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Insight

A&T Technical Brief
Issue 6, February 2013

Novel and underused food sources of key nutrients for complementary feeding

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Summary of main points

1 Meeting the high nutrient needs of infants and young children with diets based predominantly on cereals and legumes is difficult. Underused micronutrient-rich foods such as foods from animal sources and indigenous or traditional trees and plants could help address complementary feeding nutrient gaps.

2 Some underused micronutrient-rich foods meet or exceed target micronutrient densities for complementary foods (per 100 kcal). However, it may not be feasible for an infant to consume large amounts of certain foods due to palatability. If added to less nutritious foods such as plain porridge, the nutrient density of the complementary food diet will be diluted.

3 Analyses of processed complementary foods that include underused micronutrient-rich ingredients show that these foods may still fall short of meeting target micronutrient densities. As this is a new area of research, most of the results from these studies are pending.

4 Issues that should be considered in the promotion of underused micronutrient-rich foods for complementary feeding include overcoming potential aversions to the consumption of novel food stuffs, factoring in opportunity costs, assessing environmental impact, planning for sustainable harvesting, pairing new foods with nutrition education, and being aware of and sensitive to cultural dietary restrictions.

Why consider novel and underused foods for complementary feeding?

Currently, in low-resource settings, the most widely consumed complementary foods are cereal- or legume-based and have low micronutrient density. Meeting the high nutrient needs of infants and young children with diets based on such foods is difficult. Nutrient gaps in complementary food (CF) diets can be addressed in a variety of ways including supplementation and fortification. There is increasing interest in the use of micronutrient-rich foods that may not be typically consumed by children under two. Depending on local availability and ease of access, underused complementary foods may be affordable and potentially more acceptable than other CF options.

The objectives of this brief are to 1) explore the potential contribution that underused, micronutrient-rich foods could make in addressing CF nutrient gaps, 2) provide examples of infant and young child feeding (IYCF) projects that have attempted to promote underused foods, and 3) make suggestions for ways that projects can work across sectors to promote access to and consumption of underused foods by young children.

Examples of underused complementary foods

Several examples of underused food sources of key nutrients that have been linked to complementary feeding were identified through Pubmed and Google searches and communications with researchers working in the field.

Underused complementary foods include the more commonly promoted animal-source foods such as meat, poultry, and eggs; less commonly promoted animal-source foods such as rodents, small fish, insects, and spiders; and foods from indigenous or traditional trees and plants.

MEAT, POULTRY, EGGS, ANIMAL PARTS. Meat is generally a rich source of heme iron, zinc, riboflavin, and vitamin B12.[1] Poultry and eggs are also good sources of these micronutrients, but contain lower amounts of some of them than found in red meat (such as iron and zinc, Table 1). Rodents are an example of a less conventional source of meat. They comprise a substantial proportion of wild game consumed throughout the world.[2, 3] More than 89 species of rodents are consumed including squirrels, guinea pigs, and porcupines. Animal

parts aside from meat (i.e., other than the flesh or muscle) can also serve as rich sources of nutrients. For example, heart, kidney, and liver are rich sources of vitamin B-12, iron, and zinc; and liver is also high in vitamin A.[4] The anthropological literature provides insight into other animal parts that may have sustained child health. For example, in the 1960s, Jeliffe et al. observed that the Hadza (a Tanzanian ethnic group) fed their children soft fat and bone marrow from zebras as first foods.[5] Kenyan pastoralists were observed feeding their babies cow's blood and camel fat.[6]

SMALL FISH. Although often overlooked as key sources of micronutrients, fish are generally rich sources of various vitamins and minerals.[7] Certain species of small fish, when eaten with bones, heads, and viscera (the parts where most micronutrients are concentrated), can be very high in calcium, iron, zinc, and vitamin A.[8]

INSECTS AND SPIDERS. Insect-eating is widespread in tropical and subtropical countries, particularly in rural communities.[9] Some of the more popular insects and arachnids eaten around the world include crickets, grasshoppers, ants, termites, silkworms, caterpillars, and tarantulas. Insects can be rich sources of energy, protein, vitamins, and minerals. For example, studies of Angolan insects showed that a termite species had a high energy content (more than twice that of ground beef: 613 kcal/100 g vs. 234 kcal/100 g),[4] and a caterpillar species was high in zinc, thiamin, riboflavin, and iron.[10]

