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Key principles to improve programmes and interventions in complementary feeding

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Abstract

Although there are some examples of successful complementary feeding programmes to promote healthy growth and prevent stunting at the community level, to date there are few, if any, examples of successful programmes at scale. A lack of systematic process and impact evaluations on pilot projects to generate lessons learned has precluded scaling up of effective programmes. Programmes to effect positive change in nutrition rarely follow systematic planning, implementation, and evaluation (PIE) processes to enhance effectiveness over the long term. As a result a set of programme-oriented key principles to promote healthy growth remains elusive. The purpose of this paper is to fill this gap by proposing a set of principles to improve programmes and interventions to promote healthy growth and development. Identifying such principles for programme success has three requirements: rethinking traditional paradigms used to promote improved infant and young child feeding; ensuring better linkages to delivery platforms; and, improving programming. Following the PIE model for programmes and learning from experiences from four relatively large-scale programmes described in this paper, 10 key principles are identified in the areas of programme planning, programme implementation, programme evaluation, and dissemination, replication, and scaling up. Nonetheless, numerous operational research questions remain, some of which are highlighted in this paper.

Keywords: complementary feeding, programme implementation, programme cycle, case studies.

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Introduction

Although there are examples of successful complementary feeding programmes to prevent stunting at the community level (Dewey & Adu-Afarwuah 2008), to date, there are few, if any, examples of successful programmes at scale. This is likely the result of numerous factors, including the fact that healthy growth is influenced by a myriad of factors in addition to complementary feeding that often are not simultaneously addressed in programmes as described in paper 1 of this series by Stewart *et al*. (2013) in this supplement. Interventions have largely focused on the health sector without adequate attention to integration with other sectors as described in paper 5 of this series by Casanovas *et al*. (2013). Furthermore, a lack of systematic process and impact evaluations to generate lessons learned precludes an understanding of what works and what does not, and thus, a robust knowledge base for scaling up of effective programmes. As a result, a set of programme-oriented key principles to promote healthy growth remains elusive.

The purpose of this paper is to fill this gap by proposing a set of principles to improve programmes and interventions to promote healthy growth and development. Identifying such principles for programme success has three requirements, covered in the following respective sections of the paper: (1) rethinking traditional implementation strategies to promote improved infant and young child feeding; (2) ensuring better linkages to delivery platforms; and (3) improving programming. To illustrate the requirement of improving programming, in the fourth section of the paper, we present four country case studies of holistic complementary feeding programmes aiming for large-scale impacts. We close with a discussion of key principles and research gaps.

Rethinking traditional implementation strategies to improving complementary feeding

Rethinking traditional implementation strategies is needed to improve programming in complementary feeding and healthy growth. Here, we focus on three such strategies, the first concerning effective ways to counsel mothers to ensure that young children receive the recommended foods and are fed with the recommended practices, the second concerning how to help families to overcome barriers to giving children nutrient-rich foods, such as eggs and other animal-source foods, beginning at 6 months and the third referring to focusing first and foremost on locally available foods to ensure long-term sustainably and reduce the risk of dependence on external aid.

Social and behavioural change communication (SBCC) to promote healthy feeding practices is central to any intervention aiming to improve infant and young child nutrition. Individually tailored or child-specific counselling are frequently used to promote improved practices. Health providers work with caregivers to identify what is most nutritious and feasible among various options, and encourage implementation of the negotiated behaviour (WHO & UNICEF 2006). However, high-quality child-specific counselling is demanding on the part of health personnel and requires significant investments of time and training to implement well. Caregivers often see different providers on different visits and so may not receive consistent messages. Busy health services or health personnel may be required to attend to many mothers in a limited time period – an obstacle to providing any counselling let alone quality counselling. Thus, counselling may not occur, be too generic to be useful or be directed to a limited number of mothers, for example, those with children already malnourished, reducing its overall reach and ability to prevent at-risk children from becoming malnourished.

An alternative to the implementation strategy of child-specific counselling is programme-specific key message delivery. Epidemiologic data and formative research using qualitative methods and behavioural analysis to identify the most feasible messages with potential greatest nutritional impact are used to develop key messages that address the principal challenges to optimal feeding practices in the target population. Messages are built on local practices and informed by the contextual realities of the community and society. For example, messages might be crafted to reflect market barriers to accessing high-quality foods, inputs received or not received from health care systems, or environmental factors, which will ulti-

