher Hb and lower prevalence of anemia in all SQ-LNS arms combined compared to the control arm. No significant difference in plasma zinc or markers of inflammation (n=404). No significant difference in average urinary iodine concentration (n=179).	Significantly higher performance on motor, language, and personal-social development measures at 18 months in all SQ-LNS arms combined compared to the control arm (n=1,122).	No significant difference in morbidity (diarrhea, malaria, fever, respiratory tract infections) between the SQ-LNS arms (n=2,364). No comparison to the control arm conducted.
Peru Huánuco 2013-2014	Significant decrease in length-for-age and weight for age z-scores after the intervention.	Significant increase in hemoglobin, and decrease in the prevalence of anemia and of moderate anemia after the intervention.		

Challenges and Lessons Learned in the Use of SQ-LNS in Programs

Meeting discussions around the challenges and lessons learned from programs using SQ-LNS were oriented around three primary areas: 1) a set of considerations for the justification and pre-implementation planning process, 2) a set of considerations for program implementation, and 3) a set of considerations for broader policy work not necessarily tied to a specific program but often necessary for establishing an enabling environment for program implementation.

Before Implementation

Target Population's Potential to Benefit and to Respond

Throughout meeting discussions, it was stressed that before designing a program with an intervention that includes SQ-LNS, it is important to consider a population's potential to benefit from SQ-LNS as well as a population's potential to respond to SQ-LNS.

To understand a population's potential to benefit from SQ-LNS, policy makers and program designers should seek the answers to several key questions, including:

- What are the key constraints to healthy growth and development (across the 1000 days) in the target population?
- What information is available on current maternal and infant diets and infant and young child feeding (IYCF) practices?
- Does the available information suggest gaps between nutrient intakes and needs? For which macro- and micronutrients?
- Do data on nutritional status (e.g.: anemia, vitamin A) suggest problems of public health importance (high prevalence, severity, e.g.)?
- Is household food insecurity common? If so, sharing SQ-LNS with other household members may be more likely, potentially limiting the benefits to the target child or woman, unless an additional food ration is provided to the household.

To determine whether the population has the potential to respond to SQ-LNS, policymakers and program designers need to answer questions such as whether:

- Access to adequate sanitation and health care is sufficient or is so poor that clinical and subclinical infections and inflammation may reduce ability to respond to a nutritional intervention
- The program could integrate SQ-LNS into an intervention package that simultaneously tackles poor nutrition and other major causes of malnutrition

The answers to these questions will help policymakers prioritize among and sequence nutrition-specific and nutrition-sensitive interventions, including those involving the distribution of SQ-LNS, to achieve the maximum impact for prevention of malnutrition. Several of the questions in this section would inform the formulation of SQ-LNS, as described in the next section.

Product Formulation

During the planning phase, programs should choose the formulation that most closely fits their target population's nutrient needs, while also meeting the project's procurement, storage, and distribution capabilities.

Several options are available for the formulation of SQ-LNS, both in terms of main ingredients (different sources of lipid and protein such as peanuts and soy) and their ratios and in terms of micronutrient composition. The commercially available formulation of SQ-LNS for children (Nutributter), contains, in addition to the protein and lipid macronutrients, 18 micronutrients including the macrominerals calcium, magnesium, phosphorus, and potassium. The four macrominerals are not usually found in MNP because they are bulky, though they might contribute to the growth-promoting effect of SQ-LNS seen in some studies. The typical formulations of SQ-LNS for pregnant and lactating women also contain an additional 4 micronutrients (vitamins D, E, K and manganese), as well as essential fatty acids.[5]

SQ-LNS also contain linoleic acid and α-linolenic acid (ALA), two essential fatty acids (EFAs). Linoleic is a precursor for arachidonic acid (AA), and ALA is a precursor for docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA). AA, DHA and EPA play an important role in human development. There was some discussion at the meeting around the potential inclusion of DHA itself in SQ-LNS, which would ensure sufficient intake instead of relying on the sometimes inefficient conversion of its precursors. There was also discussion of the potential inclusion of EPA due to its important immune function. Participants recognized that in some areas, especially where the population consumes enough fish and seafood, there may not be a need to add DHA to SQ-LNS. Participants also recognized that adding DHA might increase the cost of producing SQ-LNS and affect its organoleptic properties.

Formative Research

The meeting included two presentations that illustrated the use of formative research to inform the design of programs with an SQ-LNS intervention. The first presentation, by Mercy Corps' PROCOMIDA USAID/Food for Peace development food assistance program in Guatemala, provided an overview of the program's social and behavior change (SBCC) strategy, which was developed based on the findings of formative research conducted in the program areas before implementation. In addition, the program tested CSB, MNP, and SQ-LNS recipes with program beneficiaries. The SBCC activities included group education sessions and household visits. Specific messages and flip charts were developed for the MNP and SQ-LNS to promote their proper consumption, and specific, culturally adapted packaging for MNP and SQ-LNS was developed, with photos to reinforce the messages delivered at the group sessions and household visits. Key messages shared about the mother's version of SQ-LNS, called "Nutri Fuerza" in the program, included:

- Nutri Fuerza is a nutritional supplement especially formulated for pregnant and lactating mothers of children up to 6 months old.
- One sachet of Nutri Fuerza must be consumed daily.
- Nutri Fuerza can be mixed with cold or lukewarm foods available at home that are not liquid.
- Only pregnant and lactating mothers of children up to 6 months old must consume it.

