



The advantages, disadvantages and risks of ready-to-use foods

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Executive summary

Globally, about 50 million children less than 5 years are wasted (too thin) at any one time; of these, over 17 million are severely wasted. These children are at high risk of death or may suffer from diseases and complications that will greatly affect their future life. They need urgent effective treatment. Much more common is stunting (failure to achieve normal growth in length or height): it affects more than 160 million children that may not reach their developmental potential, mainly in south Asia and sub-Saharan Africa. At policy level, uncomplicated stunting has no implications for treatment, prevention being the only strategy. Both wasting and stunting can and should be prevented by better maternal, infant and young child nutrition.

Progress has been substantial for many decades in reducing mortality and morbidity from infectious diseases. Progress in reducing wasting and stunting has lagged behind. During the past decade or more the news media have focused on claims that the “solution” to these problems is in hand in the form of specific food products, often referred to as “ready-to-use foods.” These foods have a high nutrient density and a low water activity; thus, they do not support bacterial growth even without refrigeration. They need no cooking or other preparation and can be fed directly from their packaging with no need for training. The “ready-to-use therapeutic foods” (RUTF) are for use in the treatment of severe acute malnutrition (SAM). The “ready-to-use supplemental foods” (RUSF) are being tested for more widespread use either in treatment of moderate acute malnutrition (MAM) or for replacing other foods used in food aid. Lipid-based nutritional supplements (LNS) are a type of RUSF with reduced bulk, currently investigated as an alternative that could minimize the risk of displacing breastmilk.

The introduction of RUTFs in the management of SAM has allowed health authorities to extend effective treatment beyond hospitals, i.e. in out-patient units or at home. As a consequence, the case fatality rates recorded in hospitals, usually less than 10%, can be achieved largely outside the hospital environment, thus greatly reducing cost and the burden on in-patient health care facilities, and allowing an increased coverage. This, however, is far from universal, and many cases, possibly the worst cases, are not yet reached by programmes. In addition, proof of the advantages of RUTFs over other products is weak. In addition, RUTFs have their downside. They are too expensive to be used for anything else besides treatment of SAM. Their provision depends often on short-term external funding for humanitarian or emergency programmes. They tend to be monopolized by a handful of manufacturers able to put in place strict quality control measures. Children treated with RUTFs require extra water; if clean water is not available, RUTF alone will not result in a healthy child. The product does not contribute to teaching the child to like the taste of the healthy local foods needed to avoid malnutrition in the future. Finally, they are only part of the solution: prevention and rehabilitation of SAM need much more than RUTFs. And SAM is only the tip of the malnutrition iceberg: 90% of malnutrition consists of forms other than SAM, and RUTFs are neither necessary nor appropriate in treating them.

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While there is widespread agreement on approximately the correct composition of RUTF, the same is not true for RUSF. Being less expensive than RUTFs, but with similar properties, RUSFs were expected to function better than existing cereal blends used in food aid programmes. They are attractive because they can provide nutrients like iron and zinc that are difficult for low-income families to provide in adequate quantity to infants starting at 6 months of life, and because they can save mothers' time and require no special knowledge of nutrition, hygiene or infant feeding. They have also the advantage of being a vehicle for providing milk powder in a way that is easily and safely stored and resistant to bacterial contamination. However, RUSFs also have their downside. They are new foods, unfamiliar to the populations expected to benefit from them. Their packages have to be transported over long distances and create additional waste requiring disposal. Like RUTFs, they require access to extra safe water for infants and young children. They are expensive and their provision to large population groups may not be sustainable. They may displace breastmilk. Finally, if effective, RUSFs, like RUTFs, can only be a minor part of the solution to under-nutrition.

As far as effectiveness is concerned, RUSFs may increase recovery rates and decrease non-responders in treating MAM, but weight gain differences between groups in controlled trials are small. Also, they have no proven benefits over other supplements in preventing under-nutrition. Yet their use, for both management and prevention of MAM, is increasing. The scaling up, however, has been largely supply- rather than demand-driven. If they were promoted to prevent malnutrition, or even worse to replace complementary foods, the market for RUSFs could include billions of children. The groundwork is being laid for industry to step in. Publicly funded commercially oriented market research is already laying the foundations for this process to take place and advertisements for branded RUSFs have already been spotted in India and in Africa.

As far as displacement of breastfeeding is concerned, a number of studies has found no impact of RUSF use on breastfeeding under controlled conditions. But this does not mean there would never be any impact under non-research conditions. It depends in part on how the products are promoted and the resulting beliefs families have about them, which in turn will influence how they are used in individual settings. If mothers are told that these scientifically developed foods will prevent malnutrition in their children, then of course many, who commonly already believe that their diets are too poor for their breastmilk to be good, will use as much as they can afford, likely displacing breastmilk.

Until the donors became interested in providing RUSFs to substantial numbers of children, there was widespread agreement that families in developing countries should largely feed themselves and be empowered and educated to do so successfully and sustainably. Expressions of such sentiment have now declined, replaced by recommendations to expand the use of RUSF. These are what donors love, magic bullets. The most cynical and disturbing aspect of the current donor rush toward RUSF is that instead of objectively programming this kind of tool for specific situations when and where it makes sense, products like these quickly become "one size that fits all." If rational decision-making were the basis for development assistance, donors ought to compare several outcomes of the provision of RUSFs with provision of an equally expensive community-based nutrition programme, a behaviour change programme, and a conditional cash transfer in the amount that it costs to buy, ship and distribute the product.

Given how weak the scientific evidence base is so far for RUSF (and even for RUTF), it is difficult to avoid the conclusion that conflicts of interest are involved in setting up both political and economic agendas. IBFAN is concerned that malnutrition "prevention and treatment are becoming increasingly medicalized with the use of fortified commercial foods as 'quick fixes', ignoring community-based approaches and underlying and basic causative factors", and points out that "meanwhile, breastfeeding and adequate complementary feeding continue to receive scant funding and attention despite the large body of research that demonstrates it is (by far) the most effective and sustainable intervention to positively impact child health and survival".

Introduction

Progress has been substantial for many decades in reducing mortality and morbidity from the infectious diseases that affect people in low-income countries. Progress in reducing problems linked to under-nutrition (nutritional stunting and wasting and deficiencies of specific nutrients) has however lagged behind. During the past decade or more the news media have focused on claims that the “solution” to these problems is in hand in the form of specific food products, often referred to as “ready-to-use foods.”

The term “Ready-to-use foods” (RUFs) in the present context refers to foods with a high nutrient density (usually containing milk or whey powder) that, even without refrigeration, do not support bacterial growth due to their low water activity. They need no cooking or other preparation and can be fed directly from their packaging with no need for training, apart from the need to give additional safe water (see details below). It is useful to speak of two different types. RUTFs (ready-to-use therapeutic foods) are for use in the treatment of severe acute malnutrition (SAM).² RUSFs (ready-to-use supplemental foods, sometimes conflated with or even called RUTFs) are being tested for more widespread use either in treatment of moderate acute malnutrition (MAM) or for replacing other foods used in food aid. Some research is focusing on reducing the bulk of RUSF in hopes that this would minimize the risk that they displace breastmilk. In the form of mainly fat with added nutrients, this type of RUSF is referred to as lipid-based nutritional supplements (LNS).

Many commercial complementary foods are “ready-to-eat”, for example from a jar, or only require the addition of water, sometimes not even hot water. However, this review does not include foods requiring the addition of water, nor commercial complementary foods, though they often have similar regulatory needs.

Exactly what ingredients such RUSFs and RUTFs contain vary considerably. We can expect, just as in the case of infant formula, that research will continue apace and each study suggesting some benefit from any particular new ingredient will be heavily touted,³ with long lag times being required to determine whether any such benefits are actually worth the additional cost.

RUTF

Its history

Early in its history, the field of international nutrition focused a good deal of attention on the treatment of SAM. Nutrition rehabilitation centres were set up and the many weeks that children were required to stay in the centres were used to teach their mothers hygiene and nutrition. However, by the early 70s,⁴ it was becoming clear that this was not working well (such mothers had too low social status and too little power to be able to serve as “change agents” as initially hoped), relapse was very common, it was too expensive, and it placed too large a burden on local health care programmes. A major constraint was that such children require milk and it is impossible for milk to be safely stored and used at home in low-income settings. Even powdered milk is dangerous.⁵ Thus, while advances were made in developing more effective special milk-

² Acute malnutrition is sometimes referred to as nutritional wasting, which basically means the child is too thin or weighs too little compared to what is normal for his or her height. Here are the statistical definitions, and later an explanatory example. SAM: below -3 z-scores of the median WHO growth standard value of weight for height (WHZ); MAM between -3 and -2 WHZ; there is also mild acute malnutrition, between -2 and -1 WHZ. Thus, for example, soon after reaching one year of age, in any given community, children on average should weigh 10 kg and be about 77 cm in height. Irrespective of age, a child 77 cm in height should thus weigh about 10 kg. Those weighing 8.5-9 kg are mildly wasted; those between 7.7 and 8.5 kg are moderately wasted (MAM); those weighing less than 7.7 kg are severely wasted (SAM).

³ Kerac M, Bunn J, Seal A et al. Probiotics and prebiotics for severe acute malnutrition (PRONUT study): a double-blind efficacy randomised controlled trial in Malawi. *The Lancet* 2009;374(9684):136-44

⁴ Beaudry-Darisme M, Latham MC. Nutrition rehabilitation centers: an evaluation of their performance. *J Trop Pediatr* 1973;19(3):299-332

⁵ Andresen E, Rollins NC, Sturm AW et al. Bacterial contamination and over dilution of commercial infant formula prepared by HIV-infected mothers in a Prevention of Mother to Child Transmission (PMTCT) programme, South Africa. *J Trop Pediatr* 2007;53(6):409-14

based foods for hospital-based nutrition rehabilitation, programmatically it was largely abandoned,⁶ which basically means that for decades severely malnourished children have been largely neglected.

Though embarrassing, this neglect might have made some sense if the resources had been shifted to community-based nutrition programmes designed to prevent malnutrition (wasting and stunting). Instead, what happened was that the European donors dropped altogether their interest in nutrition during the 1990s. The North Americans and UNICEF increased it, but only if one counts the cost of vitamin A capsules (and now, RUFs).

In the mid-1990s, a nutrition expert with long experience in low-income settings, had a eureka experience while watching his children eat hazelnut paste mixed with sugar.⁷ He realized that such a product has such a low water activity (<2.5%) that bacteria cannot thrive in it, even without refrigeration, in some cases for about a year before the fats will begin to go rancid. He connected the dots: such a product could serve as a vehicle for milk powder and fortificants in the treatment of SAM. The expert realized that at least the milk powder constraint could now be overcome. Malnourished children no longer needed to languish for weeks in a specialized facility. Once their infections are treated, they can be sent home with a container of RUTF and instructions on how much to feed daily. Though community participation in planning, implementation (apart from patients being treated at home) or evaluation is often inadequate or neglected, and though these programmes are completely beyond anything low-income communities can control and run independently, this approach to treating SAM is now commonly referred to as community-based management of acute malnutrition (CMAM).⁸

In 1996 a company in France named Nutriset, which had already for a decade been producing therapeutic milks F75 and F100 for hospital-based treatment of SAM, began producing RUTF, the most well-known of which is called “Plumpy ‘Nut” (PN). While it is relatively simple, being composed largely of peanut paste (25-30%), sugar (28%), skimmed milk powder (20%), vegetable oil (15-20%), and additional nutrients (2%), maintaining the quantities of each nutrient within a relatively narrow range requires the purchase of a ready-made nutrient blend (or nearly the same manufacturing and quality control capacity as is needed in making drugs). Particularly important is quality control of peanuts, as they are the major source of aflatoxin, the most potent known carcinogen. These factors, along with the relatively high cost of milk powder, make RUTF a relatively expensive product.