Key messages

- While the core set of policies and programmes leading to large-scale improvements in breastfeeding are well documented, a similar set to improve complementary feeding is lacking.
- A relative absence of systematic process and impact evaluations on projects to improve complementary feeding to generate lessons learned has precluded scaling up of effective programmes.
- Improving complementary feeding at scale requires rethinking traditional implementation strategies, ensuring better linkages to delivery platforms and contextual factors, and improved programming.
- Using case studies from Africa, Asia and Latin America, we identify 10 key principles in the areas of programme planning, implementation, evaluation, and dissemination, replication and scaling up.

mately impede healthy growth in the absence of concurrent behavioural changes such as hand washing or water treatment. Key messages are concise, catchy (i.e. easy to remember), relevant, behaviour specific and motivational, few in number, and are intended for all caregivers of infants and young children to help prevent malnutrition (Penny *et al*. 2005). Key messages are designed for consistent delivery on multiple occasions, through a variety of intervention channels, by many health personnel within and across health centres and community personnel. Key messages permit flexible delivery; where time is short, only one key message with a 'checking' (verification) question can be delivered. Where time permits, increased interaction of health personnel with caregivers is promoted.

Guided by theory, delivery may include key messages, explanations of benefits, use of educational materials illustrating the behaviour, 'checking' questions to be sure the mother understands the message and praise for behavioural intention. Among health and community personnel, key message delivery promotes a team approach and shared responsibility for improving infant and young child nutrition (Penny *et al*. 2005; Robert *et al*. 2007). Training requirements are fewer and can be directed at teams of health or community personnel vs. selected individual health workers. Programme-specific key messages and use of multiple platforms and contacts represent a shift from traditional child-specific counselling, but provide the ability to reach large numbers of caregivers on repeated occasions reinforcing key messages and could therefore promote widespread and sustainable change in feeding practices. A large randomised cluster trial to improve infant and young child feeding in rural Haryana in India has shown that high levels of coverage of key messages can be reached when the programme is implemented in a comprehensive way, involving key actors who are involved with child care, including public and private physicians, primary health care staff, community health workers, women's groups and school teachers (Bhandari *et al*. 2005).

The second implementation strategy refers to interventions that are built on overcoming the barriers to introducing timely, adequate and properly fed complementary foods as specified in the World Health Organization (WHO) Global Strategy for Infant and Young Child Feeding (WHO 2003). Contextual variables such as poverty, level and quality of formal education, access to markets and mothers' work influence complementary feeding practices and may be difficult to overcome in the short term. However, often within these constraints, behaviours influenced by cultural norms or traditional belief systems can be improved (Gittelsohn & Vastine 2003; Rasheed *et al*. 2011). For example, feeding energy-dilute preparations, given out of fears of choking on thick purees or the need to 'form the stomach' for later foods, are common and can be challenged by successful feeding demonstrations (Robert *et al*. 2007). Caregivers' perceptions of motor development, such as hand gestures and reaching, taken as cues to initiate feeding, may lead to early introduction (<6 months) of complementary foods (Bartolini *et al*. 2011). Animal source foods may be available but not given, being considered too hard for a child without teeth, and lack appropriate modification/preparation for the infant (e.g. mashing/mixing into a puree) (Paul *et al*. 2011). Other nutrient-rich foods, such as eggs, are often not recommended for children at 6 months because of concerns about allergies despite evidence to the contrary (Pan American Health Organization/World Health Organization 2003, ESPGHAN Committee on Nutrition *et al*. 2008). As well, nutritious foods from the family pot can be taken out, washed of spices and mashed for infants (Rasheed *et al*. 2011). Illness caused by inappropriate hygiene practices (e.g. lack of hand washing) may depress appetite and lead to inadequate intake (Paul *et al*. 2011). Traditional meal structures may need adjustment for infants (e.g. tea and bread for dinner in Pemba Island, Zanzibar or thin soup before puree/main course in peri-urban Peru; Robert *et al*. 2007; Paul *et al*. 2011). Responsive feeding or the interaction between caregivers and infants during feeding so that the person feeding the child responds to the child's cues of hunger and satiety varies greatly. Feeding behaviours range from lack of involvement (expecting self-feeding from early on) to controlling behaviours which override the child's attempt to regulate feeding and appetite and may require adaptation (Bentley *et al*. 2011).

The third implementation strategy includes emphasising the use of locally available foods in order to achieve long-term sustainability and to reduce the risk of dependence on external aid. New tools for food-based approaches that include the development of new or altered recipes to improve the nutrient quality of complementary foods using low-cost local ingredients as well as the development of action-oriented messages to improve feeding practices are described in the paper by Daelmans *et al*. in this supplement (Daelmans *et al*. 2013). Careful evaluation of the nutrient shortfalls in specific populations, ideally by child age (6 to 11 and 12 to 24 months) should be conducted and a determination as to whether they can be addressed though improving the use of local foods before consideration of the use of a supplement.

