Kerry Health and Nutrition Institute.

Eradicating World Hunger: A Community-based Approach

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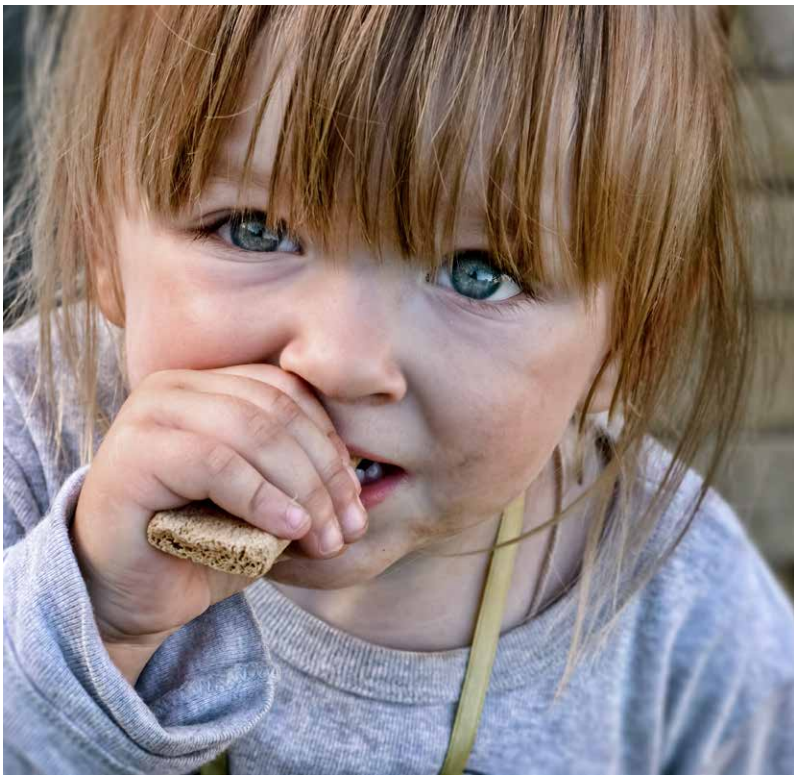
In the year 2000, the United Nations named eradicating world hunger as the first of their eight Millennium Development Goals, recognising it as one of the most challenging and important issues of our time[1]. Today, an estimated 12.9% of people living in developing regions are undernourished. While this represents an improvement on previous estimates of 18.3% in 2000 and 23.3% in 1990, 795 million people worldwide - roughly one in nine - remain chronically undernourished today[1]. Of these, 161 million are children. This white paper discusses the challenges involved in treating severe malnutrition and the community-based approach, which has transformed management of this serious problem.

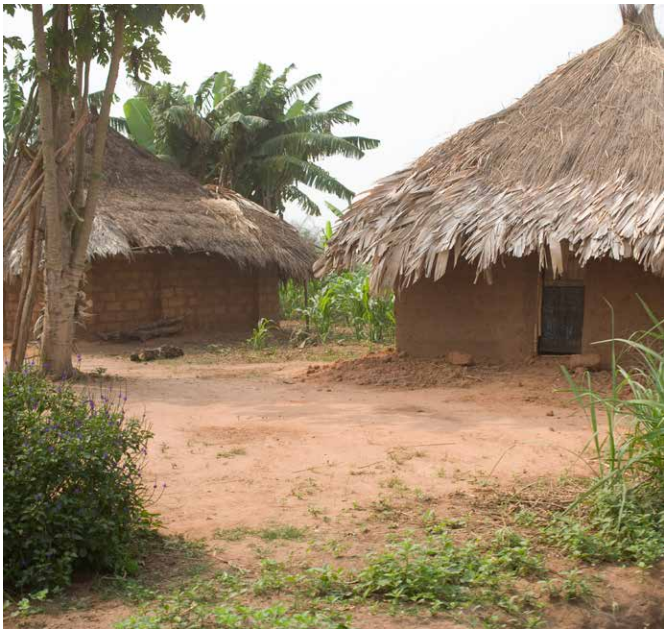
The number of undernourished people has almost halved since 1990