[5] Arimond, M. et al. 2015. "Considerations in Developing Lipid-Based Nutrient Supplements for Prevention of Undernutrition: Experience from the International Lipid-Based Nutrient Supplements (iLiNS) Project." *Maternal & Child Nutrition*. 11:31–61.

Key messages about the children's version of SQ-LNS, called "Nutri Nim" in the program, included:

- Vitamins and nutritional supplements help in the growth and health of children from 6 months old.
- Nutri Nim is a supplement that contains vitamins and minerals especially formulated for children 6 to 24 months old.
- Nutri Nim must not be shared. One sachet is to be consumed twice a day.
- Nutri Nim can be mixed with cold or lukewarm solid and semi-solid foods available at home.
- Children must eat all the mixture that was prepared, without being forced.

The second presentation described formative research carried out by the World Food Programme (WFP) as part of the design process for two large-scale programs—one in Malawi and one in Mozambique—that were planning to use SQ-LNS. In this formative research work, rapid assessment procedures were used to answer three main research questions:

1. What are community members' attitudes toward SQ-LNS?
2. What primary barriers do caregivers report after using the SQ-LNS during a home-feeding trial?
3. What socio-cultural characteristics, perceptions, and household behaviors related to food classification systems, nutrition-related illnesses, and food-related practices should be considered for programming with SQ-LNS?

In Malawi, the researchers concluded that the district being considered for the program seemed to be a viable setting for an SQ-LNS intervention but that targeted SBCC would be needed to address potential barriers, including addressing the perception that a large quantity of food is more valuable than a smaller amount of a higher quality food or supplement. In Mozambique, the researchers concluded that the setting, which was ethnically and culturally heterogeneous, seemed to be challenging for implementing an intervention with SQ-LNS. Some of the challenges in Mozambique included the need for targeted social marketing strategies to take into account village ethnicity, location and differences between typical biomedical discourse and local perception with respect to the conceptualization of chronic undernutrition. In both countries, it was found that culturally appropriate packaging would enhance the target population's acceptance and consumption of the product.

Discussions that followed the two presentations focused on the feasibility of conducting high quality formative research in a programmatic context. The challenge of carrying out formative research with adequate specificity in a context where the target population is ethnically, linguistically, and/or culturally diverse was highlighted. In addition, concerns were raised about the high cost of conducting such research. Suggestions to address these challenges included carrying out a simple and more focused study (such as a barrier analysis) as a potentially more affordable alternative to formative research and complementing any primary research with secondary information available from peer-reviewed and grey literature, including any relevant documentation from other programs in the area.

Demand

Several discussions during the meeting centered on beneficiary demand for SQ-LNS products. It was noted that "effective demand drives cost" and that higher demand for SQ-LNS can lead to economies of scale of production, thus reducing the cost of SQ-LNS. The involvement of the private sector in the production, marketing, and sale of SQ-LNS has the potential to increase product competition, thereby lowering product price. In addition, the private sector could use its existing marketing networks to help SQ-LNS reach remote communities where marketing of other products may already be taking place.

However, the opportunities to engage with the private sector may be limited until the demand for SQ-LNS is better understood and ensured.

Advance marketing commitments for ready-to-use therapeutic food (RUTF) is one strategy that some donors have used to help reduce the uncertainty around demand and encourage the private sector to play a larger role in the production, marketing, and sale of RUTF, and was highlighted as a potentially promising strategy for supporting private sector engagement with SQ-LNS.

Meeting discussions also underscored the need for programs to understand the potential demand for SQ-LNS in their specific target areas and communities and to address barriers to the purchase and/or use of SQ-LNS through designing a SBCC strategy to implement as part of program activities. Based on feedback from meeting participants, potential barriers related to the purchase and/or use of SQ-LNS may include transient and mild diarrhea in children that resolves within a few days of beginning to consume SQ-LNS and complaints among women about the smell and metallic taste of SQ-LNS.

Product Positioning

How to strategically and appropriately position SQ-LNS to effectively generate demand and reduce barriers to its purchase and/or use was another facet of SBCC messaging discussed by meeting participants. Product positioning possibilities for SQ-LNS include as a snack, food supplement, or more traditional supplement product. Some of the key advantages and disadvantages of each product positioning approach are presented in Table 4 below. However, given that the most appropriate product positioning of SQ-LNS will depend on local regulations, local availability and use of similar products, and the desired consumption behavior, the advantages and disadvantages of each product positioning option will vary somewhat according to context.

Table 4. Key Advantages and Disadvantages of Different SQ-LNS Product Positioning Approaches

Approach	Advantage(s)	Disadvantage(s)
Snack	Potentially more likely to be purchased and consumed (e.g., in Guatemala, where it is commonly mashed with a banana)	More likely to be shared, since almost all age groups can/want to have snacks
Food supplement	Least likely to affect dietary diversity and to displace local foods if used as instructed and mixed with food	Not always consumed with foods (see section on “Acceptability and Adherence” under “During Implementation” below).
Supplement	Less likely to be shared	Potential for consuming in high, undiluted doses, posing entailing risk of excess consumption and toxicity (due to the belief that more of a good thing is better).