Several other companies make other types of RUTF products. By 2011 companies in a dozen developing countries were licensed by Nutriset to make PN and Valid International had established four others.⁹ Simply to treat the existing cases of SAM, 250,000 metric tons (MT) of RUTF would be required. By 2011, 3.4 million of these cases (1.1 million in DR Congo and 1.6 million in Nigeria) were being treated via CMAM in 60 countries. Use of RUTF by UNICEF (the largest user) exploded from 200,000 cartons for 27 countries in 2006 to over 1.2 million (300,000 of which were locally produced), equivalent to about 20,000 MT for over 50 countries in 2010, accompanied by a decrease in use of F100¹⁰ to about 1/3 of 2003 levels.¹¹ Four of UNICEF’s seven global suppliers were based in developing countries and in 2010 they had another seven local suppliers. But half of their 2010 purchases came from Nutriset. About 1/3 of UNICEF’s 2008 RUTF was shipped by air, but this decreased to <1% by 2010.

Globally, close to one billion people at any one time receive too few calories and another 1-2 billion are chronically deficient in at least one nutrient. About 50 million children less than 5 years are wasted (too thin) at any one time; of these, between 17 and 20 million are severely wasted and in need of treatment.^{12,13} Much

⁶ Briend A. Treatment of severe malnutrition with a therapeutic spread. ENN Field Exchange 1997;2:15

⁷ Ibid.

⁸ More accurate but with less cachet would have been to call it “out-patient” treatment of SAM.

⁹ Fellows P. Local production of ready-to-use therapeutic food for the treatment of severe acute malnutrition. Food Chain 2012;2(2):183-96

¹⁰ F75 is used at an earlier stage in more severe cases and thus is not replaced as much by PN; its use remained fairly stable.

¹¹ Komrska J. Overview of UNICEF’s RUTF Procurement in 2010 and Past Years. Consultation with RUTF Suppliers. Copenhagen, 18th October, 2010.

¹² <http://www.cmamforum.org/Pool/Resources/Managing-Children-with-Severe-Acute-Malnutrition.htm>

¹³ UNICEF. Improving Child Nutrition: The achievable imperative for global progress. 2013.

more common is stunting (failure to achieve normal growth in length or height): it affects more than 160 million children that may not reach their developmental potential, mainly in south Asia and sub-Saharan Africa. But, especially after 2 years of age, supplemental feeding with RUSF or any other food may have little impact on stunting,¹⁴ or even cause overweight.

The advantages of RUTF

Based on the breakthrough described above, supported by research showing slight superiority to standard approaches,^{15,16} WHO endorsed CMAM.¹⁷ The extent to which RUTF will live up to the high hopes for it is still uncertain. One review suggests that case fatality rates tend to be well under 10% in CMAM programmes.¹⁸ However, it is difficult to obtain and interpret such data. For example, coverage rates may be low, suggesting that the worst cases may not be presenting in the programme.¹⁹ In addition, when SAM includes oedema (the so-called kwashiorkor variety), only poor quality data are available for treatment in general, and success rates are often not high.²⁰ One study did show that CMAM achieved higher coverage than the conventional hospital-based approach.²¹ A recent review found that CMAM resulted in an average 51% higher recovery rate than standard care, but weight gain differences between groups in controlled trials were small.²²

However, proof of the advantages of RUTF over other products is weak. Even though flour-based supplements for the treatment of SAM are not recommended internationally (though used in India and Bangladesh), a 2013 Cochrane review basically concluded that as of 2013 data were inadequate to recommend the use of RUTF over a flour porridge-based treatment regime.²³ Thus, even if demonstration of CMAM's impact on individual outcomes still requires further research, it is attractive to donor agencies because of its much lower cost, consequent ability to increase coverage, as well as greatly reduced burden on local in-patient health care facilities. Research is ongoing to find ways to reduce the cost, much of which is due to the inclusion of milk powder.²⁴ Early research has tested acceptability and tolerance of milk-free RUTF.²⁵ Early human trials suggest that leaving out milk altogether does not appear to work as well as standard RUTF,²⁶ but whey powder alone may.²⁷

¹⁴ Hendricks KM. Ready-to-use therapeutic food for prevention of childhood undernutrition. *Nutrition Reviews* 2010;68(7):429-35

¹⁵ Ciliberto MA, Sandige H, Ndekha MJ et al. Comparison of home-based therapy with ready-to-use therapeutic food with standard therapy in the treatment of malnourished Malawian children: a controlled, clinical effectiveness trial. *Am J Clin Nutr* 2005;81(4):864-70

¹⁶ Karakochuk C, van den Briel T, Stephens D et al. Treatment of moderate acute malnutrition with ready-to-use supplementary food results in higher overall recovery rates compared with a corn-soya blend in children in southern Ethiopia: an operations research trial. *Am J Clin Nutr* 2012;96(4):911-6

¹⁷ A Joint Statement by the World Health Organization, the World Food Programme, the United Nations System Standing Committee on Nutrition and the United Nations Children's Fund. Community-based management of severe acute malnutrition. Geneva, WHO/WFP/UN/UNICEF, 2007

¹⁸ Park SE, Kim S, Ouma C et al. Community Management of Acute Malnutrition in the Developing World. *Pediatr Gastroenterol Hepatol Nutr* 2012;15(4):210-9

¹⁹ Guerrero S. Final Evaluation of Concern Worldwide/MoHP Community-based Management of Acute Malnutrition (CMAM) Pilot Programme, Bardiya District, Nepal. 2010 <http://www.alnap.org/resource/8120>

²⁰ Roberfroid D, Hammami N, Mehta P et al. Management of oedematous malnutrition in infants and children aged >6 months: a systematic review of the evidence. Geneva: World Health Organization, 2013

²¹ Sadler K, Myatt M, Feleke T et al. A comparison of the programme coverage of two therapeutic feeding interventions implemented in neighbouring districts of Malawi. *Public Health Nutrition* 2007;10(9):907-13

²² Lenters LM, Wazny K, Webb P et al. Treatment of severe and moderate acute malnutrition in low-and middle-income settings: a systematic review, meta-analysis and Delphi process. *BMC Public Health* 2013;13, Suppl 3:S23

²³ Schoonees A, Lombard M, Musekiwa A et al. Ready-to-use therapeutic food for home-based treatment of severe acute malnutrition in children from six months to five years of age. *Cochrane Database of Systematic Reviews* 2013, Issue 6. Art. No.: CD009000. DOI: 10.1002/14651858.CD009000.pub2

²⁴ Dibari F, Diop El HI, Collins S et al. Low-cost, ready-to-use therapeutic foods can be designed using locally available commodities with the aid of linear programming. *J Nutr* 2012;142(5):955-61

²⁵ Owino VO, Irena AH, Dibari F et al. Development and acceptability of a novel milk-free soybean-maize-sorghum ready-to-use therapeutic food (SMS/RUTF) based on industrial extrusion cooking process. *Matern Child Nutr* 2014;10(1):126-34

²⁶ Irena AH, Bahwere P, Owino VO et al. Comparison of the effectiveness of a milk-free soy-maize-sorghum-based ready-to-use therapeutic food to standard ready-to-use therapeutic food with 25% milk in nutrition management of

Treatment of persons living with HIV might also benefit from a community-based approach.²⁸ Though some clear advantages of RUTF would be expected in young children in the HIV context, and one study suggested that LNS could be used as a replacement for breastmilk,²⁹ it has not always lived up to expectations that it might serve as some kind of super complementary food.^{30,31,32}

The downside of RUTF

- Though used for other purposes at times, especially in early years before RUSFs were developed, RUTF is unnecessarily expensive to use for anything else besides treatment of SAM. At US \$70-200 per child cured, about half of which is for the product itself,³³ CMAM costs several times more than per capita costs for preventing malnutrition through community-based approaches.³⁴ So far, increasing the scale of production has failed to bring down the unit cost of RUTF.
- CMAM is funded via humanitarian or emergency funding which almost by definition means it is short term, is a “stand alone” programme, not integrated into government programming, and rarely has become a line item in permanent government budgetary allocations. Links with existing food security and nutrition programming are weak. Even among the few governments that have budgets for it, so far, these cover only 15-20% of CMAM costs.³⁵
- The early near-monopoly enjoyed by Nutriset on RUTFs was controversial, particularly the fact that the company prevented others from making similar products, given that it is questionable whether such a simple product can or should be granted a patent. Only in 2010 the company, faced with law suits and bad publicity, relented and just before World Food Day announced how local companies operating in developing countries where Nutriset patent is in place can obtain an agreement which would make development, marketing and sales of their own products to humanitarian organizations possible.³⁶ In some developing countries locally produced versions have been made independently of Nutriset and appear to function well.^{37,38}
- Peanuts are the food most commonly contaminated with aflatoxin and thus quality control measures for both RUTF and RUSF need to be of a high standard (which makes the use of this low-cost food more expensive). RUTF, like RUSF, is at risk of being contaminated also with *Cronobacter sakazakii*.

severely acutely malnourished Zambian children: an equivalence non-blinded cluster randomised controlled trial. *Matern Child Nutr* 2013 doi: 10.1111/mcn.12054

²⁷ Bahwere P, Banda T, Sadler K et al. Effectiveness of milk/whey protein-based ready-to-use therapeutic food in treatment of severe acute malnutrition in Malawian under-5 children: a randomised, double-blind, controlled non-inferiority clinical trial. *Matern Child Nutr* 2014;10(3):436-51

²⁸ Sadler K, Bahwere P, Guerrero S et al. Community-based therapeutic care in HIV-affected populations. *Trans R Soc Trop Med Hyg* 2006;100(1):6-9

²⁹ Parker ME, Bentley ME, Chasela C et al. The acceptance and feasibility of replacement feeding at 6 months as an HIV-prevention method in Lilongwe, Malawi: results from the BAN study. *AIDS Educ Prev* 2011;23(3):281-95

³⁰ Filteau S, Baisley K, Chisenga M et al; CIGNIS Study Team. Provision of micronutrient-fortified food from 6 months of age does not permit HIV-exposed uninfected Zambian children to catch up in growth to HIV-unexposed children: a randomized controlled trial. *J Acquir Immune Defic Syndr* 2011;56(2):166-75

³¹ The Chilenje Infant Growth, Nutrition and Infection (CIGNIS) Study Team. Micronutrient fortification to improve growth and health of maternally HIV-unexposed and exposed Zambian infants: a randomised controlled trial. *PLoS One* 2010;5(6):e11165 doi: 10.1371/journal.pone.0011165

³² Thakwalakwa C, Phiri A, Rollins N et al. Growth and HIV-free survival of HIV-exposed infants in Malawi: A randomized trial of two complementary feeding interventions in the context of maternal antiretroviral therapy. *J Acquir Immune Defic Syndr*. 2014;66(2):181-7

³³ Emergency Nutrition Network (ENN). Managing acute malnutrition at scale: A review of donor and government financing arrangements. In: Coverage Monitoring Network. What do we know now: A decade of community based treatment of SAM. Conference Report 17-18 Oct 2013, page 7.