Almost 13% of our global population are undernourished

1 in 9 people are still chronically undernourished today

161 million children are chronically undernourished today

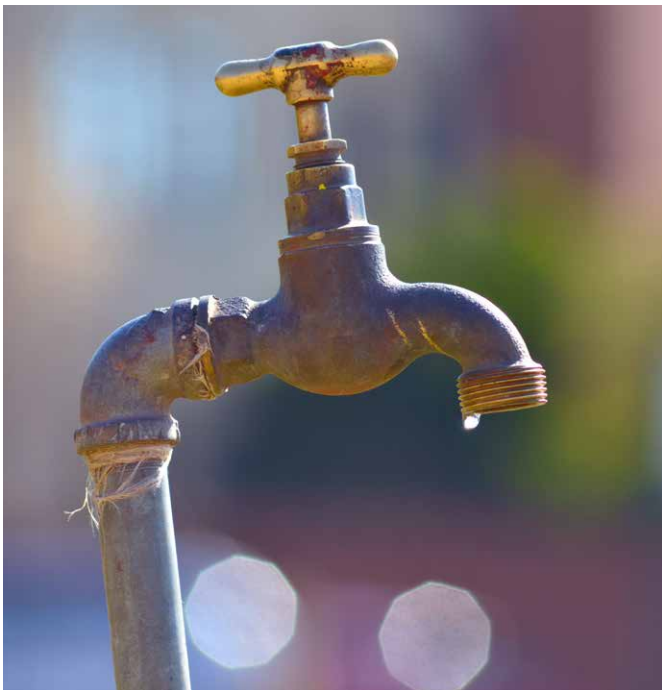




Severe Acute Malnutrition

Every year 16.3 million children suffer from severe acute malnutrition, a state characterised by very low weight for height, visible severe wasting and/or the presence of nutritional edema[2, 3]. The acute onset of malnutrition, which is caused both by food insecurity, and diseases such as diarrhea, malaria and respiratory tract infection, is responsible for the deaths of one million children annually[1, 4]. For this reason, treatment is not as simple as providing sufficient food. Many children suffering from severe acute malnutrition are immunosuppressed and at risk of developing refeeding syndrome, a potentially fatal combination of metabolic disturbances that occurs as a result of introduction of nutrition after a period of starvation[4, 5, 6]. During prolonged food deprivation, hormonal and metabolic changes aimed at preventing loss of muscle mass and preserving an energy supply to the brain occur. When food is reintroduced, insulin is secreted to facilitate uptake of glucose into cells and stimulate glycogen, fat, and protein synthesis. Cellular uptake of electrolytes occurs as part of this process. As a result, blood levels of certain electrolytes such as phosphate, potassium, and magnesium can become rapidly depleted leading to severe electrolyte imbalances. These kind of imbalances can induce potentially fatal cardiac arrhythmias if not properly managed[6]. For this reason specialised therapeutic feeding regimens are required for severely malnourished children[7].

Because of the potentially fatal consequences, UNICEF have developed a standardised two-phase approach for the treatment of severe acute malnutrition[4, 7, 8, 9]. The "stabilisation" phase lasts approximately seven days and requires treatment of medical complications (such as infections) combined with gradual introduction of nutrition using a specialised starter diet[4]. The starter diet is a milk-based formula containing skimmed milk powder, oil, carbohydrate and essential levels of micronutrients[7]. In order to prevent incorrect preparation of the starter diet and to simplify use in the field, a ready-made formula containing all of the required components is now widely used. This formula, called F75, provides limited macronutrients (0.75kcal/mL) and micronutrients (in particular electrolytes such as sodium) to minimise the risk of refeeding syndrome and needs only to be mixed with clean water prior to administration[7]. During the stabilisation phase children are monitored very closely for metabolic imbalances and underlying disease[4]. After this phase, children are moved on to the rehabilitation phase that consists of several weeks of nutritional supplementation with a more nutritionally dense milk formula, called F100, to rebuild wasted tissues and improve weight to height ratio[7]. During this phase the risk of a medical emergency is much lower, but continued intervention is essential to enable children to reach a healthy weight and prevent relapse.