Sachet Size

The size of the sachet to use for the SQ-LNS packaging should also be decided during program planning so the program’s SBCC messages can be adapted to the recommended dosage and sachet size that will be distributed to the target population. The standard commercially available size of SQ-LNS is a 20 g sachet

(intended for consumption once daily). However, several research studies and programs have used a daily dose of two 10 g sachets for children. The decision to use a 10 g sachet, with two sachets to be consumed daily by children, is often driven by a desire to prevent opened and partially consumed 20 g sachets from attracting pathogens and causing infections if the remaining contents are consumed later. Women, in contrast to infants and young children, generally have no problem consuming the full 20 g sachet during one eating occasion.

The iLiNS-DOSE trial in Malawi[6] was designed to identify the most cost-efficacious growth-promoting daily dose and formulation of SQ-LNS for children 6–18 months. Intervention groups received 10, 20, or 40 g doses of SQ-LNS daily, either containing milk powder (0.24 g dried skim milk per g of SQ-LNS) or milk-free. The study found no significant difference in children's growth or development among the different intervention groups. However, as highlighted below (see "Acceptability and Adherence" section), a significant difference in adherence was observed by dose at ~9 months of age, with children who received the 10 g daily dose of SQ-LNS showing significantly greater adherence to the recommended consumption of SQ-LNS than children who received the 20 g or 40 g dose.

Sachet and Packaging Design

Prior to program implementation, decisions also need to be made around the design of the SQ-LNS packaging The PROCOMIDA program in Guatemala customized the packages used in their program to be culturally adapted with regard to the name given to the SQ-LNS product, and the color and design used on the packaging of the sachet. The packaging also included pictorial and written messages in the local language to promote consumption of the SQ-LNS (see Appendix 5 for photos of SQ-LNS packaging).

In Mozambique, specific feedback from local community members on the design of SQ-LNS packaging for a potential WFP program included recommendations that the child shown on the package be of the intended target age, that he/she appear chubby and healthy, and that the product's name and instructions be in Portuguese. Community members also suggested that whenever the act of mixing or feeding is depicted on the sachet or package, the entire mother be shown, rather than just arms, as is the case in the generic product.

In another instance in Mozambique, WFP had an agreement with the government that SQ-LNS would be imported into the country and that the packaging would include instructions and labeling in English. However, once the shipment arrived, WFP was requested that the instructions and labeling on the sachets be provided in Portuguese. As a result, WFP had to divert the container to a country where English labeling was acceptable. Thus, while customizing packaging may be desirable in certain cases, when working with programs at scale that require large quantities of SQ-LNS to be shipped at one time, it may be necessary to use standard packaging that can easily be diverted to another country, if needed.

At the meeting, it was noted that packaging may have the potential to help address confusion among program beneficiaries and policymakers about the purpose and use of SQ-LNS, MQ-LNS, and large-quantity LNS (LQ-LNS). One possible approach discussed was to harmonize SQ-LNS packaging, or at least its color scheme, to differentiate SQ-LNS, which is used for preventing malnutrition, from other quantities of LNS, which are used for treating malnutrition. To this end, U.N. agencies are already exploring how to color-code LNS packaging by intended use and/or dose.

[6] Maleta, K.M. et al. 2015. "Provision of 10-40 g/d Lipid-Based Nutrient Supplements from 6 to 18 Months of Age Does Not Prevent Linear Growth Faltering in Malawi." Journal of Nutrition. 145(8):1909–15.

During Implementation

Procurement

Concern about the sustainability and the cost of importing SQ-LNS from Europe, the United States and other producing-countries was a cross-cutting theme discussed throughout the meeting. National governments sometimes reluctantly agree to allow programs to import SQ-LNS, but often only if there is no other procurement option available. Government entities, established companies, as well as entrepreneurs in developing countries (e.g., Bangladesh, Ethiopia) are currently exploring options for initiating local production of SQ-LNS, and in a few cases, local production has started. However, in some cases, even if locally produced SQ-LNS is available, it is not necessarily less expensive than imported SQ-LNS. Programs should therefore consider all available options for local, regional, and international procurement of SQ-LNS and should always ensure that any procurement option being considered is acceptable to the host country government.

Shipping, Storage, and Transportation

Common lessons shared during the meeting with respect to obtaining host governments' approval for importing a new product, shipping, customs, and transportation of SQ-LNS included the following:

- The need to be familiar with the relevant legal and policy frameworks, including the Codex Alimentarius regulations (if introduced as snack or food supplement), as well as country-specific regulations and certification processes, to avoid unnecessary delays in delivering SQ-LNS to the beneficiary communities.
- The difference in cost and time required for shipping by sea vs. air. For international procurements, shipping by sea is much more economical than by air; however, sea shipments can take a long time (up to 6 months), which is time lost from the products' shelf life, and programs need to account for this when considering the time required for the product to reach the beneficiary and the amount of product that can be procured at one time to ensure that the remaining shelf life is adequate and product does not need to be disposed of.
- The need to plan and account for transporting SQ-LNS to local storage facilities after arrival at the local port, which can be time-, cost-, and labor-intensive.
- The importance of adhering to the special stacking specifications that SQ-LNS requires at all storage sites and distribution centers in order to preserve the product as optimally as possible.
- The susceptibility of SQ-LNS to rodent and pest infestation. Despite its special packaging, SQ-LNS, like other food products, is not immune to rodent and pest infestation, especially once SQ-LNS has been transported from central storage facilities to local storage sites or distribution centers, or has been distributed to beneficiaries for storage at their homes.
- The challenge of the "last mile" of transport to the beneficiary communities. Programs often rely on motorcycles and bicycles to traverse difficult terrain to reach beneficiary communities. Even though this "last mile" usually isn't very long, programs need to plan for this leg of transport and consider it in program design. For example, these travel challenges usually mean it is not feasible to distribute SQ-LNS to beneficiaries more frequently than monthly.