³⁴ Jennings J, Gillespie S, Mason J et al. Managing successful nutrition programmes: A report based on an ACC/SCN workshop. In: ACC/SCN State-of-the-Art Series. Nutrition Policy Discussion Paper no. 8. WHO, Geneva, 1991

³⁵ Emergency Nutrition Network (ENN). Managing acute malnutrition at scale: A review of donor and government financing arrangements. In: Coverage Monitoring Network. What do we know now: A decade of community based treatment of SAM. Conference Report 17-18 Oct 2013, page 7.

³⁶ <http://www.nutriset.fr/en/access/patents-for-development/online-patent-usage-agreement.html>

³⁷ Aguayo VM, Agarwal V, Agnani M et al. Integrated program achieves good survival but moderate recovery rates among children with severe acute malnutrition in India. *Am J Clin Nutr* 2013;98(5):1335-42

³⁸ Rahman ME, Qamruzzaman K, Bhuiyan MMR et al. Efficacy of locally adapted dietary regimen in the treatment of nutritional marasmus: a randomized control trial. *Bangladesh Medical Journal* 2014;41(2):45-9

The World Food Programme (WFP) halted distribution of some of its RUSF in 2012 and instituted improved quality control systems.³⁹

- Another neglected problem (because RUTF's safety due to its not needing to be mixed with local water is such a strong "selling point") is that RUTF has a high renal solute load. This requires that the child drink extra water when eating it. Clearly if clean water is not available, RUTF alone will not result in a healthy child.
- RUTF will not contribute to teaching the child to like the taste of the healthy local foods needed for him or her to avoid malnutrition in the future. Bangladeshi women found the taste of PN to be unacceptable,⁴⁰ thus it is clearly introducing and getting children used to a new taste. The high sugar content of this "nutritional super-food" may also mislead families, encouraging increased consumption of sweet foods with low nutrient density.
- Finally, RUTF (and thus CMAM based on its use) is only part of what is needed to rehabilitate malnutrition. While it is understandable that CMAM programmes cannot be held responsible for strengthening weak health care systems, it will work poorly when this exists; for example where hospitals have inadequate access to effective antibiotics, malnourished children will often die even if RUTF is available. In addition, if the underlying causes, mainly the situation the family is in, are not dealt with, malnutrition is likely to return.

Rapid scale up

Donor agencies get excited by any "magic bullet" that seems to offer a simple method, low in cost to them, that will solve some serious problem in developing countries without having to involve them in "messy", time-consuming, headline-lacking work dealing with social and economic issues and with the slow and thankless task of building the developing countries' own capacity to independently solve their problems, especially when such increased capacity would run against donor country economic interests. The inclusion of goods and services from developed countries is a big plus; for adherents of the neo-liberal economic theories, involvement of, if not leadership by, the private sector, is a must. Thus donor excitement grew rapidly with the discovery of RUTF.

Before there was little more than the most basic proof of concept research completed, donor agencies were already prepared to offer literally hundreds of millions of dollars for it. As Schaetzel has pointed out,⁴¹ an excessive focus on CMAM by definition leads to further neglect of and withdrawal of scarce technical and management expertise from other important issues. In Malawi, he calculates that the food cost of treating SAM would alone monopolize 25% of all child health expenditures, to reach 2% of the child population. He concludes that when the SAM prevalence is this low, "introduction of universal SAM treatment is not rational in epidemiological, cost, or ethical terms."

SAM is only the tip of the malnutrition iceberg. At any given time, on the order of 20-30 million children suffer from SAM, causing perhaps a million deaths a year. But 90% of malnutrition consists of forms other than SAM, and RUTFs are neither necessary nor appropriate in treating them. The more complex approaches needed to deal with these other forms of malnutrition are now in danger of receiving even less attention, as donors can point to CMAM projects as evidence that they are doing their part in dealing with global nutrition problems. Most alarming is that most people, supported by misleading statements by RUTF producers,⁴² assume that CMAM is solving the hunger and malnutrition problems for the billion people in the world suffering from it.

³⁹ WFP Nutrition. Follow-up to questions raised by the global nutrition cluster members WFP suspends distribution of some specialized supplementary foods as precautionary measure. Report, 18 July 2012.

⁴⁰ Ali E, Zachariah R, Shams Z et al. Peanut-based ready-to-use therapeutic food: how acceptable and tolerated is it among malnourished pregnant and lactating women in Bangladesh? *Matern Child Nutr* 2013 doi: 10.1111/mcn.12050

⁴¹ Schaetzel T, Nyaku A, IYCN Project. The case for preventing malnutrition through improved infant feeding and management of childhood illness. USAID IYCF Project. Presented at the 10th Commonwealth Association of Paediatric Gastroenterology and Nutrition (CAPgAN) Congress on Diarrhoea & Malnutrition in Blantyre, Malawi, August 2009.

⁴² Sachs J, Fanzo J, Sachs S. Saying "Nuts" to Hunger. *Huffington Post*, 09/06/10.

http://www.huffingtonpost.com/jeffrey-sachs/saying-nuts-to-hunger_b_706798.html

RUSF

While there is widespread agreement on approximately the correct composition of RUTF (and a WHO standard for it),⁴³ the same is not true for RUSF. A good deal of research is still required to explore the impact of different formulations on different outcomes. Much of the thinking and research on the development of RUSFs is being done by a group at the University of California, Davis.^{44,45} They use the term “lipid-based nutrient supplements” (LNS), rather than RUSF, and are attempting to find ways of reducing the food-like component of RUSF so as to optimize nutritional impact while reducing the risk of breastmilk displacement, an issue addressed by few others who work on complementary feeding issues.

Its advantages

It was assumed that lower cost RUSFs with similar properties to RUTFs could fulfil other needs for larger groups; in particular it was expected to function better than existing cereal blends used in food aid programmes. Again, Nutriset was the first to develop this product and the most well-known brand, Plumpy Doz, is theirs. The UN has endorsed its use for treatment of MAM in emergency settings (but not for other contexts and not for prevention).

RUSFs are attractive to some technicians because they can provide nutrients like iron and zinc that are difficult for low-income families to provide in adequate quantity to infants starting at 6 months of life. Second, RUSFs save mothers’ time and require no special knowledge of nutrition, hygiene or infant feeding, all of which are complex and generally not substantially improved in routine health education programmes. The successful use of home-made complementary foods is time-consuming and certainly requires such special knowledge. While such advantages are important and indeed most citizens of high income countries, despite high levels of education, would have difficulty keeping a number of children healthy living on a dirt floor, cooking over a three-stone fire, and working 12 hours a day just to afford tomorrow’s food, the fact is that the majority of poor mothers living under such conditions do not need RUSF. They have well-nourished children, even in the countries with the highest rates of malnutrition.

RUSFs are designed to avoid some of the limitations in absorbability and some of the anti-nutritional substances present not only in home-made foods but in many foods used in food aid for supplemental feeding (targeted or blanket) programmes such as blended foods like corn soy blend (often distributed together with vegetable oil). Like RUTFs, RUSFs have the advantage of being a vehicle for providing milk powder (or whey protein) in a way that is easily and safely stored and resistant to bacterial contamination.

While the use of a food supplement may not be necessary in food secure situations (in one study nutrition education worked as well when a per protocol analysis was used),⁴⁶ naturally people prefer to get some free food for their children rather than just receiving information. Thus in that study, the drop-out rate was higher in the group that received education instead of free food.

The downside of RUSFs

- RUSFs are new foods, unfamiliar to the populations expected to benefit from them. Thus in some settings the expense of introducing and obtaining acceptance for them might better be spent in more conventional forms of nutrition education focusing on already available foods. Indeed, human rights conventions obligate governments to provide clean and adequate water, support locally sustainable food economies and systems, and communicate practical nutritional information.

⁴³ A Joint Statement by the World Health Organization, the World Food Programme, the United Nations System Standing Committee on Nutrition and the United Nations Children’s Fund. Community-based management of severe acute malnutrition. Geneva, WHO/WFP/UN/UNICEF, 2007

⁴⁴ Dewey KG, Arimond M. Lipid-based nutrient supplements: how can they combat child malnutrition? PLoS Medicine 2012;9:e1001314

⁴⁵ Arimond M, Zeilani M, Jungjohann S et al. Considerations in developing lipid-based nutrient supplements for prevention of undernutrition: experience from the International Lipid-Based Nutrient Supplements (iLiNS) Project. Matern Child Nutr 2013 doi: 10.1111/mcn.12049

⁴⁶ Nikièma L, Huybregts L, Kolsteren P et al. Treating moderate acute malnutrition in first-line health services: an effectiveness cluster-randomized trial in Burkina Faso. Am J Clin Nutr 2014;100(1):241-9

- Focusing on available local foods has additional environmental advantages compared to packaged food like RUSF transported over long distances and creating additional waste requiring disposal that can be problematic in some areas.
- While its low water activity means RUSF does not support bacterial growth, it actually increases the need for access to safe water for infants and young children. Since RUSF has a high renal solute load, children not given additional plain water to drink may become dehydrated, especially in hot and dry climates. Typically infants receive adequate water from breastmilk, fruit, and watery foods that have been cooked and thus are likely not to be seriously contaminated. Thus widespread use of RUSF ought to be linked to an increased availability of safe water and training in hygiene.
- Another downside of RUSFs is their high cost. One study found that, with respect to outcomes like diarrhoea and anaemia, adding RUSFs to an intervention package actually significantly lowered cost effectiveness.⁴⁷ The duration of use, the amount given per day, and logistical and delivery costs all need to be taken into account. For example, many studies only give RUSF for a few weeks. One study touts that, although RUSF failed to have any impact on development or morbidity, it increased weight and height, but this was true only when it was given for 6 rather than 3 months (and at 108 kcal/d).⁴⁸ Indeed, several studies have found an impact but a supplementation period of even up to one year was used,⁴⁹ and, beyond other objections that might be raised, this is beyond what is reasonable to expect governments or donors to do to prevent malnutrition.
- The long-term effects of RUSF use on body composition and on food consumption patterns compared to a traditional complex diet, are unknown. Again, the greater the number of calories given, the greater the chance for breastmilk displacement.
- Studies of RUSF do not compare it to the distribution of locally available foods. One study, conducted in Kenya partly due to concerns about the lack of sustainability of programmes distributing commercially prepared products found that the distribution of monthly rations of locally available foods also resulted in weight gain and reduced acute malnutrition.⁵⁰