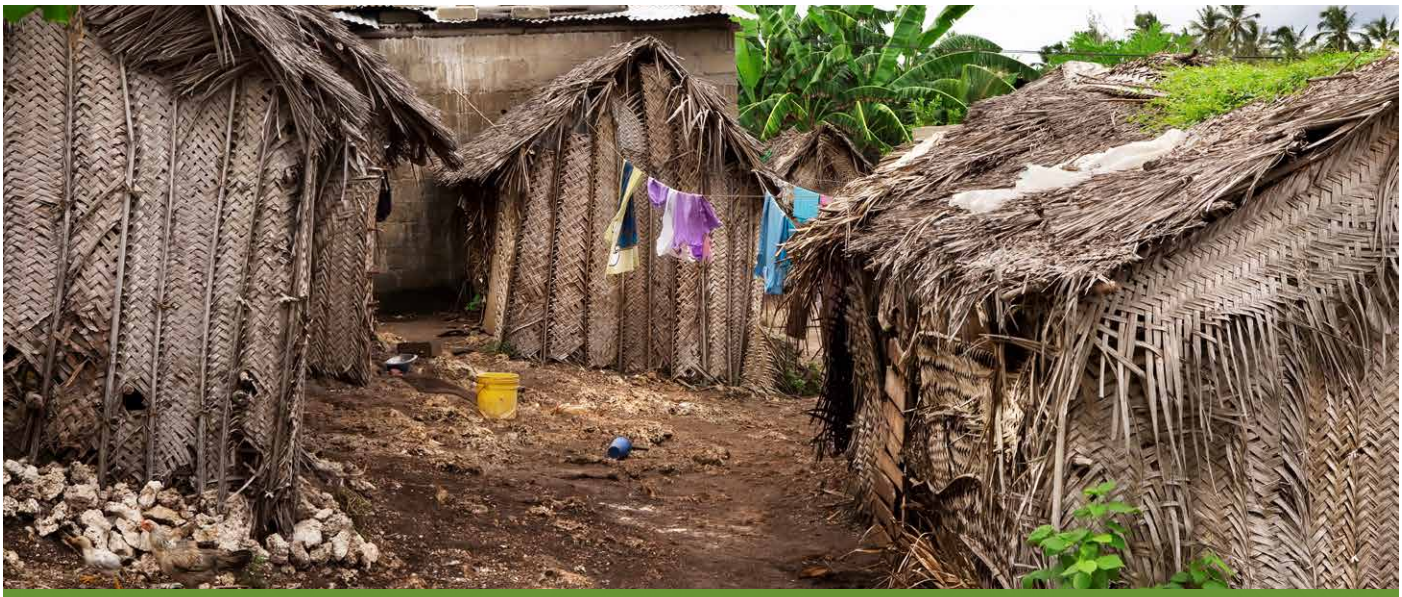
The Community-based Approach

Providing adequate resources to carry out the two-phased treatment of severe acute malnutrition is challenging in the world's poorest countries[10]. F75 and F100 diets can only be safely used in a hospital or health centre setting to ensure correct reconstitution of the formulas and use of clean water. This kind of inpatient care demands qualified staff and inpatient beds, both of which are in short supply in many of the regions in which severe acute malnutrition is most prevalent. Inpatient centres tend to be centralised, meaning children may have to travel long distances to reach them, especially in highly dispersed rural populations. This can pose a risk to the wider family unit if it causes mothers, who stay with malnourished children during treatment, to be absent from the home and unable to care for other members of the family. Housing large numbers of malnourished children in close proximity can also result in the spread of infection. The reality in many developing countries is that the majority of children who suffer severe acute malnutrition will never be brought to a health care centre[11]. These children can only be reached by a community-based approach.

Community-based management of severe acute malnutrition refers to provision of resources that allow malnourished children to be treated in their homes rather than a hospital/healthcare setting[4, 11]. This approach is now used widely to treat uncomplicated malnutrition in developing countries i.e. malnutrition that is not accompanied by severe infectious disease. The development of ready to use therapeutic foods (RUTF) has greatly aided the development of community-based nutrition strategies. RUTF are soft or crushable foods that have a similar nutrient composition to the F100 rehabilitation formula, but that can be used safely with children who are well enough to start this treatment and without the need for clinical supervision[11]. Due to the risk of refeeding syndrome, it is unsafe to treat extremely malnourished children at home with an F75-type RUTF substitute because of the severity of their illness, however they can be sent home on the F100-type RUFT when their condition stabilises. RUTFs are designed to be low cost, energy dense, rich in protein and micronutrients, and most importantly, easy to use[12]. RUTFs are by definition "ready to use" and do not require any kind of reconstitution/processing prior to administration. The formulations are designed, in terms of texture and taste, to facilitate self-feeding even by toddlers and young children. From a food safety perspective, RUTF cannot be water-based to eliminate the possibility of bacterial growth, and they must have a long shelf life and no requirement for refridgeration. These properties enable RUTF to be safely used even in communities with very poor standards of hygiene[4, 12].

Requirements of Ready to use Therapeutic Food

In order to standardise the nutritional quality of RUTFs, UNICEF have produced a specification outlining the nutritional parameters that need to be met by a RUTF. The product must deliver 520 to 550 kilocalories per 100 grams, including 10-12% protein. RUTF must contain 45-60% fat in the form of canola or soybean oil, a staple carbohydrate and 24 vitamins and minerals. Additional components may include nuts, legumes, grains, and sweeteners. UNICEF supplies each child requiring treatment for severe acute malnutrition in the community with 10-15 kg of RUTF, to be used over a period of six to eight weeks[7, 11]. Modern treatment regimens aim to provide RUTF in combination with clean water and antibiotics where required[4].