INDIGENOUS TREES AND PLANTS. Various foods from traditional trees and plants are potentially nutritious but often neglected. For example, the Moringa tree's *(Moringa oleifera)* pods and leaves are particularly nutritious. The pods, which look like giant string beans, are high in protein and vitamin C with significant quantities of vitamin A and B vitamins.[11] The leaves are boiled and eaten like spinach and contain substantial quantities of vitamins A and C, more calcium than most other greens, and high levels of iron.[12] In West Africa, seeds from the néré tree *(Parkia biglobosa)* are used to make a fermented condiment called "soumbala" which is a rich source of iron (16.9 mg/100 kcal).[13] Soumbala is often used as a low cost meat substitute by families.[14]

Several processed complementary foods have been designed to include underused foods as key ingredients and are currently being studied in various countries. These include a cereal made from maize and caterpillar flour in the Democratic Republic of Congo[15] and flours that contain termites and small fish in Kenya,[16] spiders and fish in Cambodia,[17] soumbala in Burkina Faso, and sweet potato and fishmeal developed for use in Sub-Saharan Africa.[18, 13]

Results from the Burkina Faso study are the only ones available at this time. In that study, 131 children 6-23 months old were randomized to receive either a gruel made from a flour containing soumbala, pearl millet, beans, peanuts, red sorghum, sugar, and salt, or the same gruel with multiple micronutrients added just before consumption. Children received the prepared gruel twice daily, 6 days/week, for 6 months. Hemoglobin (Hb) concentrations increased in both groups from the start of the study to the end of the study (gruel only: 89.2 to 104.1 g/L; gruel plus micronutrients: 90.3 to 107.6 g/L), and there were no differences between groups in endpoint Hb concentration or anthropometric indices. This suggests that the efficacy of the unfortified gruel was as good as that of the gruel with micronutrients added.

Nutrient content of underused food sources

The foods described above are by no means an exhaustive list of all of the underused food sources of key nutrients for complementary feeding, but are meant to provide an overview of some of the food sources that have recently garnered more attention in infant and young child feeding. Food composition data presented in Tables 1 and 2 show the potential of some underused food sources to meet the micronutrient needs of infants and young children.

CALCIUM. The foods that met or exceeded the target calcium density for complementary foods, in descending order, were cow's blood, Moringa leaves, a species of small indigenous fish in Bangladesh, and soumbala. Dagaa met the target calcium density only for the 9-11 and 12-23 month age groups.

IRON. The foods that met the target iron density for complementary foods for all age groups, in descending order, were cow's blood, soumbala, termites, chicken liver, dagaa, silkworm pupae, cow lung, and certain small indigenous fish species in Bangladesh and Cambodia. When the target iron densities were restricted to the 9-11 month and 12-23 month age groups, squirrel, Moringa leaves, and cow heart, kidney, and liver were able to meet the target iron density. When the target density was further restricted to just the 12-23 month age group, beef, caterpillar, spider, and Moringa pods were able to meet the target iron density of complementary foods.

Table 1.
Comparison of nutrient density (per 100 kcal) of various underused sources of key nutrients