However, in many poor settings, nutrient-rich foods – especially animal source foods – are not readily available and costly and even when provided may not meet the iron requirements of infants 6 to 8 months of age. Accessing animal source foods may require going to the market, which in many settings occurs only once a week. Because the lack of availability and/or economic access is a problem in many settings, other strategies such as provision of fortified complementary foods, lipid-based nutrient spreads or multi-micronutrient powders may also be needed in order to increase micronutrient and essential fatty acid intakes to recommended levels. Where possible, use of locally produced fortified complementary foods or lipid-based nutrient spreads should be encouraged.

Ensuring better linkage to delivery platforms

Maternal and child health services, including community-based programmes, are a unique platform for the delivery of nutrition interventions. Their effectiveness, however, depends on a health delivery system that functions well enough in terms of quality and coverage to provide basic nutrition services and health and care messages. Starting with antenatal care, there is the potential for multiple contacts with service providers, during pregnancy, childbirth, the post-natal period and early childhood. These contacts are precious opportunities to integrate counselling on infant and young child feeding; however, they are often not used. While coverage of antenatal care is generally high, the proportion of women who attend four antenatal visits or more is much lower and little is known about their quality. Coverage of post-natal care in the first week of a child's life is often low, but many women and children are reached later in life by immunisation programmes (WHO & UNICEF 2012). Do health workers, when they see women for antenatal care, help them prepare for birth, discuss essential newborn care practices and facilitate that mother and baby will receive support from skilled personnel in the hour, days and week of life to initiate and maintain exclusive breastfeeding? Are immunisation visits used to support exclusive breastfeeding and appropriate complementary feeding? And when families seek care for a sick child, is that visit used as an avenue to assess the child's nutrition status, discuss feeding practices and help families solve any difficulties they may have in feeding the child?

Evidence from several programme evaluations of child health services suggest that, often, health workers do not use the contacts that they have with women and children to support optimal infant and young child feeding. A recent evaluation of the impact of the Integrated Management of Childhood Illness (IMCI) strategy in Egypt showed that prior to introduction of IMCI, health workers did not counsel caregivers of sick children on infant and young child feeding (Rakha *et al*. 2013). IMCI evaluation studies in Bangladesh and Brazil showed similar results (Santos *et al*. 2005; Arifeen 2009). However, evidence is emerging that this can be changed. In Egypt, the proportion of children less than 2 years of age who were assessed for feeding increased from 1% to over 90%, after primary care health staff was trained in IMCI and this result was sustained at 6 weeks and 6 months after training. The analysis suggests that this achievement can be attributed to a systematic approach to introducing IMCI as a strategy at district level, focusing on health system readiness rather than training alone. In Bolivia, when the new WHO Child Growth Standards were introduced, the IMCI protocol was revised to include nutritional assessment and

counselling at the beginning of a health care visit rather than at the end as commonly occurs to emphasise the importance of nutrition for child health. By integrating infant and young child feeding into guidelines for sick child visits, IMCI promotes that no opportunity is missed to support caregivers in implementing appropriate infant and young child feeding practices.

Based on evidence that community health workers can be effective agents to support families to adopt appropriate care practices and identify when a child needs care from a more skilled provider, WHO and UNICEF have developed a package of training materials for community health workers. The package is composed of three training tools to facilitate that caregivers are reached during pregnancy, immediately after childbirth and at critical moments throughout the first 2 years of a child's life. The *Caring For Newborns and Children in the Community* materials provide community health workers with the knowledge and skills to help families adopt appropriate care practices for newborn health, infant and young child feeding, psychosocial stimulation and responsive care giving, prevention of illness and timely care seeking (WHO & UNICEF 2011). They cover two home visits in the antenatal period, three home visits in the first week after childbirth, three home visits at regular intervals before the child reaches 6 months of age and a further three contacts until 1 year of age. Evaluation of programmes that included community health workers training have shown that this approach improves caregiving practices, including timely initiation and exclusive breastfeeding, and reduces mortality (Bhutta *et al*. 2011). Further evaluation is needed to assess the impact of this approach on appropriate complementary feeding, prevention of growth faltering and improved growth thereafter.

The lack of clear indicators and methods to routinely collect data on infant feeding counselling in health services is an important shortcoming. With the exception of the WHO Health Facility Survey that has been used in some countries, quality of primary health care services as they provide for infant and young child feeding counselling is largely not assessed (WHO 2003). This is a critical gap in public health programming that calls for immediate remedial action (Lutter *et al*. 2011).