Food aid issues

Food aid as delivered by most donors like the World Food Programme is mainly humanitarian aid, which is now much more closely monitored and is meant to follow a set of agreed upon guidelines.⁵¹ UNHCR has issued guidance for the use of special nutritional products.⁵² Height is somewhat complex and expensive to measure, but using it in deciding which children to provide with RUSF/RUTF could lower costs by 61% according to one analysis.⁵³

In one study, when fed for one year, RUSF was not found to improve weight more than a corn-soy blend (CSB), but may have improved height growth somewhat,⁵⁴ another doing so if a dose of at least 50g/d was given.⁵⁵ The use of small doses of LNS (20g/d for young children and 40g/d for persons living with HIV) has

⁴⁷ Puett C, Salpéteur C, Lacroix E et al. Protecting child health and nutrition status with ready-to-use food in addition to food assistance in urban Chad: a cost-effectiveness analysis. *Cost Eff Resour Alloc* 2013;11(1):27

⁴⁸ Iannotti LL, Dulience SJL, Green J et al. Linear growth increased in young children in an urban slum of Haiti: a randomized controlled trial of a lipid-based nutrient supplement. *Am J Clin Nutr* 2014;99(1):198-208

⁴⁹ Phuka JC, Maleta K, Thakwalakwa C et al. Postintervention growth of Malawian children who received 12-mo dietary complementation with a lipid-based nutrient supplement or maize-soy flour. *Am J Clin Nutr* 2009;89(1):382-90

⁵⁰ Tomedi A, Rohan-Minjares F, McCalmont K et al. Feasibility and effectiveness of supplementation with locally available foods in prevention of child malnutrition in Kenya. *Public Health Nutr* 2011;15(4):749-56

⁵¹ The SPHERE Project. Free online humanitarian training resources <http://www.sphereproject.org/blog/free-online-humanitarian-training-resources/>

⁵² United Nations High Commission for Refugees. UNHCR Operational Guidance on the Use of Special Nutritional Products to Reduce Micronutrient Deficiencies and Malnutrition in Refugee Populations, 2011. <http://www.unhcr.org/4f1fc3de9.html>

⁵³ Yang Y, Van den Broeck J, Wein LM. Ready-to-use food-allocation policy to reduce the effects of childhood undernutrition in developing countries. *Proc Natl Acad Sci* 2013;110(12):4545-50

⁵⁴ Phuka JC, Maleta K, Thakwalakwa C et al. Complementary feeding with fortified spread and incidence of severe stunting in 6-to 18-month-old rural Malawians. *Arch Pediatr Adolesc Med* 2008;162(7):619-26

⁵⁵ Phuka JC, Maleta K, Thakwalakwa C et al. Postintervention growth of Malawian children who received 12-mo dietary complementation with a lipid-based nutrient supplement or maize-soy flour. *Am J Clin Nutr* 2009;89(1):382-90

been recommended to USAID.⁵⁶ RUSF appears to have an advantage over CSB++ (CSB with added milk powder) in that it is less shared with others in the family.⁵⁷

Prevention of SAM/treatment of MAM

The idea of the large-scale use of RUSF to prevent MAM from developing into SAM received a huge push when Médecins Sans Frontières (MSF) tested whether RUTF might achieve this during the annual hungry season in a region of Niger in 2005.⁵⁸ One early study in the same country used a poor quality study design.⁵⁹ Children who received RUTF did better than children who received nothing. Such an outcome would have been achieved if they had received a sandwich. Later studies have found RUTF to perform about as well as⁶⁰ or slightly better than CSB.^{61,62,63} CSB++ performs as well as soy RUSF.^{64,65} A study in Mali found that adding RUSF to an existing package of household foods being provided, reduced iron deficiency and morbidity, but failed to prevent acute malnutrition.⁶⁶ Another in Honduras showed that LNS added to a food supplement improved micronutrient status.⁶⁷ But a trial in Malawi found only a small improvement in weight with LNS compared to CSB.⁶⁸ As in the case of treatment for SAM, many cases may revert to being malnourished. And, as in the case with RUTF, one recent review found that while RUSFs may increase recovery rates and decrease non-responders in treating MAM, weight differences were small.⁶⁹ One review in 2010⁷⁰ noted that RUSFs still have no proven benefits over other supplements in preventing under-nutrition. Another came to similar conclusions in 2013, stating “Blended foods such as CSB++ may be equally effective and cheaper than LNS.”⁷¹ A large and complex study (comparing seven groups of villages receiving

⁵⁶ Webb P, Rogers B, Rosenberg I et al. *Delivering Improved Nutrition: Recommendations for Changes to U.S. Food Aid Products and Programs*. Boston, MA: Tufts University, 2011

⁵⁷ Wang RJ, Trehan I, LaGrone LN et al. Investigation of Food Acceptability and Feeding Practices for Lipid Nutrient Supplements and Blended Flours Used to Treat Moderate Malnutrition. *J Nutr Educ Behav* 2013;45(3):258-63

⁵⁸ Defourny I, Minetti A, Harci G et al. A large-scale distribution of milk-based fortified spreads: evidence for a new approach in regions with high burden of acute malnutrition. *PloS One* 2009;4:e5455

⁵⁹ Isanaka S, Nombela N, Djibo A et al. Effect of preventive supplementation with ready-to-use therapeutic food on the nutritional status, mortality, and morbidity of children aged 6 to 60 months in Niger: a cluster randomized trial. *JAMA* 2009;301(3):277-85

⁶⁰ Matilsky DK, Maleta K, Castleman T et al. Supplementary feeding with fortified spreads results in higher recovery rates than with a corn/soy blend in moderately wasted children. *J Nutr* 2009;139:773-8

⁶¹ Nackers F, Broillet F, Oumarou D et al. Effectiveness of ready-to-use therapeutic food compared to a corn/soy-blend-based pre-mix for the treatment of childhood moderate acute malnutrition in Niger. *J Trop Pediatr* 2010;56(6):407-13

⁶² Chang CY, Trehan I, Wang RJ et al. Children successfully treated for moderate acute malnutrition remain at risk for malnutrition and death in the subsequent year after recovery. *J Nutr* 2013;143(2):215-20

⁶³ Lin CA, Manary MJ, Maleta K et al. An energy-dense complementary food is associated with a modest increase in weight gain when compared with a fortified porridge in Malawian children aged 6–18 months. *J Nutr* 2008;138:593-8

⁶⁴ LaGrone LN, Trehan I, Meuli GJ et al. A novel fortified blended flour, corn-soy blend “plus-plus,” is not inferior to lipid-based ready-to-use supplementary foods for the treatment of moderate acute malnutrition in Malawian children. *Am J Clin Nutr* 2010;95(1):212-9

⁶⁵ Ivers LC, Teng JE, Jerome JG et al. A Randomized Trial of Ready-to-Use Supplementary Food Versus Corn-Soy Blend Plus as Food Rations for HIV-Infected Adults on Antiretroviral Therapy in Rural Haiti. *Clin Infect Dis* 2014;58(8):1176-84

⁶⁶ Huybregts L, Hounbé F, Salpéteur C et al. The effect of adding ready-to-use supplementary food to a general food distribution on child nutritional status and morbidity: a cluster-randomized controlled trial. *PLoS Medicine* 2012;9:e1001313

⁶⁷ Siega-Riz AM, Estrada Del Campo Y, Kinlaw A et al. Effect of Supplementation with a Lipid-Based Nutrient Supplement on the Micronutrient Status of Children Aged 6–18 Months Living in the Rural Region of Intibucá, Honduras. *Paediatr Perinat Epidemiol* 2014;28(3):245-54

⁶⁸ Thakwalakwa CM, Ashorn P, Jawati M et al. An effectiveness trial showed lipid-based nutrient supplementation but not corn-soya blend offered a modest benefit in weight gain among 6-to 18-month-old underweight children in rural Malawi. *Public Health Nutr* 2012;15(9):1755-62

⁶⁹ Roberfroid D, Hammami N, Mehta P et al. *Management of oedematous malnutrition in infants and children aged >6 months: a systematic review of the evidence*. Geneva: World Health Organization, 2013

⁷⁰ Hendricks KM. Ready to use therapeutic food for prevention of childhood undernutrition. *Nutrition Reviews* 2010;68(7):429-35

⁷¹ Lazzarini M, Rubert L, Pani P. Specially formulated foods for treating children with moderate acute malnutrition in low- and middle-income countries. *Cochrane Database of Systematic Reviews* 2013, Issue 6. Art. No.: CD009584. DOI:10.1002/14651858.CD009584.pub2

different interventions) found that the provision of both cash (\$52/mo) and a smaller supplement of Plumpy Nut and Plumpy 'Doz did not have any beneficial effect compared to a fortified cereal.⁷²

Scaling up

As has been seen in the case of vitamin A capsules (where the development-agency-defined “need” continued to grow as donor interest in providing them increased),⁷³ for donor-driven, product-based, business-friendly approaches, scaling up takes place as the donors make more resources available rather than in response to developing country needs or capacity expansion. As Michael Latham pointed out, a close parallel was the “great protein fiasco” of the 60s and early 70s.⁷⁴

As far as I know, especially given that treatment of SAM was embarrassingly neglected, before the entrance of RUSF on the “donor market”, there had never been any serious discussion of treating moderately malnourished children. Suddenly, it was imperative to do so. MSF initiated a campaign in October 2007 called “Starving for Attention” to highlight the neglect of SAM mentioned above, but also to promote use of RUFs for both treatment and prevention of malnutrition, holding a widely publicized meeting on it in New York in September 2008. MSF was mildly criticized for not doing this within the context of the WHO *Global Strategy on Infant and Young Child Feeding*, giving inadequate attention to the protection and support of early, exclusive, and continued breastfeeding, and basically treating infants as though they are “beneficiaries in waiting” for RUFs.⁷⁵

WHO then held a conference on the treatment of MAM and the resulting set of papers, published in a special issue of *Food and Nutrition Bulletin*,⁷⁶ did indeed suggest that special foods were probably needed to rehabilitate these children as well. When it became clear in the early 90s that micronutrients were going to be the next big issue attracting large-scale donor funding, the UN agencies fought over who would take the lead. The result was that the donors set up separate agencies to distribute their funds (skimming off the usual “overheads” of course): the Micronutrient Initiative, GAIN, and others. This time, as it became clear that RUFs were to be the next donor “flavour of the month”, there was no risk of this occurring. The leadership “cake” was divided up: WHO would take leadership for in-patient care of SAM, UNICEF for out-patient care of SAM (CMAM), and WFP for programming to deal with MAM.