Food	Country where analyzed food source came from	Quantity equivalent to 100 kcal	Calcium (mg/100 kcal)	Iron (mg/100 kcal)	Zinc (mg/100 kcal)	Vitamin A (RAE /100 kcal)	Reference
MINIMUM TARGET NUTRIENT DENSITIES OF COMPLEMENTARY FOODS							
	6-8 mo		100	4.5	1.7	0	
	9-11 mo		72	3.0	1.2	30	
	12-23 mo		62	1.0	0.66	20	
MEAT, POULTRY, EGG							
Egg (cooked)	US	64.5 g ~1/2 cup, chopped	32	0.77	0.68	96	USDA NNDSR[4] (No. 01129)
Chicken (cooked)	US	46 g ~ 1/3 cup, chopped	6	0.53	0.8	20	USDA NNDSR[4] (No. 05010)
Beef (ground, cooked)	US	43 g	11	1.14	2.64	3	USDA NNDSR[4] (No. 23220)
Squirrel (cooked)	US	58 g	2	3.95	1.03	0	USDA NNDSR[4] (No. 17184)
OTHER ANIMAL PARTS							
Chicken liver (cooked)	US	60 g	7	6.97	2.38	2385	USDA NNDSR[4] (No. 05028)
Cow liver (cooked)	US	52 g	3	3.43	2.78	4948	USDA NNDSR[4] (No. 13326)
Cow heart (cooked)	US	61 g	3	3.87	1.74	0	USDA NNDSR[4] (No. 13322)
Cow kidney (cooked)	US	63 g	12	3.67	1.8	0	USDA NNDSR[4] (No. 13324)
Cow lung (cooked)	US	83 g	9	4.5	1.37	10	USDA NNDSR[4] (No. 13329)
Cow's blood	Kenya	105 g	255	19.74	-	-	Sehmi 1993[19]
Caribou bone marrow (raw)	US	13 g	-	0.57	-	9	USDA NNDSR[4] (No. 35021)
COMMONLY CONSUMED SMALL INDIGENOUS FISH SPECIES							
	Bangladesh	54 g	40 – 109	0.7 – 6.5	0.7 – 2.2	33 – 1455	Roos et al., 2007[7]
	Cambodia	54 g	30 – 60	0.7 – 6.1	0.7 – 6.1	141 – 261	Roos et al., 2007[7]
Dagaa	Kenya	70 g	72	5.3	2.5	-	WinFood unpublished results
INSECTS & ARACHNIDS							
Caterpillar	DRC	28 g	44	2.8	2.8	10	Kodondi et al., 1987[20]
Termite	Kenya	15 g	8.7	12.2	2.5	-	WinFood unpublished results
Spider	Cambodia		34.2	2.2	10.6	-	WinFood unpublished results
Silkworm pupae	India	33 g	16.5	5.1	1.5	-	Longvah et al., 2011[21]
INDIGENOUS TREES							
Moringa leaves	US	167 g	252	3.87	0.82	586	USDA NNDSR[4] (No. 11223)
Moringa pods	US	278 g	56	1.25	1.17	11	USDA NNDSR[4] (No. 11621)
Soumbala	Mali	24 g	101	16.9	1.2	4.1	TACAM Mali FCT[22]

Legend: DRC (Democratic Republic of Congo), RAE (retinol activity equivalent), TACAM Mali (Table de Composition d'aliments du Mali - Food composition table for Mali), USDA NNDSR (United States Department of Agriculture National Nutrient Database for Standard Reference)

ZINC. The foods that met the target zinc density for complementary foods for all age groups, in descending order, were spider, cow liver, beef, chicken liver, some of the small indigenous fish, caterpillars, dagaa, termites, and cow kidney and heart. When the target zinc densities were restricted to the 9-11 and 12-23 month age groups, soumbala, silkworm pupae, and cow lung were able to meet target zinc density. When the target density was further lowered to that for the 12-23 month age group, Moringa pods, squirrel, Moringa leaves, chicken, and egg were able to meet target zinc density of complementary foods.

VITAMIN A. The foods that met the target vitamin A density for complementary foods for all age groups were cow and chicken liver, egg, Moringa leaves, and various small indigenous fish species. When restricted to the target vitamin A density of 12-23-month-olds, chicken was able to meet the target vitamin A density of complementary foods.

Overall, each of the foods listed in the table is a rich source of at least one of the four micronutrients examined. It should be noted that it is probably not feasible for an infant to consume large amounts of some of the items listed such as soumbala and Moringa leaves because the quantity required (e.g., 100 kcal) would not be palatable. The overall nutrient density of a complementary food diet that includes items listed in Table 1 will be "diluted" by the inclusion of less nutritious foods such as plain porridge, so achieving the target

Table 2. Comparison of nutrient density (per 100 kcal) of various processed complementary food products that include underused sources of key nutrients

Country	Food	Ingredients	Calcium (mg/100 kcal)	Iron (mg/100 kcal)	Zinc (mg/100 kcal)	Vitamin A (RAE /100 kcal)	Reference
MINIMUM TARGET NUTRIENT DENSITIES OF COMPLEMENTARY FOODS							
		6-8 mo	100	4.5	1.7	0	
		9-11 mo	72	3.0	1.2	30	
		12-23 mo	62	1.0	0.66	20	
Kenya	WinFood Classic cereal	• Germinated grain amaranth • Maize • Soybean oil • Sugar • Dagaa (small fish) • Edible termites	3.4	2.8	0.82	-	Konyole et al., 2012[16]
Cambodia	WinFood cereal	• Rice • Spider • Small fish • Oil • Sugar	126	1.0	1.0	-	WinFood unpublished results
	Sweet potato flour	• Sweet potato • Soybean • Soybean oil • Fishmeal	130	-	-	28	Amagloh et al., 2011[18]
Democratic Republic of Congo	Caterpillar cereal	• Maize • Dried caterpillar flour • Palm oil • Sugar • Salt	7.1	2.9	2.8	-	Bauserman et al., in press[15]
Burkina Faso	Flour	• Pearl millet • Beans • Peanuts • Red sorghum • Soumbala • Sugar • Salt	-	2.6	1.2	-	Ouedraogo et al., 2010[13]