Package of Interventions

SQ-LNS is not a silver bullet and cannot be expected, alone, to eliminate malnutrition. Rather, SQ-LNS should be considered as one nutrition intervention option available, which, to optimize its potential

effectiveness, should be delivered within a broader package of interventions. The package of interventions provided by the SQ-LNS programs represented at the meeting typically included, at a minimum, SBCC activities related to maternal and child nutrition, usually with a specific focus on IYCF practices. In addition, some programs included activities related to water, sanitation, and hygiene (WASH); malaria and diarrhea prevention and treatment; and, in the case of FFP development food assistance programs, the distribution of food commodities. The appropriate package of interventions to include alongside SQ-LNS should be driven by the specific context and vulnerabilities of the target population, which underscores the importance of understanding the target population's potential to benefit from and respond to SQ-LNS when designing the program.

Program Staffing and Distribution Modality

How SQ-LNS is distributed to the target population can have important implications for the beneficiaries' adherence to the recommended dose and for their uptake of any other interventions delivered alongside the distribution of SQ-LNS. Programs should therefore balance the convenience of home deliveries for beneficiaries with the cost of and labor needed to deliver the SQ-LNS to beneficiaries' homes. Similarly, the desire to bring beneficiaries to a central location (such as a community health center) to improve the likelihood of their participation in other project-supported activities should be balanced against the challenge that some beneficiaries might face in coming to a central location. Besides mode of delivery to the target population, programs should consider the required level of education of those distributing the SQ-LNS to beneficiaries and any associated messages, activities, or counseling that should be provided with the product.

Social and Behavior Change Communication

Development of an effective SBCC strategy for programs using SQ-LNS ideally starts with good formative research, or in its absence, small- scale targeted data collection or literature review to understand the target population's existing knowledge, behaviors, preferences, and barriers related to nutrition, diet, and health. Some lessons learned by existing and past SQ-LNS programs include the need to target not only mothers but also the broader community (e.g., influential community leaders and influential family members such as fathers, grandmothers, and other caregivers) with appropriate SBCC messages. In promoting the use of SQ-LNS, it was highlighted that it could be useful to include messages on both the short-term benefits and long-term benefits (i.e., more aspirational-types of messages).

Programs distributing SQ-LNS need to develop specific messages on how to consume SQ-LNS (mixed with food or directly from the sachet), when, and how often. In addition, it is recommended that programs consider developing appropriate messages to try to optimize adherence and decrease sharing, such as positioning SQ-LNS as specifically formulated for the target group, providing instructions to knead the sachet before consumption to mix in any oil that might have separated from the product (which is normal) and informing caregivers that children might experience self-limiting diarrhea in the first few days they consume SQ-LNS (with a concurrent reminder to caregivers to offer the infant or young child additional breast milk or water while diarrhea is present and to otherwise continue to feed the child normally).

During the meeting, there was a call to develop a core set of messages that are widely applicable to SQ-LNS programming and that could be subsequently adapted to programmatic contexts. The aforementioned topics could be included among those for which such a set of core messages might be developed in the future.

Acceptability and Adherence

A review of the available evidence on acceptability and adherence to SQ-LNS highlighted some common experiences, which were affirmed by the programs represented at the meeting:

- In general, SQ-LNS is highly liked and well accepted by children. Among women, the acceptability of SQ-LNS tends to be lower.
- Adherence to the recommended dose of SQ-LNS is usually higher when assessed before the project starts as part of a take-home acceptability trial than when assessed after the intervention is up and running.
- Estimates of adherence will likely vary based on the method used to assess adherence. Adherence is generally higher when self-reported or when assessed by disappearance data (i.e., by counting empty sachets or tubs/containers of SQ-LNS) than when assessed by a 24-hour dietary recall or in-home observation. Related to this point, there was general agreement among meeting participants that adherence to the recommended dose of SQ-LNS would ideally be assessed by multiple methods to allow for triangulation of data and obtaining the most informed picture of what is likely to be the true level of adherence among the target population.
- The trend within and across research studies is toward higher adherence when the dose is smaller. For example, in Malawi, among those who consumed at least some SQ-LNS, children who were offered a 40 g daily dose consumed an average of 45 percent of this daily dose, those who were offered 20 g consumed an average of 70 percent, and those who were offered the 10 g daily dose consumed almost 100 percent.[7]
- Despite the traditional program recommendation to consume SQ-LNS mixed with food, in studies that have asked program beneficiaries how they typically consume SQ-LNS, beneficiaries often report consuming it directly from the sachet "as is." When compared to consuming the SQ-LNS with food, there seems to be less leftover SQ-LNS when it's consumed "as is."
- Sharing of SQ-LNS was anecdotally reported; this was acknowledged by surveyed mothers and was also directly observed. SQ-LNS was most commonly reported or observed to be shared with other young children in the household or compound. During observations, this was often only after the targeted child had consumed SQ-LNS (i.e., "leftovers" were shared). Pressures to share were highly salient in qualitative research in Malawi but less so in Ghana.