In addition to health centres as the point of message delivery, community-based peer counsellors have been used to provide home-based counselling and individual demonstrations for mothers to support exclusive breastfeeding and improved complementary feeding practices (Haider *et al*. 2000). While volunteer counsellors are most common, salaried staff (e.g. community-based workers known as infant and young child feeding promoters) working together with volunteer staff has also been employed (Guyon *et al*. 2009). Not only have mothers been the target of individual home counselling, but also grandmothers, who in many settings are influential regarding feeding practices (Quinn *et al*. 2005). Research is needed to understand how fathers, who are often neglected in programmes to improve complementary feeding, can be positively engaged.

Beyond health services, other platforms are needed to address the contextual factors at the base of the conceptual framework developed by Stewart *et al*. (2013), which may act to either enable or impede progress towards improving child growth and development (Victora *et al*. 2005). These include services related to agriculture and food systems, and water, sanitation and the environment. It is important that careful consideration during the programme planning process be given to identify these conditions, which often disproportionately influence child nutrition. Inroads into these sectors should be made early and key stakeholders involved at the outset of programming. For example, in Africa, the most important platform outside the health service is the Safety Net Program (Coady *et al*. 2004; Grosh *et al*. 2008; Weigand & Grosh 2008). Experience has been gained for nutrition programming in the agriculture sector, though more experience and evidence on conducting nutrition-sensitive agriculture is needed particularly with respect to impact on child growth (Masset *et al*. 2012; Ruel *et al*. 2013). Nutrition outcomes are more likely to be affected when explicit nutrition objectives and behaviour change communication strategies are offered in tandem with agriculture inputs (Berti *et al*. 2004). A recent review of programmes to improve milk production for nutrition impacts highlighted the

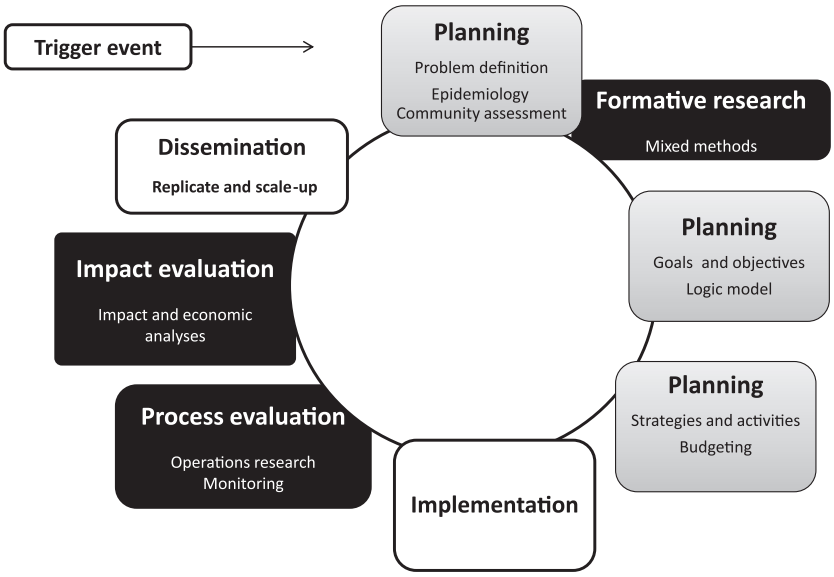

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Fig. 1. Programme planning, implementation, and evaluation (PIE) cycle.

potential for small livestock development for improving child growth (Iannotti *et al*. 2013). Other programmes were also described with links to the local agriculture sector such as blended food supplements containing milk powder. The interesting aspect of this integrated programming was the multiplicative or additive potential for affecting nutrition by targeting vulnerable groups and improving local economic conditions.

Water, sanitation and environmental factors might be addressed in programming through health behaviour communication or through other non-traditional delivery platforms (Fink *et al*. 2011). Messaging around positive complementary feeding practices should incorporate hygiene and sanitation. Targeting health behaviour practices that are more closely related to nutrition such as hand washing before food preparation and before feeding young children will better ensure impact. Larger infrastructure and environmental conditions might also be considered in programming to improve child growth. For example, partnerships may be formed with organisations and governmental agencies responsible for water treatment and sanitation facilities to engage them in efforts to improve the overall water and sanitation infrastructure. The contextual conditions driving causal determinants of child growth may require more creative programming approaches in alternative sectors.