nutrient density will depend on the relative proportion of foods in the diet.

The only processed complementary foods in Table 2 that met the target calcium density are the sweet potato flour (130 mg/100 kcal) and the Cambodian WinFood cereal made from spiders and small fish (126 mg/100 kcal).

None of the processed complementary foods met the target iron density for 6-8 or 9-11-month-olds (although they were close to meeting the 9-11 month target), but the processed complementary foods did meet or exceed the target iron density for 12-23-month-olds (DRC caterpillar cereal: 2.9 mg/100 kcal; Kenya WinFood classic cereal: 2.8 mg/100 kcal; Burkina Faso flour: 2.6 mg/100 kcal; Cambodia WinFood cereal: 1.0 mg/100 kcal).

The DRC caterpillar cereal (2.8 mg/100 kcal) met the target zinc density for complementary foods for all three age groups, while the Burkina Faso flour (1.2 mg/100 kcal) met the target zinc density only for the two older groups. The Cambodia WinFood cereal (1.0 mg/100 kcal) and the Kenya WinFood classic cereal (0.82 mg/100 kcal) only met the target zinc density for the oldest age group.

Data for vitamin A content of the processed complementary foods were available only for the sweet potato flour, which met the target vitamin A density for complementary foods for 12-23-month-olds, but not 9-11-month-olds, who have the highest target density. These data illustrate the challenges of meeting target micronutrient densities using processed complementary foods once stability, taste, and other factors are taken into consideration.

Barriers and facilitating factors that may affect consumption of novel and underused complementary foods

Barriers to consumption of novel and underused complementary foods include cultural perceptions and opportunity costs.

CULTURAL PERCEPTIONS. One barrier to the consumption of underused complementary foods is a pervasive western aversion to the idea of eating insects as well as other non-western foodstuffs, such as blood and spiders. Individuals promoting entomophagy (the consumption of insects as food) have noted this aversion for centuries, with literature accounts dating back to the American Revolutionary War.[9] Although western attitudes may not impact traditional practices in more insular societies, these aversions have resulted in reduced funding and research for efforts to increase the consumption of local, underused complementary foods.[9] A reorientation in the donor and policy-making community may be underway, as evidenced by the first international meeting committed to the topic: "Assessing the Potential of Insects as Food/Feed in Assuring Food Security," held in January 2012 and cosponsored by the UN Food and Agriculture Organization (FAO) and Wageningen University.[23]

Although as much as 80 percent of the world's population lives in settings where various insects have long been a component of the traditional diet, populations tend to shift away from consuming these foods as they urbanize and possibly come to view them as "primitive" foodstuffs.[9] Even in contexts where these foods are widely accepted, they may not be provided to young children. In Laos, forest foods (including insects, frogs, and bamboo shoots) comprise the largest share of non-rice foods consumed by populations living in certain regions, yet Mennonite Central Committee (MCC) health promotion staff report that many of these foods are reserved for household elders and not prioritized for consumption by young children.[24] (Jeffrey Knisely, personal communication, 2012)

OPPORTUNITY COSTS. The opportunity costs of proposed new activities should always be considered before undertaking efforts to change specific IYCF behaviors. Opportunity costs can be understood as the trade-offs in use of time and resources associated with one particular choice compared to its alternative. For example, the opportunity costs of choosing to harvest wild insects may include less time to engage in another money-making activity or reduced time spent socializing or caregiving, such as making enriched complementary foods for a young child. With underused complementary foods, opportunity costs for specific foods may vary greatly even within a relatively small geographical area, depending on the habitat availability of foods of interest. Where foods are currently being harvested for consumption by household elders, redistributing these nutrient-rich foods to young children must not adversely impact elders' food security. The ease of collecting wild foods generally varies depending on the season, so efforts to increase consumption must be sensitive to seasonal availability and the potential for preservation of these foods for year-round consumption, for example by drying. The sustainability of harvesting practices also needs to be taken into account. In Zambia, the picking season for a certain type of forest caterpillar is regulated to ensure

that adequate numbers of caterpillars remain to reproduce for the following year.[9] In places where abundance of wild foods is decreasing, efforts to promote their harvest and consumption should be carefully conducted with experts familiar with the local ecology and with a plan for increasing their supply.