Papers began to be published to show that the use of RUSFs can prevent malnutrition or replace complementary feeding,⁷⁷ that is, that the markets for these products could include literally billions of children. Yet research on complementary feeding in general is not well developed, most studies have not shown impressive results (perhaps in part because researchers rarely appreciate or account for the breastmilk displacement effect complementary foods can have), and the issues involved are extremely complex.⁷⁸ For this purpose, a product called “ready-to-use complementary food” (RUCF) has been designed, though so far it has not been found to be superior to an earlier fortified food used for this purpose (UNIMIX).⁷⁹ So far the

⁷² Langendorf C, Roederer T, de Pee S, Brown D, Doyon S, et al. (2014) Preventing Acute Malnutrition among Young Children in Crises: A Prospective Intervention Study in Niger. *PLoS Med* 11(9): e1001714. doi:10.1371/journal.pmed.1001714

⁷³ Greiner T. Vitamin A Wars: the Downsides of Donor-driven Aid. *Independent Science News*, Sept 25, 2012 <http://www.independentsciencenews.org/health/vitamin-a-wars-the-downsides-of-donor-driven-aid/>

⁷⁴ Latham MC. The First Food Crisis? How to reduce the unacceptable levels of malnutrition through improved breastfeeding. Presentation to WABA, Sept 2008 <http://www.waba.org.my/whatwedo/advocacy/pdf/foodcrisis.pdf>

⁷⁵ Infant and Young Child Feeding in Emergencies Core Group. Discussion paper on infant and young child feeding in the context of current initiatives to address moderate acute malnutrition in children under 2 years <http://www.enonline.net/pool/files/ife/ife-core-group-discussion-paper-final-250908.pdf>

⁷⁶ *Food and Nutrition Bulletin Supplement*. WHO/UNICEF/WFP/UNHCR Consultation on the management of moderate malnutrition in children under 5 years of age. Volume 30, Number 3, September 2009

⁷⁷ Phuka JC, Maleta K, Thakwalakwa C et al. Complementary feeding with fortified spread and incidence of severe stunting in 6- to 18-month-old rural Malawians. *Arch Pediatr Adolesc Med* 2008;62:619-29

⁷⁸ Lassi ZS, Zahid G, Das JK et al. Systematic Review of Complementary Feeding Strategies amongst Children Less than Two Years of Age. Report to UK Aid, 2013 http://r4d.dfid.gov.uk/pdf/outputs/Malnutrition/Revised-Complementary-Feeding-desk-study_5-13-2013.pdf

⁷⁹ Bisimwa G, Owino VO, Bahwere P et al. Randomized controlled trial of the effectiveness of a soybean-maize-sorghum-based ready-to-use complementary food paste on infant growth in South Kivu, Democratic Republic of Congo. *Am J Clin Nutr* 2012;95(5):1157-64

impact of RUSF, even in treating MAM,⁸⁰ is not adequately impressive to set in motion such large-scale use, but the groundwork is being laid. Once the producers are ready and the donor funds available, the best research available at that time will be declared the basis for an imperative “call to arms” and the wholesale destruction of complementary food traditions will be launched.

Just as in the vitamin A capsule case where terminology was changed to suit donor preferences (UN agencies began informing participants in international meetings that vitamin A capsules were no longer to be referred to as “short term” or “stop gap” measures, but were to be integrated into primary health care, like vaccination), CMAM reports are now stating that stunting cannot be successfully addressed without first solving the problem of wasting, providing a convenient excuse for ignoring (or failing to have an impact on) the much larger and more complex problem of stunting while pushing ahead with CMAM.

Finally, another similar process is taking place. As donors allocated increasing funding for vitamin A capsules, the infant mortality rate that “required” that countries distribute them gradually decreased. Now the arm circumference threshold for which young children “need” RUTF or RUSF is increasing.⁸¹

Marketing issues

RUTF is a product not likely to be abused through promotion to the public on the open market. It is bought by agencies that work with CMAM, mainly UNICEF and NGOs. But RUSF is highly subject to this risk. Many who believe that products alone can prevent malnutrition actually are favourable to such promotion and think manufacturers should be encouraged to market such products. In particular they believe that this approach, occurring on a large scale, will bring down unit costs. Publicly-funded commercially-oriented market research is already laying the foundations for this process to take place,^{82,83} as has long been happening in the case of commercial complementary foods.⁸⁴

In such quarters there seems to be little concern that, in the worst case, low-income mothers might sacrifice far too much of scarce family income to buy amounts of expensive RUSFs that are too small to make any difference in their children’s nutritional status. Warnings about the dangers of this began a few years ago,⁸⁵ as manufacturers began ramping up to promote and sell the product to the public on the open market in low-income countries. We have seen advertising in Africa for an RUSF called Grandibien (French for grow well) with chocolate flavour (which flavour is also added to a RUSF named “Shakti” in India). Meanwhile, Valid Nutrition (<http://www.validnutrition.org/>) is gearing up to ensure that RUSF use expands to an extremely large scale. Steve Collins, a researcher who has published in this field, is quoted on their website as saying “For the first time in history we have the potential to combat starvation.” This goes beyond anything reasonable in several ways, but may be bringing an increase in resources to Valid. The author has written to him about the risks of the promotion of RUSF, heard that he was giving attention to the letter, but has never received a reply.

The threat to breastfeeding

Several investigators have designed studies to detect if the use of RUSFs had a rapid and substantial impact on breastfeeding (usually frequency) and have not found any such relation. One that is widely cited

⁸⁰ Lazzerini M, Rubert L, Pani P. Specially formulated foods for treating children with moderate acute malnutrition in low- and middle-income countries. Cochrane Database of Systematic Reviews 2013, Issue 6. Art. No.: CD009584. DOI:10.1002/14651858.CD009584.pub2

⁸¹ Inter-Agency Nutrition Meeting. Options for exceptional community-based management of acute malnutrition programming in emergencies. Washington DC, July 9, 2014.

⁸² Tripp K, Perrine CG, de Campos P et al. Formative research for the development of a market-based home fortification programme for young children in Niger. *Matern Child Nutr* 2011;7(s3):82-95

⁸³ Segrè J, Winnard K, Abrha TH et al. Willingness to pay for lipid-based nutrient supplements for young children in four urban sites of Ethiopia. *Matern Child Nutr* 2013 doi:10.1111/mcn.12022

⁸⁴ Pelto GH, Armar-Klemesu M. Balancing nurturance, cost and time: complementary feeding in Accra, Ghana. *Matern Child Nutr* 2011;7(s3):66-81

⁸⁵ Latham MC, Jonsson U, Sterken E et al. RUTF stuff: Can the children be saved with fortified peanut paste? *World Nutrition* 2011;2(2):62-85

compared breastmilk intake in infants fed RUSF with those fed UNIMIX.⁸⁶ While there was no difference between them, they were not compared to infants fed homemade complementary foods. Another found that the addition of a small amount of LNS (20 g twice a day) to the diet at 6 months did not reduce the number of breastfeeds per day.⁸⁷ Nor did the provision of 108 g/day of Nutributter.⁸⁸ Not surprisingly, there was no difference in the number of breastfeeds per day in groups who received 50g/day (254 kcal) or LNS compared to 71 g/day (282 kcal) of CSB.⁸⁹

An earlier study found that one month after introducing complementary foods to 6 month-old infants, the quantity of breastmilk consumed (using the “golden standard” isotope dilution method to measure intake) had declined significantly (from 129 to 115 g/kg body weight per day), but there was no difference in impact between groups that received 25 g/day of LNS, 50 g/day of LNS, or 72 g/day of CSB.⁹⁰ Rather than being interpreted to show that RUSFs have no impact, this could be interpreted to say that 25 g/day of LNS depressed breastmilk consumption as much as three times that amount of CSB. It should be pointed out that by definition, the intention of “complementary” foods added at 6 months of age is not to displace breastmilk but to maintain breastmilk production while giving additional food as the child continues to grow.

Even if a large number of serious studies had found no impact of RUSF use on breastfeeding under controlled conditions, this does not mean there would never be any impact under non-research conditions. It depends in part on how the products are promoted and the resulting beliefs families have about them, which in turn will influence how they are used in individual settings. If mothers are told that these scientifically developed foods will prevent malnutrition in their children, then of course many, who commonly already believe that their diets are too poor for their breastmilk to be good,⁹¹ will use as much as they can afford, likely displacing breastmilk. In one study, mothers’ commitment to continue breastfeeding was portrayed as a major obstacle to RUSF effectiveness,⁹² likely to become increasingly common as people with a poor understanding of malnutrition in a setting of poverty join the RUSF bandwagon.

As Michael Latham often pointed out, those involved in the promotion of optimal infant and young children feeding are already neglecting to put adequate attention toward the need of encouraging and supporting women to continue giving as much breastmilk as possible beyond the age of 6 months of life, particularly into the second year; promotion or promiscuous distribution of RUSFs threatens to worsen the situation. Infant and young child feeding statements as well as the latest global nutrition targets focus almost universally on exclusive breastfeeding and then quickly shift to foods needed after 6 months without adequately stressing the need to support continued breastfeeding at the highest levels possible for 2 years and beyond.⁹³

Integrating infant and young child feeding into CMAM may help ensure that approaches used do the least possible harm to breastfeeding.⁹⁴ But the early studies cited above seem to have allayed fears such that breastfeeding beyond 6 months is no longer on the agenda among agencies working with CMAM. For

⁸⁶ Owino VO, Bahwere P, Bisimwa G et al. Breast-milk intake of 9–10-mo-old rural infants given a ready-to-use complementary food in South Kivu, Democratic Republic of Congo. *Am J Clin Nutr* 2011;93(6):1300-4

⁸⁷ Flax VL, Ashorn U, Phuka J et al. Feeding patterns of underweight children in rural Malawi given supplementary fortified spread at home. *Matern Child Nutr* 2008;4(1):65-73

⁸⁸ Adu-Afarwuah S, Lartey A, Brown KH et al. Randomized comparison of 3 types of micronutrient supplements for home fortification of complementary foods in Ghana: effects on growth and motor development. *Am J Clin Nutr* 2007;86(2):412-20

⁸⁹ Flax VL, Phuka J, Cheung YB et al. Feeding patterns and behaviors during home supplementation of underweight Malawian children with lipid-based nutrient supplements or corn-soy blend. *Appetite* 2010;54(3):504-11

⁹⁰ Galpin L, Thakwalakwa C, Phuka J et al. Breast milk intake is not reduced more by the introduction of energy dense complementary food than by typical infant porridge. *J Nutr* 2007;137(7):1828-33

⁹¹ Perez-Escamilla R, Lutter CK, Wickham C et al. Identification of risk factors for short breastfeeding duration in Mexico City through survival analysis. *Ecology of Food and Nutrition* 1997;36(1):43-64

⁹² Davis TE, Fischer EF, Rohloff PJ et al. Chronic Malnutrition, Breastfeeding, and Ready-To-Use Supplementary Food in a Guatemalan Maya Town. *Human Organization* 2014;73(1):72-81

⁹³ Comprehensive implementation plan on maternal, infant and young child nutrition. WHO, Geneva, 2014 http://www.who.int/nutrition/topics/WHA65.6_annex2_en.pdf

⁹⁴ Lung’aho M, Stone Jimenez M. Integration of IYCF support into CMAM. Emergency Nutrition Network, 2009 <http://www.enonline.net/pool/files/ife/iycf-cmam-facilitators-us-final.pdf>

example, it was not mentioned in a 2012 synthesis of lessons learned based on case studies of CMAM implementation in nine countries.⁹⁵

One idea I believe the breastfeeding “community” should promote is that every project with a budget for RUSFs should have an equally large budget for the protection, promotion and support of breastfeeding. Every evaluation of the impact of RUSFs should include examination of whether they displace breastmilk more or less than the traditional foods or food aid foods the RUSF is replacing.