Improving programming

Interventions to affect positive change in nutrition rarely follow systematic planning, implementation and evaluation (PIE) processes to enhance effectiveness over the long term. The PIE cycle is typically initiated by a trigger event, often by the release of funds for a particular issue or setting (Fig. 1). It is helpful if epidemiological and community-based assessments follow to adequately describe the nutrition situation (Issel 2009). This is a particularly important step for complementary feeding where understanding contextual factors is vital to success. Formative research has long been recognised as a key to developing appropriate, responsive interventions, but often neglected by funding entities and organisations. Subsequently in the PIE cycle, a logic model together with programme goals and objectives should

be developed and remain dynamic and integral to programme evaluation (Bryce *et al*. 2005). The development and prioritisation of strategies and specific activities follow, drawing upon the evidence base and other criteria such as sustainability, feasibility, social and political will, and ethical considerations (Fowler & Dannenberg 2003). Implementation of programming activities requires human capacity, supportive supervision at all institutional levels, functioning supply chains and continuity of care with organised referral systems. Strong monitoring systems are similarly needed for proper record-keeping and subsequent use of information for decision making.

While seemingly occurring later in the PIE cycle, process and impact evaluations should be initiated early in the programme planning and implementation stages. The evidence base for effectiveness in complementary feeding programming lags behind in part because of the complexity of interventions, but as well, because few evaluations are designed in such a way as to allow for impact to be attributed to interventions. It is imperative that standards be elevated in evaluation to extend beyond mere performance measurement and achieve plausibility or probability levels of causal inference (Habicht *et al*. 1999; McDavid & Hawthorn 2006; Victora *et al*. 2009). Process evaluations closely linked to impact evaluation can deepen our understanding for programme pathways to change. There is growing appreciation for quasi-experimental studies, but organisations often resist the use of control or comparison groups because of ethical or mission-driven concerns. Creative approaches can be introduced such as the crossover (switching control and intervention groups after a period of time) or stepped-wedge designs (gradually introducing an intervention to different subgroups of the target population over time, which allows for a dose-response analysis) to ensure all participants are eventually beneficiaries (Brown & Lilford 2006). One simple technique that encourages use of a control group while reducing some of its pitfalls is an adaptation of the crossover design in which evaluation research follows a control group and intervention group over a period of time. Upon completion of the impact evaluation, the programme continues and incorporates the control group into the intervention population.

Finally, dissemination is integral to programming to complete the PIE cycle (Kreuter & Bernhardt 2009). Communication of lessons learned to Ministries of Health and other key stakeholders is critical for responsible replication and ultimately, for scaling up. Systematic dissemination that involves stakeholders throughout PIE will better ensure scale.

Case studies

Bangladesh

An example of a comprehensive, community-based approach aimed at improving micronutrient nutrition of young children is provided by the homestead food production programme (HFP) of Helen Keller International (HKI) in Bangladesh. The programme has been recognised for achieving scale, ultimately improving food security for 5 million vulnerable people in the country (Bushamuka *et al*. 2005). HFP may be categorised as a 'nutrition-sensitive intervention' drawing largely on the agriculture sector to produce more nutritious foods in home gardens and small livestock production, with health, education and poverty elements to address other determinants of undernutrition (Ruel *et al*. 2013). It was initiated in the early 1990s to address the problem of vitamin A deficiency Bangladesh, but evolved to encompass young child growth as one of its primary objectives. With micronutrient-rich food production as the basis for improving nutrition in vulnerable groups, HFP focused on the complementary feeding period for achieving results.

The original HFP, called the Gardening and Nutrition Education Surveillance Project, was launched in response to the trigger events of increased public awareness for vitamin A deficiencies and a pilot funding mechanism, consistent with the PIE framework. When epidemiological evidence later emerged for the bioavailability of critical micronutrients in animal source foods, small livestock production was introduced into HFP in 2003. During the programme planning phase, HKI and its partners were particularly adept at community assessments and drawing

on local practices and institutions to foster community engagement, acceptability and sustainability. Although use of the logic model came later with other HFP programmes in Cambodia for example (Olney *et al*. 2009), there were efforts made to map programme pathways to child growth and systematically incorporate strategies and activities to address the determinants of undernutrition in Bangladesh. The HFP programme prototype involves first, the formation of partnerships with local NGOs to establish village model farms that in turn, provide agriculture inputs, training and nutrition education to households in the community. Implementation strategies and activities have been added over the years to more holistically address IYCF problems in this particular context. SBCC with key message delivery across multiple platforms was introduced as were direct links with the primary health care system in programme communities.

Evaluation of HFP has been largely through programme monitoring and performance measurement, although as the programme has expanded into other countries such as Nepal, more efforts have been made to carry out the process and impact evaluations as indicated in the PIE framework. Through process evaluations, particular elements of HFP have been identified in the successful implementation of the programme (Bushamuka *et al*. 2005). First, SBCC is critical for translating food production into improved dietary intakes. Second, applying a multidisciplinary approach, linking agriculture and health sectors in particular, more readily promotes growth and development in children. Third, building on local practices and institutions fosters community engagement, acceptability and sustainability. Finally, commitment to information systems and high-quality evaluations enables ongoing adjustments and dissemination. In terms of impact evaluation, the evidence for HFP on child growth and micronutrient nutrition has been minimal (Iannotti *et al*. 2009, Olney *et al*. 2009). In the future, there may be a need to improve the design and methods for HFP impact evaluation to detect effects or make further adjustments to the programme.