The source of the labor should also be considered. Women are often responsible for gathering wild foods. If increasing their harvest of wild foods competes with their ability to perform other work which may include feeding young children, the end result could negatively impact child nutrition. In other instances, wild food collection can be a useful boon to household livelihoods in addition to improved child nutrition.

Projects that have successfully promoted underused complementary foods

In Laos, MCC is in year 4 of a 5-year nutrition and food security project in partnership with Canadian Food Grains Bank. MCC staff members have promoted the importance of forest foods for all the population and especially for young children in the "1000 day" window of opportunity. The International Union for Conservation of Nature (IUCN) modeled the economic value and future sustainable use of non-timber forest products from 1996-2001 and found that in the dry season, rice comprised 82 percent of the adult diet, forest food 11 percent, and production food (cultivated vegetables, etc.) 7 percent. In the rainy season, forest foods comprised 19 percent of the total diet by weight in those households observed for this study.[24] Given the substantial contribution of forest foods to the local diet, MCC staff encourage mothers of young children and school-aged students who also provide childcare to include crickets, crabs, frogs, snails, rodents, and plant-source forest foods in the sauces they prepare for young children to eat with rice. Another important component of the project is its focus on conservation. Community elders recall harvesting forest foods with ease even 10 years prior to the IUCN study when, for example, they could harvest 4-5 kilograms of fish in one hour. At the time of this study, it had become difficult to catch even 0.5 kilograms of fish in an hour. This raises questions about how to ensure sustainability and minimize opportunity costs associated with collection of forest foods. MCC's nutrition education promotes planting *Moringa oleifera* trees that offer nutritious leaves and seeds while they scale up efforts to counteract widespread deforestation.

Helen Keller International (HKI) has successfully promoted homestead food production, including raising chickens for eggs, as a means to improve household food security in several countries. As part of HKI's Action Against Malnutrition through Agriculture (AAMA) project in Nepal, participants, all mothers of children 0-24 months old at enrollment, received several hens and a rooster, and attended monthly meetings at their local village model farm where they learned about agriculture and nutrition with a focus on feeding children 0-24 months old (Nisha Sharma, personal communication, 2012). The Nepali context proved challenging to egg consumption. Higher-caste Hindu households have strict dietary prohibitions against eggs. Well aware of both the cultural restrictions and the affordable nutrient source eggs presented, HKI staff promoted egg consumption in the village model farm sessions and provided a locally made poster of an 18-month-old girl eating eggs to each participant family. Higher-caste household elders often still refuse to eat eggs themselves, and have required that poultry enclosures be located at a distance from the house. However, they are not standing in the way of egg consumption by pregnant women and young children. An endline survey of the project showed that 14.9 percent of intervention children 12-48 months old consumed eggs on the day prior to the survey compared to 2.5 percent at baseline (n=1053). Among control children, 0.09 percent consumed eggs on the day before the baseline, and 2.5 percent consumed eggs on the day prior to the endline survey (n=1307).

Through its social behavior change communications, the Alive & Thrive project is promoting consumption of eggs and powdered beef in Ethiopia; eggs, fish, and chicken liver in Bangladesh; and iron-rich foods (pork, beef, chicken liver or heart, and egg yolk) in Viet Nam. The qualitative research, process evaluation surveys in 2013, and impact surveys in 2014 will bring together findings on the impacts of the Alive & Thrive interventions on the consumption of these foods, and shed light on factors that influence what families choose and are able to feed their infants and young children.

Moving forward: Recommendations and issues

The underused complementary foods discussed above provide promising options for creating nutritionally adequate diets in resource-constrained environments. They are not, however, a panacea, and given the relative dearth of research conducted to date on these foods, some should be pursued with caution. "Mini-livestock," a term for the rearing of edible rodents, guinea-pigs, giant snails, frogs, insects, and other less conventional animal species, are being promoted as a means to improve food security, reduce

the depletion of natural resources including game meat, and increase livelihood opportunities.[25] However, the potential risks of zoonotic diseases (those spread from animals to humans), particularly those that can be transmitted by rodents, have not been adequately researched, and the pest potential of escaped mini-livestock such as locust infestations needs to be considered.