Putting the brakes on

Already in June 2009, the World Alliance for Breastfeeding Action (WABA) expressed its concern about the “commercialization of malnutrition” and called for the development of guidelines for the appropriate use of RUTF and other fortified food supplements, expressing the need “to give equal weight to strategies using increased support for continued breastfeeding and optimal use of customary family and indigenous foods rather than focusing solely on fortified foods.”⁹⁶ A later WABA statement called for ensuring that “RUTFs and RUSFs are not used as a preventive measure in stable populations and that these products are prepared from locally-produced foods and not imported.”⁹⁷

Similarly, IBFAN expressed concern that malnutrition “prevention and treatment are becoming increasingly medicalized with the use of fortified commercial foods as ‘quick fixes’, ignoring community-based approaches and underlying and basic causative factors.” IBFAN further called on governments and others concerned “to take steps to ensure that the primary treatment of all types of acute malnutrition is based on local foods and supervised by trained health professionals without undue commercial influence.”⁹⁸ Certainly, the use of local foods to the greatest extent possible is not only the ideal, but is widely accepted (if not always implemented) by all the agencies involved.

A paper published in *World Nutrition* also criticized the use of RUTF for prevention of malnutrition,⁹⁹ and called for guidelines on how they should be used.¹⁰⁰ It listed the following as major problems: “The promotion of RUTF is now medicalizing and commercialising the prevention of malnutrition, which is better achieved by local measures to improve food intakes, health services and child care. It is unrealistic, and even irresponsible, to suggest that RUTFs could be provided worldwide to the very many millions of children identified as having mild malnutrition or chronic hunger.” Another major concern was the way UNICEF and many NGOs appeared to be focusing only on exclusive breastfeeding during the first 6 months, after which RUSF, rather than continued breastfeeding, was receiving attention.

The civil society constituency of the UN System Standing Committee on Nutrition met in Bangkok in October 2009 and produced a statement expressing similar concern and calling for the development of guidelines on the promotion of these products analogous to the *International Code of Marketing of Breastmilk Substitutes* before they were made available on the private commercial market. Draft guidelines for how such foods should be marketed, patterned on the *International Code*, were later published and discussed online.¹⁰¹

⁹⁵ Emergency Nutrition Network. Government experiences of scale-up of Community-based Management of Acute Malnutrition (CMAM). ENN: Oxford, 2012 <http://www.ennonline.net/pool/files/ife/cmam-conference-2012-synthesis.pdf>

⁹⁶ World Alliance for Breastfeeding Action. Joint Statement based on a workshop of the World Alliance for Breastfeeding Action (WABA) Global Breastfeeding Partners Meeting VII in Penang, Malaysia, October 2008 http://www.waba.org.my/pdf/gbpm_statement_June09.pdf

⁹⁷ Statement on the use of Ready-to-Use-Therapeutic and Supplementary Foods from the participants at the WABA Global Breastfeeding Partners Forum, 17-19th October 2010, Penang, Malaysia

⁹⁸ International Baby Food Action Network (IBFAN) Statement on the Promotion and Use of Commercial Fortified Foods as Solutions for Child Malnutrition, August 2011

⁹⁹ It did not discriminate between RUTF and RUSF.

¹⁰⁰ Latham MC, Jonsson U, Sterken E et al. RUTF stuff: Can the children be saved with fortified peanut paste? *World Nutrition* 2011;2(2):62-85

¹⁰¹ Greiner T. Draft Guidelines for the Marketing of Ready to Use Supplemental Foods for Children. *Field Exchange (Emergency Nutrition Network)* 41:47-51, 2011 <http://www.ennonline.net/pool/files/ife/fex41-draft-guidance-on-marketing-rusf-for-children-&-responses-fex41.pdf>

Unfortunately, WHO did not respond to multiple requests for comments and in general has not chosen to become involved, something that will have to take place if such guidelines are to have much impact. This may relate to opposition to the guidelines expressed by a high-profile group involved in LNS research because it “would be likely to stifle private sector investment.”¹⁰² They also complain that it is unfair to regulate promotion of RUSFs while not doing so for complementary foods (a long-standing and ongoing effort) or the snacks commonly fed by mothers to young children. WHO recommendations state that RUSFs are needed: “In situations of food shortage, or where some nutrients are not sufficiently available through local foods, specially formulated supplementary foods are usually required to supplement the regular diet.”¹⁰³ But these researchers state that “even with diverse diets including animal-source foods it is difficult to meet some micronutrient needs, particularly for infants 6-11 months of age,” a view that no doubt many donors share, ensuring that there will be no limit to how widely the “need” for RUSF is perceived to be.

One of the clearest statements regarding how inappropriate donor-led use of RUFs is came from a proposal for a draft code of conduct for sustainable diets from a Food and Agriculture Organisation scientific symposium: “Recognizing that when ecosystems are able to support sustainable diets, nutrition programmes, policies and interventions supporting the use of supplements, RUTF, fortificants, and infant formulas are inappropriate and can lead to malnutrition, and that the marketing of these food substitutes and related products can contribute to major public health problems.”¹⁰⁴ This was later cited by the Special Rapporteur on the Right to Food, Olivier De Schutter, in a report to the Human Rights Council.¹⁰⁵

Unlike in other countries, the use of imported RUTF has remained controversial in India. In mid-2009, UNICEF was brought before a court in India for importing RUTF into the country without government permission. UNICEF stated that it had brought the product to two states with the permission of those states.

Donor-driven = lack of sustainability

Until the donors became interested in providing RUSFs to substantial numbers of children, there was widespread agreement that families in developing countries should largely feed themselves and be empowered and educated to do so successfully and sustainably. Expressions of such sentiment have now diminished. Even when RUSF appeared to work temporarily to prevent MAM from becoming SAM in Niger, the effect was short-lived, i.e., not sustainable.¹⁰⁶

As in the case of vitamin A capsule distribution,¹⁰⁷ CMAM is donor-driven, with reports admitting that “meeting the full costs of CMAM programming is beyond the reach of many governments,” and that a large proportion of the costs are for RUTF products, local production of which has not lowered costs (nutrients usually still have to be imported; as mentioned above, quality control costs may be high; milk powder is expensive). The sustainability of CMAM financing is particularly uncertain because the majority has been covered not under development budgets, but under humanitarian budgets. These are typically available only for short periods of time to cover costs during emergencies and can rapidly disappear when more severe

¹⁰² Arimond M, Dewey K, Briend A. Comment from Arimond et al. Field Exchange (Emergency Nutrition Network) 41:47-51, 2011 <http://www.enonline.net/pool/files/ife/fex41-draft-guidance-on-marketing-rusf-for-children-&-responses-fex41.pdf>

¹⁰³ WHO. Technical note: supplementary foods for the management of moderate acute malnutrition in infants and children 6–59 months of age. Geneva, World Health Organization, 2012 http://apps.who.int/iris/bitstream/10665/75836/1/9789241504423_eng.pdf?ua=1

¹⁰⁴ FAO. Report, International Scientific Symposium, Biodiversity and Sustainable Diets, United Against Hunger, Rome, 3-5 November 2010. <http://www.fao.org/ag/humannutrition/29186-021e012ff2db1b0eb6f6228e1d98c806a.pdf>

¹⁰⁵ Report submitted by the Special Rapporteur on the right to food, Olivier De Schutter. Human Rights Council Nineteenth session, Agenda item 3, Promotion and protection of all human rights, civil and cultural rights, political, economic, social, including the right to development. 26 December 2011, United Nations General Assembly, A/HRC/19/59

¹⁰⁶ Isanaka S, Nombela N, Djibo A et al. Effect of preventive supplementation with ready-to-use therapeutic food on the nutritional status, mortality, and morbidity of children aged 6 to 60 months in Niger: a cluster randomized trial. JAMA 2009;301(3):277-85

¹⁰⁷ Houston R. Sustainability of vitamin A supplementation programs. Technical brief to USAID, 2007 http://pdf.usaid.gov/pdf_docs/PNADK392.pdf

emergencies occur elsewhere. One agency working with CMAM mentions risks not only to sustainability, but the risk that CMAM could compete with community-based approaches to deal with MAM.¹⁰⁸ As is done for other donor-driven approaches, CMAM programming bypasses governments to a large extent. This prevents governments from fully understanding the issue, from developing their own capacity to deal with it, from engaging in the challenging process of deciding how much priority it deserves compared to other investment options, and certainly from developing the public support needed to ensure it obtains financing based on its own merits.

UNICEF began using RUTF as a basis for fundraising already in 2008. By that year, they were also promoting the use of RUSF (Plumpy 'Doz) to prevent malnutrition in Somalia.¹⁰⁹ The donor frenzy for using RUSFs to prevent malnutrition (or "treat" MAM) was not in response to any request or demand from the developing countries themselves. In fact, MSF, who had initiated it via its study in Niger, was accused by the government of not working collaboratively with it and forced to leave the country.¹¹⁰

Perhaps the most cynical and disturbing aspect of the current donor rush toward RUTF and RUSF is that it once again puts the cart before the horse. Instead of objectively programming this kind of tool for specific situations when and where it makes sense, products like these quickly become "one size that fits all." Like leaf concentrate (which shifted from being the answer to protein deficiency to being the solution for vitamin A deficiency) or vitamin A capsules (which shifted from a short-term stop-gap solution to vitamin A deficiency to a routine component of primary health care "needed" to decrease young child mortality), RUSF in particular is a solution looking for places where it might work or do good.

Concluding thoughts

If only because the resources available are so often insufficient to meet the direst of needs, it can be assumed that RUSFs are usually given only where really needed. Nevertheless, replacing or, more effectively, complementing current food aid commodities (the main one currently being CSB) with foods that work better to achieve the goals of each programme may be justifiable if the cost increase is not too great, especially when the target group includes many moderately malnourished children. If rational decision-making were the basis for development assistance, donors ought to compare several outcomes of the provision of RUSFs with provision of an equally expensive community-based nutrition programme, a behaviour change programme, and a conditional cash transfer in the amount that it costs to buy, ship and distribute the product.