In the final step of PIE, dissemination is carried out to better ensure replication and scaling up, ideally premised on positive programme outcomes. HKI embraces this aspect of PIE and effectively disseminates information about HFP and other programmes through advocacy, publications and other means. HFP has now been replicated in Nepal, Cambodia, Indonesia, Philippines, Burkina Faso and Tanzania, with plans to also introduce HFP in Senegal and Côte d'Ivoire.

Ethiopia

The United States Agency for International Development (USAID)-funded Essential Services for Health in Ethiopia project (USAID undated), managed by JSI (formally John Snow Incorporated), had the goal of reducing under-5 mortality and morbidity in a population area of 6 million people by implementing an integrated approach within government health structures, with nutrition as one component among other child survival interventions. During the planning phase in 2003, it was found that Ethiopia was only focusing on managing nutrition during recurrent waves of emergency crises. Challenges included the assumption that malnutrition was due only to lack of food, limited knowledge of maternal, infant and young child feeding and control of micronutrient deficiencies at all levels, and limited endorsement by the Ministry of Health of the community component.

An initial desk review that included the most recent Demographic and Health Survey, project baseline surveys (Quinn *et al*. 2006) and formative research showed that complementary feeding practices included too early or too late introduction of complementary foods, use of thin gruels, high rates of bottle-feeding, wide use of cow's milk and low food diversity. Project implementation replicated and expanded a similar implementation of the Essential Nutrition Actions (ENA) framework by incorporating lessons learned from an earlier project in Madagascar and adapting it to a totally different context. At this time, a set of guiding principles for infant and young child feeding were well established and local adaptation readily feasible (Pan American Health Organization/World Health Organization 2003).

The ENA framework was applied to provide improved nutrition support through advocacy, capacity building, interpersonal communication and

community mobilisation. Emphasis was given to the programmatic integration of these nutrition actions so that they did not operate in isolation from one another and from other child survival programmes. Nutrition actions were implemented at multiple levels – through health facilities, communities and families, and using multiple contacts that are included during pregnancy, delivery, the post-natal period, family planning, immunisation, growth monitoring and promotion, and sick child, at the clinic and community levels. This was done by deploying a large cadre of volunteers to reach families. Key inputs were advocacy and partnerships at the national and regional levels, capacity building of more than 1600 health providers and 20 000 community volunteers. Action-oriented messages and information on key nutrition practices, based on formative research and supported by simple tools, were delivered through all contacts of the health system and existing community platforms.

Monitoring of the project was embedded in the implementation of the government child health project. The evaluation assessed and documented the changes in practices among children <2 years of age by comparing project to non-project areas using a pre-post design and two representative cross-sectional household surveys. At the start of the project in 2003, 782 children in project areas and 882 children in non-project areas were surveyed. Five years later, at the end of the project in 2008, 541 children in project areas and 541 in non project areas were surveyed. The results showed that infant and young child feeding practices at baseline were the same in the project and control communities; however, 3 years later, they were significantly different. For example, by the end of the project, early initiation of breastfeeding increased from 64% to 72%, exclusive breastfeeding from 54% to 64%, and timely introduction of complementary feeding from 56% to 69% (all differences significant at the $P < 0.001$ level) in project areas. With respect to complementary feeding, at the end of the project, 53% of children were eating three or more types of foods compared with 33% at baseline; 24% of children in project areas met the minimum acceptable diet compared with 12% in non-project areas and 25% of children in project areas consumed animal source foods compared with 8% in non-project areas (USAID 2008). The interventions reached more than 51% of mothers through community support and mobilisation. Thus, the project demonstrated that infant and young child feeding can be improved at a scale using multi-contacts and different delivery platforms. The community component with a large number of actors and contacts was also considered critical for success.

Dissemination was done at the end of the project within and outside of the country. As a result, the ENA framework is now embraced in various countries and by various partners, sometimes taking to scale selected high-impact nutrition interventions, often under a different name. However, the key principle of leveraging synergies among partners and improving programme delivery through multiple contacts, platforms and channels, which led to the successful Ethiopian project, has been incorporated in many subsequent projects.