Carefully examine traditional practices in developing nutrition education messages.

Careful examination of traditional practices provides a good starting place for developing messages to promote underused complementary foods. In some instances, it may be possible to overcome dietary restrictions, as evidenced in Nepal, while in other contexts projects may be more successful when they focus on foods enjoyed by the majority of the population. Context-specific nutrition education is an essential component of any program.[26] Indigenous beliefs informing IYCF practices need to be understood, respected, and possibly challenged. Because caretakers may include individuals other than mothers, and because they are often influenced and supported by extended families and peers, it is important to develop nutrition education messages that address the larger community. Messages should also pertain to the family meal instead of just complementary foods, since many households lack adequate time to prepare completely separate foods for young children.

Cooperate with multiple sectors.

Cooperation with development sectors outside of the health and nutrition "silo" will also facilitate the uptake of behaviors related to underused complementary foods. As shown in the example from Laos, "forest foods" are of great interest to the conservation sector since the sustainable harvest of non-timber forest products provides an alternative to logging and its ensuing deforestation. Cases from Thailand show that promoting insect consumption can serve as a tool for combating locust plagues.[9] Some Thai farmers eliminated pesticide application when the market price for grasshoppers increased by 230 percent over nine years, and they heard reports of serious illness and death from ingestion of pesticide-treated insects.

Consider environmental factors.

Climate change science is also relevant to discussions regarding mini-livestock and entomophagy. In a recent paper, a team of animal and plant scientists quantified the feed conversion efficiency and greenhouse gas emissions of insect species, including edible species.[27] The insects studied emitted, on average, similar amounts of three common forms of greenhouse gases (methane, carbon dioxide, and nitrous oxide, as well as ammonia which indirectly contributes to greenhouse gases) as the amounts emitted by pigs, and significantly less than emitted by beef cattle. There was significant inter-species variation with respect to greenhouse gas emission and the average daily gain (a measure of the efficiency with which they grew), with one species growing five times faster than another. This research attempts to quantify the potential environmental benefits of replacing conventional livestock animal protein with insect sources, an important effort given global concerns about climate change and the planet's ability to feed a growing population.

Raise awareness of policy-makers.

Successful spread of mini-livestock production will depend on improving the understanding of policy-makers within the agricultural sector of the importance of unconventional animals to the diets and livelihoods of low-income communities. The Laboratory of Entomology at Wageningen University in the Netherlands has raised awareness of entomophagy through efforts to quantify the nutritional and environmental impacts of increased insect consumption in lieu of current meat consumption, as well as through policy-focused relationships with the Food and Agriculture Organization(FAO). The FAO Forestry Department promotes edible forest insects and their ability to improve nutrition and support livelihoods. When harvesting is well managed, it contributes to healthy ecosystems. FAO has made specific investments in this area in Lao PDR, where a project is underway to develop and support market systems that incorporate sustainably harvested forest foods.[28]

In conclusion, the nutritional status of young children in low-income settings could be enhanced by improved consideration and integration of complementary foods that are currently underused. These foods will vary depending on what is available and culturally acceptable in a specific site. Their integration into the diets of young children may be facilitated by strong behavior change communication efforts. Understanding the extent to which these foods can address nutrient gaps will require further research. To increase the commitment of the international development community to fully realizing the potential of underused complementary foods, IYCF practitioners will need to collaborate with experts in agricultural and environmental sectors. Successful efforts could result in improved nutritional status of young children, restored forest habitats, reduced pesticide use, and reduced ecological pressures posed by livestock production.

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The Insight series of technical briefs addresses the continuum of care for good infant and young child feeding, from initiation of early and exclusive breastfeeding through complementary feeding in later infancy and the second year of life. Alive & Thrive aims to improve feeding practices during this critical period to save lives, prevent malnutrition, and promote optimal growth. Alive & Thrive is funded by the Bill & Melinda Gates Foundation and managed by FHI 360. Other members of the team include BRAC, GMMB, IFPRI, Save the Children, UC-Davis, and World Vision.

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