This last point can and should be dealt within the broader context of product-based approaches for the prevention of malnutrition, for example vitamin A capsules. Such approaches currently utilize much if not most of the funding available for nutrition, resulting in little actual funding entering the developing countries and little being done to build institutional capacity for them to solve their own nutrition problems. In the context of the forthcoming Second International Nutrition Conference (November 2014), over 20 NGOs and other civil society groups recently stated: "Donors should start phasing out the use of product-based approaches for the prevention of malnutrition, and move to human rights-based, locally owned, bottom-up approaches, and restrict the use of product-based approaches to the treatment of acute malnutrition."¹¹¹

Developing countries themselves speak out only reservedly on top-down donor-driven approaches. In the smaller and weaker countries it is a political disaster if one is found to have turned down donor support even for superficial short-term approaches (in the case of RUTF, exactly as in the case of vitamin A capsules, there is no lack of criticism from a strong country not dependent on donor support like India). When asked in private, policymakers will say that what they want is sustainable improvements in the diets of their entire population. When asked if they are willing to fund donor-driven approaches when the donors withdraw, they

¹⁰⁸ Terre des hommes. Malnutrition and ready-to use therapeutic foods. Position paper on community management of severe acute malnutrition without complications with the help of ready-to-use therapeutic foods. July 2009

¹⁰⁹ UNICEF. An innovative approach to prevent child malnutrition in Somalia. Using Plumpy'Doz, the latest generation of ready-to-use food. 31 Dec 2008 http://www.unicef.org/media/media_46991.html

¹¹⁰ Reuters, French medical charity MSF says it is leaving Niger. 30 October 2008

¹¹¹ Oenema S, on behalf of civil society. FAO-WHO International Conference on Nutrition. Needed: Partnership with civil society. [Feedback]. World Nutrition 2014;5(5):495-9

carefully indicate that they cannot afford to do so.¹¹² One voice from Zimbabwe against the use of RUSF for the prevention of malnutrition can be read here.¹¹³

While any public health document utilizing openly a human rights and social justice lens for analysis would be quickly called biased and unscientific, the neoliberal agenda from the opposite end of the political spectrum has been increasingly successful over the past three decades in pressuring the public health community to accept “partnership” with, and even a degree of leadership from, the private sector. This neoliberal agenda is now so pervasive that few recognize it as a political agenda at all or understand that effective, proven alternatives to its approaches continue to exist.

Given how weak the scientific evidence base is so far for RUSF and even for RUTF, as documented by the above review of the existing literature, it is difficult to avoid the conclusion that conflicts of interest are involved in setting up both political and economic agendas. While researchers may not profit from sales of these foods, they are finding it easy to obtain research grants to study them and this is critical in a world where indeed one must “publish or perish.”

Despite admitting that the “differences were for the most part small”, the Gates Foundation-funded *Lancet* nutrition series heavily advocates and holds up as among the most effective interventions, the use of RUTF and other interventions based almost universally on fortificants that the vast majority of developing countries must import.¹¹⁴ Some 27% of the budget required to implement these interventions would go for treatment of SAM. Admitting the lack of hard research evidence, the *Lancet* article cites “substantial programmatic evidence” as a basis for its recommendations. This, it turns out, is a single article by Steve Collins who happens to run an organization that makes money selling RUTF (Valid International). The risks of creating dependency on transnational corporations and on charitable contributions (which are often then used as leverage to enforce adherence to neoliberal economic approaches) are, of course, nowhere mentioned by the *Lancet* authors.

Calling such an externally-imposed, dependency-creating intervention “evidence-based”, when such advocacy requires ignoring the existing evidence base (or lack thereof), is surely well within the definition of political propaganda. Yet the ready-to-use-food bandwagon continues to gather steam. As IBFAN points out, “meanwhile, breastfeeding and adequate complementary feeding continue to receive scant funding and attention despite the large body of research that demonstrates it is (by far) the most effective and sustainable intervention to positively impact child health and survival.”¹¹⁵ In addition, locally designed and run efforts to prevent malnutrition exist and could be supported if donors' interest was in supporting developing countries' independent capacity to solve the problem.¹¹⁶ This accelerating rush toward supporting product-based approaches epitomizes the continued refusal by most donor agencies to employ human rights approaches that call for sustainable solutions involving the mobilization and strengthening of local capacity to educate and assist vulnerable communities as well as the use of local foods, judiciously fortified only as necessary, while taking all possible steps to continue to protect, support, normalize and promote breastfeeding.

¹¹² For examples with respect to vitamin A capsules, see Greiner T. Vitamin A Wars: the Downsides of Donor-driven Aid. Independent Science News, September 24, 2012. <http://www.independentsciencenews.org/health/vitamin-a-wars-the-downsides-of-donor-driven-aid/>

¹¹³ McLellan A. Does the distribution of ready to use food products for the prevention of undernutrition meet the ultimate needs of the beneficiary? African Journal of Food, Agriculture, Nutrition and Development 2014;14(3):8956-62. <http://www.ajfand.net/Volume14/No3/McLellan13590.pdf>

¹¹⁴ Bhutta ZA, Das JK, Rizvi A et al. Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? *Lancet* 2013;382(9890):452-77

¹¹⁵ IBFAN. IBFAN calls for review of nutrition programmes for malnourished children. June 27, 2013 <http://info.babymilkaction.org/pressrelease/pressrelease27jun13>

¹¹⁶ As one example: McLellan A, Heinzer Y. Collaborating to Prevent Malnutrition: The Experience of an Innovative Community Intervention in Bikita District, Zimbabwe. African Journal of Food, Agriculture, Nutrition and Development 2013;13(3):1-4. <http://www.ajfand.net/Volume13/No3/Upenyu-article.pdf>

Abstracts

Bahwere P, Banda T, Sadler K et al. Effectiveness of milk whey protein-based ready-to-use therapeutic food in treatment of severe acute malnutrition in Malawian under-5 children: a randomised, double-blind, controlled non-inferiority clinical trial. *Matern Child Nutr* 2014;10(3):436-51

This randomised controlled trial was set up to test the effectiveness of a new RUTF formulation, containing whey protein concentrate (WPC) instead of dried skimmed milk (DSM), in treating SAM. WPC RUTF is cheaper than ordinary DSM RUTF. The trial was carried out in 600 children 6-59 months of age diagnosed as suffering from SAM in 17 outpatient treatment programmes in Malawi and blindly randomised to either WPC (n=308) or DSM (n=292) RUTF. Data were gathered by trained nurses and community health workers at enrolment and once a week until discharge from the programme. The statistical analysis showed that WPC RUTF is not inferior to DSM RUTF in terms of rate of recovery from SAM, average weight gain and length of stay in the treatment programme. The authors conclude that WPC RUTF is an effective cheaper alternative to DSM RUTF for the treatment of SAM.

Aguayo VM, Agarwal V, Agnani M et al. Integrated program achieves good survival but moderate recovery rates among children with severe acute malnutrition in India. *Am J Clin Nutr* 2013;98(5):1335-42

This study assessed the effectiveness of an integrated model for the management of SAM in India, where an average 8 million children are affected at any point in time. The model included facility- and community-based care for 2,740 children aged 6-59 months (79% between 6 and 23 months) randomly sampled from over 44,000 children admitted to 199 nutrition rehabilitation centres in the state of Madhya Pradesh from 1 January to 31 December 2010. The programme did not include the administration of RUTF or RUSF. Of the 2,684 programme exits (56 children with severe congenital or pathological conditions had to be transferred to the district hospital), 10 children (0.4%) died, 860 (32%) did not complete treatment, and 1,814 (68%) were discharged after a mean stay of 75.8 days. The

mean weight gain among discharged children was 2.7 g/kg body weight; on discharge, 1179 (65%) of the children had recovered (weight gain of 15% or more compared to initial weight). The survival rates in this integrated programme were very high. However, the moderate recovery rates seem to indicate that the protocols currently in use need to be improved.

Ali E, Zachariah R, Shams Z et al. Peanut-based ready-to-use therapeutic food: how acceptable and tolerated is it among malnourished pregnant and lactating women in Bangladesh? *Matern Child Nutr* 2013 doi: 10.1111/mcn.12050

Within a Medecins Sans Frontieres's nutrition programme in a slum of Dhaka, Bangladesh, this cross-sectional survey using semi-structure questionnaires was carried out to assess the acceptability of a peanut-based RUTF among malnourished pregnant and lactating women. A total of 248 women at risk of malnutrition admitted in the nutrition programme were interviewed. Overall, 212 (85%) perceived a therapeutic benefit. Despite this finding, 193 (78%) women found the peanut-based RUTF unacceptable, of whom 12 (5%) completely rejected it after 4 weeks of intake. Reasons for unacceptability included undesirable taste (60%) and unwelcome smell (43%); more than half of the latter was due to the peanut-based smell. Overall, 39% attributed side effects such as nausea, vomiting, diarrhoea, abdominal distension and pain to RUTF intake. Nearly 80% of women felt a need to improve the taste and smell of RUTF. Overall, only 146 (59%) understood the illustrated instructions on the package. Despite a perceived beneficial therapeutic effect, only 2 in 10 women found RUTF acceptable for nutritional rehabilitation.

Schoonees A, Lombard M, Musekiwa A et al. Ready-to-use therapeutic food for home-based treatment of severe acute malnutrition in children from six months to five years of age. *Cochrane Database of Systematic Reviews* 2013, Issue 6. Art. No.: CD009000. DOI: 10.1002/14651858.CD009000.pub2

Treating children with SAM in hospitals is not always desirable or practical in rural settings, and home treatment with food prepared by the carer, such as flour porridge, or commercially manufactured food, such as RUTF, may be better. This systematic review was conducted to assess the effect of home-based treatment on recovery, relapse and mortality in children with SAM. The search of the literature for randomised and quasi-randomised controlled trials where children between 6 months and 5 years of age with SAM were treated at home with RUTF compared to a standard diet, or different regimens and formulations of RUTFs compared to each other, yielded four trials, all conducted in Malawi with the same contact author. Three of the trials, all quasi-randomised, had a high risk of bias and one included children with HIV. When comparing RUTF with standard diet (flour porridge) in three of the quasi-randomised trials (599 children), the former slightly improved recovery by about 32% (95% confidence intervals between 16% and 50%), but there was no evidence of superiority in terms of relapse, mortality or weight gain. When comparing RUTF supplement with RUTF that meets total daily nutritional requirements, in two quasi-randomised trials (210 children) there was no difference in recovery, relapse, mortality and weight gain. When comparing a cheaper RUTF containing less milk powder (10%) versus standard RUTF (25% milk powder), in one randomised trial (1874 children) there was no difference for recovery, but the former led to 33% more children relapsing (95% confidence intervals between 3% and 72%) and to less weight gain (-0.50 g/kg/day; 95% confidence intervals between -0.75 and -0.25). Given the limited evidence currently available, it is not possible to reach definitive conclusions regarding differences in clinical outcomes in children with SAM given home-based RUTF compared to a standard diet, or treated with RUTF in different daily amounts or formulations.

Nikièma L, Huybregts L, Kolsteren P et al. Treating moderate acute malnutrition in first-line health services: an effectiveness cluster-randomized trial in Burkina Faso. *Am J Clin Nutr* 2014;100(1):241-9

This cluster randomized controlled trial compared the effectiveness of weekly context-appropriate child-centred counselling (CCC) with an improved corn-soy blend (CSB++) or a locally produced RUSF in treating children aged 6-24 months with uncomplicated MAM. Eighteen first-line rural health centres in Burkina Faso were randomised to the three arms, six per arm. In the CCC arm, trained health workers provided weekly personalized counselling to caregivers; in the two other arms, children received weekly either 455 g of CSB++ or 350 g of locally-produced soy-based RUSF. Both food supplements provided about 250 kcal per day. The recovery rate after three months of treatment was significantly lower with CCC (57.8%) than with CSB++ (74.5%) and RUSF (74.2%). Mothers' attendance at health facilities was also substantially lower in the CCC arm; this arm had also a high defaulter rate. When the analysis was adjusted for attendance, there were no significant differences between the three arms. The authors hypothesize that appropriate and specific nutrition counselling centred on children's needs, through primary health facilities, might be an alternative strategy for MAM treatment in rural food-secure areas, provided that attendance at counselling sessions by the caregiver is ensured.