Madagascar

The Madagascar experience showed high impact nutrition interventions can be implemented at scale (Guyon *et al*. 2009). The USAID-funded projects, BASICS, LINKAGES and Jireo Salama Isika (JSI) tested the implementation of the ENA framework to improve infant and young child feeding practices, increase uptake of micronutrient supplements and improve women's dietary practices. The ENA framework represented the implementation and the scaling up of the WHO-UNICEF-BASICS, Nutrition Essentials – a guide for health managers (WHO, BASICS & UNICEF 1999) with the aim of strengthening nutrition within the health sector. The project worked closely with the Ministry of Health and more than 40 stakeholders, from 1997 to 2006.

During the planning phase that lasted 2 years, project efforts were devoted to the development of a national policy, advocacy activities and consensus building among partners. Early on, a diverse group of nutrition partners was brought together at the national level to harmonise nutrition strategies and guidelines, including conducting formative research,

behaviour change strategy, ENA practices/messages and field approaches. Taking into account the high prevalence of malnutrition among women, promotion and support to improve nutrition during pregnancy and lactation was included into the programme. Formative research including Trials for Improved Practices (Dicken *et al*. 1997 and Positive Deviants (Dearden *et al*. 2002) were used the translate the newly developed *Indicators for Assessing Infant and Young Child Feeding Practices* (WHO *et al.* 2008) into small doable actions that mothers and family members could undertake.

The implementation phase aimed to enhance nutrition at all levels and leverage existing contacts and platforms to ensure the delivery of nutrition direct interventions. Implementation at the district level began in 2000 in two highland provinces. Over the implementation phases of the project, the targeted total population varied from 1.4 million in six districts to 6 million in 23 districts. Interventions included national and regional advocacy, training of health workers and existing members of women groups, building all training and supervision to foster interpersonal communication; enhancing community mobilisation with active involvement of well-positioned community members such as leaders and teachers, and mass media by using same messages through radio and engaging the number one pop singer to promote improved maternal and infant and young child feeding.

Monitoring and evaluation were included from the start either as part of the integrated child health projects or as part of the LINKAGES nutrition focus project. The project successfully documented changes in practices using a pre-post design and comparing nutrition indicators for children less than 2 years of age from representative cross-sectional household surveys conducted at baseline in 2000 ($n = 1200$) and at the end of programme implementation in 2005 ($n = 1760$). (A limitation of the evaluation was that a control group was not identified at the beginning.) The surveys were conducted in six districts with a total population of 1.4 million. The results showed an increase in the early initiation of breastfeeding from 32% to 68%, exclusive breastfeeding among infants less than 6 months of age from 42% to 70%, continuation of breastfeeding at 20 to 23 months from 43% to 73%, and children 6 to 23 months fed the minimum recommended number of meals per day from 87% to 93% ($P < 0.001$ for all changes). Among women in project areas, iron–folic acid supplementation during pregnancy increased from 32% to 76%, and post-partum vitamin A supplementation increased from 17% to 54% ($P < 0.001$ for all changes). Modest improvement was achieved in maternal dietary practices during lactation and feeding of the sick child after illness. The results were inconclusive regarding food diversity for complementary feeding and no improvements were reported in increasing food intake during child illness or pregnancy.

Dissemination was carried out with donors, ministries, NGOs and other stakeholders within and outside of Madagascar through conferences, training and workshops, first in Africa then in Asia. This project showed that through the maximisation of contacts and use of multiple programme opportunities within existing health systems and community structures, and mass media, broad-scale improvement of some nutritional practices can be achieved.

Peru

The impoverished peri-urban areas of the coastal city Trujillo, Peru with a stunting rate of 17% was the setting for a cluster randomised intervention trial to improve infant feeding practices in children from birth to 18 months of age through the existing government health services (Penny *et al*. 2005). In these communities, caregivers had access to local markets, which offered a variety of foods including low-cost micronutrient rich foods. Government health facilities were accessible on foot and widely used by families. During the planning phase, formative research was conducted in the community to identify barriers to, and opportunities for, optimal caregiver feeding practices. Principal feeding problems identified from 6 months included dilute preparations, low animal source food intake and mothers' concerns about difficulties in feeding their children. Government health

personnel and health authorities recognised the problem of chronic malnutrition; however, an effective approach to address complementary feeding was lacking. Formative research in the health centres identified the need to improve message quality for behaviour change, increase consistency in message delivery among health personnel and achieve greater coverage among caregivers.