Cost-Effectiveness

Questions around the cost-effectiveness of SQ-LNS interventions were raised throughout meeting discussions. As a product, SQ-LNS is relatively more expensive than other products such as MNPs, although the latter does not provide calcium, magnesium, phosphorous, potassium, protein, fats (including essential fatty acids), and energy. The main contributors to the price of SQ-LNS include: research and development costs, production costs (including the price of the raw materials, taxes on them, labor costs, equipment costs, and packing costs), and distribution costs (shipping, transportation, and tariffs). Other costs associated with SQ-LNS include household costs (such as out-of-pocket costs to buy the SQ-LNS, the time and transportation costs to get to its point of purchase or distribution) and societal costs (such as the strain on the environment to produce and transport the products and to dispose of the byproducts).

[7] Hemsworth, J. et al. September 15–20, 2013. "The Impact of Various Quantities of Lipid-Based Nutrient Supplements (LNS) on Energy Intakes of 9-Month-Old Malawian Infants." Presented at the International Congress of Nutrition in Granada (Spain). Poster number PO1171.

Preliminary cost-effectiveness calculations per case of stunting averted using data from an SQ-LNS efficacy study in Burkina Faso (iLiNS-Zinc) were presented. In addition to the distribution of SQ-LNS, children in the SQ-LNS arm in this study received weekly morbidity surveillance and referral and treatment of diarrhea and malaria. Three cost-effectiveness scenarios for the Burkina Faso study were modeled: 1) a scenario reflecting the actual procurement and distribution costs the iLiNS-Zinc study faced for its 2-year duration, 2) a scenario reflecting the costs a nongovernmental organization (NGO) would have faced if it adopted a similar procurement and distribution mechanism for the iLiNS-Zinc population, and 3) a scenario reflecting the cost an NGO would face if it served a wider catchment area for 5 years, using the adjusted procurement/distribution mechanism. Cost-effectiveness was highest (most favorable) in the third scenario and lowest (least favorable) in the first (i.e., iLiNS-Zinc study) scenario.

Preliminary cost-effectiveness estimates of SQ-LNS given to pregnant women per case of newborn stunting averted were also presented using data from an SQ-LNS cluster randomized program effectiveness study in Bangladesh (Rang-Din Nutrition Study). For this example, the following cost scenarios were modeled: 1) the actual costs for the research context, 2) the adjusted costs that mirror what an NGO would pay if implementing a similar intervention, 3) a scenario in which there was national production of LNS and no home distribution of the product, and 4) a scenario in which only vulnerable young mothers were targeted. Cost-effectiveness was highest (most favorable) in the fourth (i.e., targeted scenario) and lowest (least favorable) in the first (actual study cost) scenario.

One of the key takeaway messages from the presentation on cost-effectiveness was that it varies depending on the program design and implementation assumptions applied to the calculations, such as the model used to distribute the SQ-LNS (e.g., delivery to participant homes vs. at community clinics), the cost of procurement of the SQ-LNS, to whom the SQ-LNS is targeted, the program's scale and spread, and the functioning of the supply chain.

Additional SQ-LNS cost-effectiveness data are expected to soon be available for several other SQ-LNS studies conducted across a range of programmatic and geographic contexts. These results will help to further elucidate the set of parameters that may significantly affect the cost-effectiveness of SQ-LNS in a given setting.

Outside of Implementation (Policy-Type Work)

Political Acceptability

As outlined earlier in this report, the evidence base on the impact of SQ-LNS on nutritional outcomes is not yet entirely clear, given the heterogeneity of results in the studies conducted to date (refer to Tables 1-3) and this should be borne in mind when considering the most appropriate and relevant advocacy approach for a given context.

Several meeting participants shared their experiences with engaging regional and national government representatives on matters related to SQ-LNS programming. Participants recounted their meetings with high level officials to describe SQ-LNS, explain its potential benefits, and advocate for learning about and research on SQ-LNS. Participants reported that even though the process can be time-consuming, the experience has generally been positive and has paid off in terms of ensuring national and community support for the program to run smoothly.

To date, the programmatic experiences engaging with government representatives on SQ-LNS have been primarily for relatively small-scale programs. Meeting participants suggested that it would be important for SQ-LNS programs intending to operate at scale to plan for sustained engagement and intensive

advocacy with national government representatives and decision makers, indeed, it is probably the case that programs operating truly at scale would be carried out by national governments. They also expressed a need for tools to help guide program implementers on how to engage with governments on SQ-LNS programming. Discussions that followed focused on identifying the best approach/angle for advocating for SQ-LNS.

Stunting reduction was proposed as one possible advocacy approach that could be used to improve host country government representatives' acceptance and support for SQ-LNS programs. Other advocacy approaches suggested included SQ-LNS's potential to improve dietary diversity, IYCF practices, food security, and children's cognitive development.