Iannotti LL, Dulience SJL, Green J et al. Linear growth increased in young children in an urban slum of Haiti: a randomized controlled trial of a lipid-based nutrient supplement. *Am J Clin Nutr* 2014;99(1):198-208

Stunting affects one in five young children in Haiti. The objective of this study was to test the efficacy for increased linear growth of a daily lipid-based nutrient supplement (LNS), providing 108 kcal and other nutrients including vitamins A, vitamin B-12, iron, and zinc at 80% or more of the recommended amounts. A total of 589 healthy infants aged 6–11 months were recruited from an urban slum of Cap Haitien and randomly assigned to receive a control, LNS for 3 months, or LNS for 6 months. Infants were followed monthly on growth, morbidity, and developmental outcomes over a 6-month intervention period, and at one additional time point 6 months after the

intervention to assess sustained effects. The results showed that LNS supplementation for 6 months significantly increased the length-for-age z-score by 0.13 and the weight-for-age z-score by 0.12, compared with in the control group. The effects were sustained 6 months after the intervention. Morbidity and developmental outcomes did not differ by trial arm.

Puett C, Salpéteur C, Lacroix E et al. Protecting child health and nutrition status with ready-to-use food in addition to food assistance in urban Chad: a cost-effectiveness analysis. *Cost Eff Resour Alloc* 2013;11(1):27

A cost effectiveness analysis was conducted comparing costs and outcomes of two arms of a cluster randomized controlled trial implemented in eastern Chad during the 2010 hunger gap. This trial assessed the effect in preventing SAM and associated morbidity of a 5-month general distribution of staple rations, or staple rations plus a RUSF given to households with a child aged 6-36 months who was not acutely malnourished. While the addition of RUSF to a staple ration did not result in significant reduction in wasting rates, cost-effectiveness was assessed using successful secondary outcomes of cases of diarrhoea and anaemia averted among children receiving RUSF. Total costs of the programme and incremental costs of RUSF and related management and logistics were estimated using accounting records and key informant interviews, and include costs to institutions and communities. An activity-based costing methodology was applied and incremental costs were calculated per episode of diarrhoea and per case of anaemia averted. The results of this exercise showed that adding RUSF increased total costs by 23%, resulting in an additional cost per child of 374 Euros, and an incremental cost per episode of diarrhoea averted of 1,083 Euros and per case of anaemia averted of 3,627 Euros. This strategy is less cost-effective than other standard intervention options for averting diarrhoea and anaemia; it might be useful in emergency settings where infrastructure is weak and other intervention options are infeasible in the short-term.

Chang CY, Trehan I, Wang RJ et al. Children successfully treated for moderate acute malnutrition remain at risk for malnutrition and death in the subsequent year after recovery. *J Nutr* 2013;143(2):215-20

The objective of this study was to test if successful treatment reduces the risks of morbidity and mortality associated with MAM in affected young children. A total of 1,967 children aged 6-59 months successfully treated for MAM in rural Malawi following randomized treatment with CSB++, soy RUSF or soy/whey RUSF, were followed for 12 months. The initial supplementary food had been given until the child reached a WHZ of -2 or more. The median duration of feeding was 2 weeks, with a maximum of 12 weeks. The primary outcome, remaining well-nourished, was defined as: mid-upper arm circumference of 12.5 cm or more, or WHZ of -2 or more for the entire duration of follow-up. During the 12-month follow-up period, only 1,230 (63%) children remained well-nourished, 334 (17%) relapsed to MAM, 190 (10%) developed SAM, 74 (4%) died, and 139 (7%) were lost to follow-up. Children who had been treated with soy/whey RUSF were significantly more likely to remain well-nourished (67%) than those treated with CSB++ (62%) or soy RUSF (59%). This study demonstrates that children successfully treated for MAM with soy/whey RUSF are more likely to remain well-nourished than children treated with CSB++ or soy RUSF. However, all children successfully treated for MAM remain vulnerable.

Huybregts L, Houngré F, Salpéteur C et al. The effect of adding ready-to-use supplementary food to a general food distribution on child nutritional status and morbidity: a cluster-randomized controlled trial. *PLoS Medicine* 2012;9:e1001313

This cluster-randomized controlled trial examined the effect of RUSF on the prevention of wasting within the framework of a general food distribution programme. A sample of 1,038 children aged 6 to 36 months in the city of Abeche, Chad, were included in a general food distribution programme providing staple foods. Children in the intervention group were given,

in addition, 46g of RUSF daily for 4 months. Anthropometric measures and morbidity were recorded monthly. Adding RUSF did not result in a reduction in the cumulative incidence of wasting. However, the intervention group had a modestly higher gain in height-for-age. In addition, children in the intervention group had a significantly higher haemoglobin concentration at the end of the study than children in the control group, thereby reducing the odds of anaemia by almost 50%. Adding RUSF also resulted in a significantly lower risk of self-reported diarrhoea (-29.3%) and fever episodes (-22.5%).

Lizzerini M, Rubert L, Pani P. Specially formulated foods for treating children with moderate acute malnutrition in low- and middle-income countries. Cochrane Database of Systematic Reviews 2013, Issue 6. Art. No.: CD009584. DOI:10.1002/14651858.CD009584.pub2

This systematic review was carried out to evaluate the safety and effectiveness of different types of specially formulated foods for children with MAM in low- and middle-income countries, and to assess whether foods complying or not complying with specific nutritional compositions, such as the WHO technical specifications, are safe and effective. Eight randomised controlled trials with a low risk of bias, enrolling 10,037 children, met the inclusion criteria; seven of the trials were conducted in Africa. The provision of any specially formulated food, compared to standard care, increased the recovery rate by 29% (95% confidence intervals 20% to 38%), decreased the number dropping out by 70% (95% confidence intervals 22% to 39%), and improved weight-for-height. The reduction in mortality did not reach statistical significance. The comparison between LNS and any blended foods (dry food mixtures, without high lipid content) did not result in significant differences in mortality, progression to severe malnutrition, or number of dropouts. However, LNS significantly increased the number of children recovered by 10% (95% confidence intervals 4% to 16%), and decreased by 47% the number of non-recovering children (95% confidence intervals 40% to 69%). LNS also improved weight

gain, weight-for-height, and mid-upper arm circumference, although for these outcomes, the improvement was modest. One trial observed more children with vomiting in the LNS group compared to those receiving blended food. CSB++ resulted in similar outcomes to LNS. In one trial, CSB++ did not show any significant benefit over locally made blended food. No study evaluated the impact of improving adequacy of local diet, such as local foods prepared at home according to a given recipe or of home processing of local foods (soaking, germination, malting, fermentation) in order to increase their nutritional content. The authors conclude that there is moderate to high quality evidence that both LNS and blended foods are effective in treating children with MAM. Although LNS led to a clinically significant benefit in the number of children recovered in comparison with blended foods, it did not reduce mortality, the risk of default or progression to SAM; it also induced more vomiting. Blended foods such as CSB++ may be equally effective and cheaper than LNS. There are no studies evaluating interventions to improve the quality of the home diet, an approach that should be evaluated in settings where food is available, and nutritional education and habits are the main determinants of malnutrition.

Owino VO, Bahwere P, Bisimwa G et al. Breast-milk intake of 9–10-mo-old rural infants given a ready-to-use complementary food in South Kivu, Democratic Republic of Congo. Am J Clin Nutr 2011;93(6):1300-4

The objective of this study was to assess the breastmilk intake of infants given either a ready-to-use complementary food (RUCF) paste or a standard corn-soy blend (UNIMIX) porridge in South Kivu, Democratic Republic of Congo. Infants were randomly assigned at 6 months to receive either RUCF (n = 700) or UNIMIX (n = 700) for 6 months. Breastmilk intake (g/day measured from saliva samples by using infrared spectroscopy) was measured at 9-10 months in a subsample of 58 infants (29 from each group). Mean breastmilk intake was not significantly different between the two groups: RUCF (705 ± 236 g/day) and UNIMIX (678 ± 285 g/day).

Lenters LM, Wazny K, Webb P et al. Treatment of severe and moderate acute malnutrition in low-and middle-income settings: a systematic review, meta-analysis and Delphi process. BMC Public Health 2013;13, Suppl 3:S23

This systematic review assessed the effectiveness of interventions for SAM, including the WHO protocol for inpatient and community-based management with RUTF, as well as interventions for MAM in children under 5 years in low- and middle-income countries. Fourteen studies were included in the meta-analysis. Case fatality rates for inpatient treatment of SAM using the WHO protocol ranged from 3.4% to 35%. For community-based treatment of SAM, children given RUTF were 51% more likely to achieve nutritional recovery than the standard care group. For the treatment of MAM, children in the RUSF group were significantly more likely to recover and less likely to be non-responders than in the CSB group. In both meta-analyses, weight gain in the intervention group was higher, but the differences were small, although statistically significant. The authors admit that gaps in their ability to estimate effectiveness of overall treatment approaches for SAM and MAM persist.

Bhutta ZA, Das JK, Rizvi A et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? Lancet 2013;382(9890):452-77

This article is part of the 2013 *Lancet* series on Maternal and Child Nutrition, commissioned by the journal to update the 2008 series on the same topic. The authors assessed new evidence

and modelled the effect of a number of effective interventions on lives saved and cost in the 34 countries that have 90% of the world's children with stunted growth. Their analysis suggests that the current total of deaths in children younger than 5 years could be reduced by 15% in those 34 countries if populations could access the following evidence-based nutrition interventions at 90% coverage (ranked by estimated number of life saved): management of SAM plus management of MAM (435,000 lives saved); promotion of early and exclusive breastfeeding for 6 months and continued breastfeeding for up to 24 months plus appropriate complementary feeding education in food secure populations and additional complementary food supplements in food insecure populations (221,000); vitamin A supplementation between 6 and 59 months age plus preventive zinc supplements between 12 and 59 months of age (145,000); multiple micronutrient supplementation in pregnancy plus maternal balanced energy protein supplementation (102,000). Also, about a fifth of the existing burden of stunting could be averted using these approaches, if access could be improved. The estimated total additional annual cost involved for scaling up access to these nutrition interventions in the 34 focus countries is \$ 9.6 billion per year. If this improved access is linked to nutrition-sensitive approaches, i.e., women's empowerment, agriculture, food systems, education, employment, social protection, and safety nets, this could greatly accelerate progress in countries with the highest burden of maternal and child under-nutrition and mortality.

Prepared by the Geneva Infant Feeding Association (GIFA), an affiliate of the International Baby Food Action Network (IBFAN)

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