With these results, and in keeping with the Ministry of Health's current guidelines on IYCF education and emphasis on improved quality of maternal and child services, the implementation phase began. The educational intervention was integrated into all paediatric health services and delivered by government health personnel. At the core of the intervention was the delivery of three age-appropriate, behaviour-specific 'key messages' to all caregivers of young children. Message content included food preparation consistency, low-cost accessible animal source foods and responsive feeding to address barriers identified during formative research. Additional principal components of the intervention included participatory complementary food demonstrations; anthropometric assessment and explanation of the child's growth to caregivers; provision of infant food recipe flyers; growth and development monitoring in groups; and problem-solving sessions among health personnel. Secondary messages were developed and used to support additional appropriate feeding practices. Integration of the educational intervention was promoted via team training of all health personnel attending the caregivers of young children, and incentivised through an accreditation scheme, whereby health centres received recognition by the regional health authorities for meeting implementation standards set out in publicised criteria. Involvement of the regional health authorities and the team training promoted a change in the entire paediatric service, raising the profile of nutrition and fostering shared responsibility for intervention delivery and nutritional outcomes (Robert *et al*. 2006, 2007).

During the evaluation phase, process evaluation examined intervention implementation/delivery and caregivers' reception/use based on the expected pathway for behaviour change. While intervention delivery was less than expected, it still represented significant improvements compared with nutrition education delivery in the control centres and exposed areas for improvement. The usefulness of key messages to increase mothers' exposure to, and recall of, recommendations was demonstrated (Robert *et al*. 2006, 2007). The nutritional impact was evaluated by following a cohort of children from birth to 18 months in six intervention and six control health facility communities. Results showed that stunting was reduced by more than two-thirds (5% vs. >15%) in intervention as with to control communities. There were also significant improvements in nutrient intakes and caregiver knowledge of appropriate feeding practices (Penny *et al*. 2005).

Key elements learned from this trial were the importance of formative research, the consistent use and dissemination of key messages across all paediatric services to ensure optimal caregiver exposure, team training and integration, the regional health authority's involvement and the usefulness of process evaluation to explain and understand how the intervention worked. Although the methodology used in the study was highly innovative and successful in reducing stunting, it has not been scaled up as such. However, dissemination of the key complementary feeding recommendations promoted in this intervention has been adopted and promoted by the Ministry of Health and other institutions in different parts of the country, and other projects working with the Ministry of Health have developed interventions applying and adapting parts of the methodology such as the formative process and the focus on improving the quality, consistency and coverage of key messages in health facilities and the use of other delivery platforms in addition to health services.

Key principles and research gaps

Programme interventions aimed at promoting healthy growth and development in young children require comprehensive, transdisciplinary approaches and rigorous evaluation designs. The case studies described above share many common features that provide lessons learned and insights into key principles related to programme planning, implementation,

evaluation, dissemination, replication and scaling up that are likely to be helpful to guide programming in complementary feeding:

Programme planning

1. Define programme purpose and conduct formative research using mixed methods (qualitative research and epidemiological assessments) to make programmes context specific and built on local practices.
2. Develop logic models to be used for planning, monitoring and evaluation purposes.

Programme implementation

3. Develop a small set of programme-specific doable action-oriented key messages that (1) are delivered consistently through multiple channels/platforms; (2) focus on local foods, including animal source foods; and (3) where appropriate, are crafted to address barriers to giving nutrient-rich foods.
4. Enhance and strengthen health service delivery to ensure that families of young children receive complementary feeding messages multiple times and are provided support for their implementation.
5. Enlist existing local institutions to serve as delivery platforms, build capacity and engage a wide variety of actors and stakeholders such as those working in agriculture and water and sanitation.

Programme evaluation

6. Include process evaluations that track through qualitative and quantitative data collection the programme impact pathways.
7. Conduct rigorous impact evaluations using creative designs to ensure impact attributions can be made and incorporate cost-effectiveness and cost–benefit analyses into process and impact evaluation to have the evidence needed to make the case for investing in complementary feeding interventions.

Dissemination, replication and scaling up

8. Engender political commitment and government ownership through all phases of the programme to better ensure sustainability.

9. Build into programme budgets dissemination resources to communicate evaluation results and lessons learned.
10. Plan strategically for resource allocation in the scaling-up phase of programmes.

Numerous research gaps exist in the area of programming for complementary feeding and it is beyond the scope of this paper to provide a comprehensive discussion of these. Nonetheless, a few key gaps stand out. First, operational research is needed to further validate the approach of programme-specific key message delivery. Second, operations research is needed to better understand how barriers to introducing timely, safe and nutritious complementary foods can be overcome in a variety of settings and circumstances. Third, operations research is needed to understand how complementary feeding interventions can be better integrated into heath care delivery systems and other linked as well to other delivery platforms. Lastly, operations research is needed to understand how the programmes can adapt and use the PIE cycle in different contexts.

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The authors declare no conflicts of interest.

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Disclaimer

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