Markets and Involvement of the Private Sector

Public/private partnerships could potentially help make the production of SQ-LNS attractive for the private sector, and therefore increase their availability for the consumers. This could enable governments to provide the products to the target population free of charge or to help make the products affordable for purchase by the target population, thereby increasing the potential for sustainability. However, specifics on how to best leverage the comparative advantages of the public and private sectors to engage around SQ-LNS to establish an appropriate customer base, distribution network, and marketing network were not fully outlined at the meeting.

The use of markets was discussed as a possibly viable option for distributing SQ-LNS in cases where there was sufficient demand. However, it was pointed out that in some target communities, markets may not be developed enough to support such a distribution, or if they are developed enough, the SQ-LNS would be reaching population groups of high enough SES that may not need the product (from a nutritional standpoint). Meeting participants further highlighted that there are currently many products that could compete with SQ-LNS on the market, including supplement-type products and snack foods, and that the target population may have already developed strong taste preferences and purchasing/consumption patterns that could be difficult to change.

Other Policy Consideration(s)

One potential policy tool for promoting SQ-LNS through increasing affordability is to advocate for reducing tariffs, customs, and fees, both on raw ingredients and the manufactured product itself. In two cost models presented, for SQ-LNS produced in France and in Niger, waiving the import tariffs and value-added tax (VAT) reduced the final price of SQ-LNS by up to 24 percent.

Research Agenda

Gaps in the evidence base were highlighted throughout the meeting and resulted in the outlines of a potential research agenda to advance scientific knowledge and programmatic practice on the use of SQ-LNS to prevent malnutrition. Topics identified for further research ran the spectrum from basic research to implementation research, including cost-effectiveness research. The full list of questions discussed at a session dedicated to the development of a research agenda are listed in Annex 6. Some of the research questions that generated the most interest among meeting participants included the following:

- What nutrients are most specifically related to growth and development and need to be included in the formulation of SQ-LNS to optimize effectiveness, and which nutrients could potentially be dropped (i.e., what is the best formulation of SQ-LNS for the lowest price)?
- What is the relative effectiveness and cost-effectiveness of SQ-LNS and MNP for growth and development outcomes?
- What minimum SQ-LNS dose adherence is necessary for a response, and over what length of time?
- What minimum package of interventions would be recommended to combine with SQ-LNS in programmatic efforts to address stunting?
- Does SQ-LNS delivered through health centers or community-based platforms improve the demand for health services, supplies at health services, and quality of health services?
- Would a market-based or a combination of delivery approaches be cost-effective and reach the most vulnerable?

Conclusion

The experiences and learning shared by participants at the meeting formed the basis for this report and allowed for a set of key considerations to be identified for programs planning to roll out SQ-LNS, as well as for a potential research agenda related to SQ-LNS to be outlined. There was broad consensus that SQ-LNS should not be viewed as a silver bullet and cannot be expected, alone, to eliminate malnutrition; it should rather be considered alongside a broader package of interventions. There was also wide agreement that there are many questions remaining about SQ-LNS that need to be answered. Many of the research questions highlighted are currently being addressed in ongoing trials. These include questions about the efficacy and effectiveness of SQ-LNS in other settings and contexts, the integration of SQ-LNS with WASH interventions (including in the Sanitation, Hygiene, Infant Nutrition Efficacy Project (SHINE) trial in Zimbabwe and in the WASH Benefits trials in Kenya and Bangladesh), the integration of SQ-LNS with early childhood development (the Addressing Chronic Malnutrition in Madagascar project), the long-term effects of SQ-LNS in both women and children (the RDNS follow-up study in Bangladesh and the iLiNS-DYAD trial in Ghana), the pre-conception use of SQ-LNS in the four-country Women First project, and the cost-effectiveness of programs that use SQ-LNS. Given these ongoing trials, in the next few years more results are expected to help answer some of the remaining research questions related to SQ-LNS, possibly even providing sufficient data for meta-analyses. In addition, the World Health Organization has begun a systematic review of the use of LNS products and their potential impact on maternal and child nutrition and health in order to develop evidence-based guidelines for the use of LNS, including SQ-LNS for preventing malnutrition. In the meantime, projects are encouraged to embed monitoring, evaluation and learning about the process and the impact of their intervention, in order to fill the gaps and inform decision-making around the integration of SQ-LNS in programs to prevent malnutrition.

Annex 1. Meeting Participants

First Name	Last Name	Affiliation
Nancy	Aburto	WFP
Paul	Alberghine	U.S. Department of Agriculture (USDA)
Mary	Arimond	University of California, Davis (UC Davis)
Deborah	Ash	FANTA/FHI 360
Emmanuel	Atuhairwe	Millennium Villages Project MVP
Elizabeth	Bontrager	USAID
Judy	Canahuati	USAID
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Kerstin	Hanson	Médecins Sans Frontières
Nicole	Henretty Ilic	Edesia
Sheila	Isanaka	Epicentre/Harvard School of Public Health
Marcel	Janssen	Mercy Corps
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Mark	Manary	Project Peanut Butter
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Timothy	Mastro	FHI 360

First Name	Last Name	Affiliation
Thais	Mosquet	Nutriset
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Andre	Ntamack	USDA
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Rafael	Perez-Escamilla	Yale School of Public Health
Ellen	Piwoz	Bill and Melinda Gates Foundation (BMGF)
Jumana	Qamruddin	World Bank
Timothy	Quick	USAID
Sandra	Remancus	FANTA/FHI 360
Michelle	Schaan	USAID
Melanie	Thurber	USAID
Stephen	Vosti	UC Davis

Annex 2. Meeting Agenda

Day 1 - Wednesday, October 14		
8:30–8:45	Opening	Tim Mastro Kay Dewey Omar Dary
8:45–9:15	Introductions	Deborah Ash
9:15–9:45	Presentation to summarize the evidence on the efficacy of SQ-LNS	Kay Dewey
9:45–10:05	Presentation on the role of EFAs in SQ-LNS	Concetta DiRusso
10:05–10:20	Q&A	
10:20–10:30	Break	
10:30–11:00	Presentation on the effectiveness of SQ-LNS: Results from PROCOMIDA, Guatemala	Jef Leroy Deanna Olney
11:00–11:30	Presentation on the effectiveness of SQ-LNS: Results from RDNS, Bangladesh	Malay Mridha
11:30–11:45	Q&A	
11:45–12:45	Lunch	
Topic area 1: SBCC related to SQ-LNS		
12:45–1:45	Panel on SBCC related to SQ-LNS	Marcel Janssen Steve Kodish
1:45–3:00	Facilitated discussion	
3:00–3:15	Break	
3:15–3:45	Presentation on programming and integration of SQ-LNS at scale	Nancy Aburto
3:45–4:45	Facilitated discussion	
4:45–5:00	Day 1 wrap-up	

Day 2 - Thursday, October 15		
8:30–8:45	Day 1 debrief	
Topic area 2: Use of SQ-LNS		
8:45–9:15	Presentation on published literature on the use of SQ-LNS: Acceptability, adherence	Mary Arimond
9:15–9:30	The PROCOMIDA Guatemala experience: A case study on the use of SQ-LNS	Marcel Janssen
9:30–9:45	The RDNS Bangladesh experience: A case study on the use of SQ-LNS	Kay Dewey
9:45–10:45	Facilitated discussion	
10:45–11:00	Break	
Topic areas 3 & 4: Economics and logistics related to SQ-LNS		
11:00–12:00	Presentation on the economics of SQ-LNS	Steve Vosti
12:00–1:00	Lunch	
1:00–1:30	Presentation on the local production of SQ-LNS	Alima Jimu
1:30–1:45	Presentation on the logistics of LNS	Nancy Aburto
1:45–2:00	Q&A	
2:00–3:00	Break-out groups by topic area	
3:00–3:15	Break	
3:15–4:00	Plenary report-back and facilitated discussion: Economics related to SQ-LNS	
4:00–4:45	Plenary report-back and facilitated discussion: Logistics related to SQ-LNS	
4:45–5:00	Day 2 wrap-up	

Day 3 - Friday, October 16		
8:30–8:45	Day 2 debrief	
8:45–10:45	Outlining of key operational conditions needed to roll out programs using SQ-LNS	
10:45–11:00	Break	
11:00–12:00	Identification of an implementation research agenda	
12:00–12:15	Wrap-up	
12:15-12:30	Closing	Elizabeth Jordan-Bell Ellen Piwoz Sandra Remancus

Annex 3. Glossary of Terms[8]

Term	Definition
Lipid-based products	A range of products designed for different purposes, including the treatment of severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) and the prevention of wasting or stunting. The majority of the energy provided by these products comes from fats or lipids (including essential fatty acids). They also provide protein, vitamins, and minerals. They vary along a number of dimensions, most notably in energy dose and concentration of micronutrients
SQ-LNS	Small-quantity lipid-based nutrient supplement. Designed to prevent malnutrition and promote growth and development. Typical ration is ~20 g/day (~110 kcal/day). Considered suitable for complementing the local diet with micronutrients, essential fatty acids, and a small amount of protein, and leave ‘‘room’’ for other foods in the diet. Common commercial names for SQ-LNS include “Nutributter” and “Enov’Mum.”
MQ-LNS	Medium-quantity lipid-based nutrient supplement. Designed for treating MAM and for preventing undernutrition in food insecure populations and seasonal wasting in food insecure populations. Typical ration is ~45–90 g/day (~250–500 kcal/day). These products can also be classified as ready-to-use supplemental food (RUSF) (see definition below). Commercial names include “Plumpy’Doz,” “eeZeeCup,” and “Wawamum.”
RUSF	Ready-to-use supplementary food. Term used inconsistently, sometimes referring only to products used for treating MAM and sometimes also referring to products used for preventing MAM.
RUTF/LQ-LNS	Ready-to-use therapeutic food/large-quantity lipid-based nutrient supplement, used for treating SAM. Designed to achieve rapid nutritional recovery and thus provided in large amounts (180–280 g/d, providing ~1,000–1,500 kcal/day or 200 kcal/kg/day), temporarily replacing most or all other foods aside from breast milk. The most common commercial name for RUTF is “Plumpy’Nut.”
WFP definition of LNS-LQ[9]	An RUSF for children age 6 months and above, intended to treat MAM. One package contains one daily dose of 500 to 550 kcal. Commercial names include “Plumpy’Sup,” “eeZeeRUSF,” and “Achamum.”

[8] The proposed terminology is based on that used in Arimond et al. “Considerations in Developing Lipid-Based Nutrient Supplements for Prevention of Undernutrition: Experience from the International Lipid-Based Nutrient Supplements (iLiNS) Project.” *Maternal & Child Nutrition*. 2013 May 6. doi: 10.1111/mcn.12049.
[9] WFP. 2014. *Technical Specifications for Lipid-Based Nutrient Supplement—Large Quantity*. Available at: http://documents.wfp.org/stellent/groups/public/documents/manual_guide_proced/wfp262353.pdf

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Annex 5. Examples of SQ-LNS Sachets, Packaging, and Materials from Bangladesh and Guatemala

Front of SQ-LNS sachet for PLW used in Bangladesh

Back of SQ-LNS sachet for PLW used in Bangladesh

Label on plastic container distributed to caregivers for storing SQ-LNS for children in the home in Bangladesh

Zip-lock bag containing SQ-LNS sachets for women, used in Guatemala

Zip-lock bag containing SQ-LNS sachets for children, used in Guatemala

Poster supporting the SBCC strategy for SQ-LNS for PLW in Guatemala

Poster supporting the SBCC strategy for SQ-LNS for children in Guatemala

Annex 6. Research Questions Discussed at the Meeting

Impact

- What is the relative effectiveness and-cost effectiveness of SQ-LNS and MNP for growth and development outcomes?
- What is the impact and cost-effectiveness of prenatal-only SQ-LNS supplementation compared to child-only SQ-LNS supplementation on growth and development outcomes?
- What minimum SQ-LNS dose adherence is necessary for a response and over what length of time?
- To what extent do mycotoxins, environmental enteropathy, and other constraints on growth impair the impact of SQ-LNS on stunting?

Delivery

- What are effective programmatic mechanisms for the delivery of SQ-LNS and messages related to SQ-LNS (that won't add to the burden of health workers)?
- Does SQ-LNS delivered through health centers or community-based platforms improve the demand for health services, supplies at health services, and quality of health services?
- How much SQ-LNS can be distributed at one time (to reduce distribution costs) without negatively impacting adherence over the long term?
- What minimum package of interventions would be recommended to combine with SQ-LNS in programmatic efforts to address stunting?
- Would market-based or other combination of delivery approaches be cost-effective and reach the most vulnerable?
- What strategies do we have to help ensure the intended beneficiary receives the SQ-LNS?

Adherence

- Testing of innovative SBCC strategies (e.g., video messaging) for improving supplement adherence and retention of messages related to SQ-LNS.
- How does packaging, including dosage (g) and the frequency of dose per day, affect adherence?
- To what extent may cultural norms affect sharing of the SQ-LNS in any particular setting?
- Does adherence differ based on the message given about whether or not to mix SQ-LNS with food (i.e., mix with food, do not mix with food, or no guidance on whether to mix with food)?
- Does adherence vary by characteristics such as socioeconomic status and food insecurity?
- Does adherence differ based on whether the SQ-LNS was purchased or received free of charge?
- For messaging purposes, how is the product best positioned (e.g. snack, food supplement, or supplement) and what outcome(s) (e.g., nutrition, growth, health, intelligence) resonate most among SQ-LNS beneficiaries to encourage willingness to pay and/or adherence?

Unintended consequences

- Does consumption of SQ-LNS among children influence a taste preference for sugar and undesirable changes in the diet (i.e., increased sugar consumption) and expenditure patterns?
- What is the risk for overdosing with use of SQ-LNS?

Formulation

- Can the formulation of SQ-LNS address potential issues with nausea and SQ-LNS during pregnancy?
- Can the formulation of Nutributter be changed to reduce sugar content?
- What nutrients are most specifically related to growth and need to be included in SQ-LNS to optimize effectiveness (and which nutrients could potentially be dropped), i.e., best formulation for lowest price/including whether or not DHA should be included as opposed to other EFA precursors?

Demand

- Testing of various strategies to generate demand among beneficiaries and markets for SQ-LNS.

Logistics

- Evaluation of the stability of SQ-LNS at more extreme temperatures.
- Does the emulsifier used affect the mucosal barrier and hence nutrient absorption and susceptibility to gut infection?
- How to reduce the cost of SQ-LNS?

Measurement-related

- What outcome measures/indicators should programs use to evaluate the effects of SQ-LNS in the long term and short term?
- Development of user-friendly programmatic tools to assess quality of diet.
- Further development and refinement of methods to measure adherence.

Annex 7. WFP Case Study on the Use of SQ-LNS to Prevent Malnutrition

The Government of Malawi, with technical support from WFP and partners and with financial support from the Children's Investment Fund Foundation (CIFF), is implementing a stunting prevention program in the Ntchisi District in Malawi's Central region as part of the national Scaling Up Nutrition (SUN) movement. This program is a large-scale community-based intervention, which includes an SBCC campaign around appropriate dietary intake during pregnancy, optimal IYCF, and hygiene promotion. The program also provides SQ-LNS to all children 6–23 months of age and supports the treatment of MAM in PLW. WFP summarized this program in the form of a case study, focusing on key success factors and lessons learned to date. The case study can be found at the following link: http://documents.wfp.org/stellent/groups/public/documents/newsroom/wfp274582.pdf.