This type of coordinated community-based management of severe acute malnutrition has had a major public health impact[11]. In 2005, the American Journal of Clinical Nutrition published a study that investigated use of RUTF versus standard inpatient care for the treatment of over 1,200 severely malnourished children in Malawi. The study reported that children treated at home with RUTF not only had greater rates of weight gain but also had a lower prevalence of fever, cough, and diarrhea than children treated in a hospital setting[13]. A six-month follow-up demonstrated that the rates of relapse were similar in both groups at less than 5%. Similar results have been reported by numerous other field-based studies[14, 15].

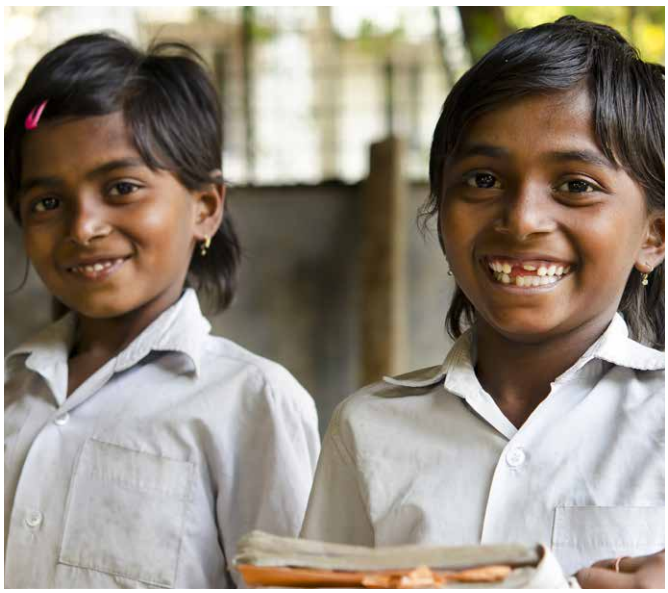
Current Landscape and Future Opportunities in RUTF

Commercially, RUTF is produced in two forms, a compressed biscuit (BP100 developed and produced by Compact) or a peanut oil-based paste (Plumpy'nut developed by the Institute for Development Research and produced by Nutriset)[16]. Although biscuit and peanut oil-based paste applications are both suitable in terms of nutritional composition, ease of use and food safety, manufacturing considerations make peanut oil-based products the favoured application. The equipment and facilities required to make compressed biscuits are complicated and expensive while oil-based pastes involve only the heating and stirring of ingredients, meaning minimal industrial infrastructure is required[17]. For this reason, production of peanut oil-based pastes is easily transferable to small-scale local producers, which is a considerable advantage for RUTF products. In crisis situations, shipping supplies internationally can be both time consuming and costly while local production can respond swiftly and proportionately. In addition, local production provides much-needed stimulus to struggling economies in the region[11, 17].

Although peanut-oil based RUTF are more simple to produce, the raw materials used in peanut oil-based RUTF are not ideal for production in developing countries. A typical peanut oil-based RUTF is comprised of peanuts, sugar, milk powder, vegetable oil and vitamin and mineral complexes[12]. The high content of milk powder greatly increases cost of local supply and must be imported in many developing countries. Dependence on peanuts can also be problematic[17]. Although peanuts are locally sourced, supply can vary year on year. From a food quality and safety perspective, contamination of peanut with aflatoxin is common and the use of peanuts also raises concerns about allergic reaction[17].

For these reasons, there is growing interest in producing alternative paste forms of RUTF[18]. Theoretically, RUTF can be formed using any staple, a high quality protein supplement (plant or animal), an energy source (oil and/or sugar) and a vitamin and mineral supplement[12]. A number of "next generation" RUTF pastes that do not contain peanut or milk powder are currently under development. These new pastes use roasted sesame seed, soy or chickpea as a source of protein and local grains such as rice, maize and barley as staples[18]. The cereals, legumes and oilseeds are mixed to maximise the protein quality and deliver all essential amino acids. Similar to peanut oil-based versions, the products remain soft, palatable, ready to eat and microbiologically stable. These "next generation" RUTF pastes possess the added benefits of improved food safety profiles and use of locally available ingredients.

The advent of the community-based approach has without doubt transformed management of malnutrition in developing countries. UNICEF currently supports community-based programmes in over 60 countries, and it is estimated that up to 80% of malnourished children can be treated successfully within their own homes. RUTF is an integral part of these programmes, with more than 20,000 metric tonnes used every year[11, 19]. The ultimate goal of the community-based approach is to return control of management of malnutrition to local agencies. While the assistance of international donors is essential during crisis situations, the only sustainable way to eliminate malnutrition is to equip local communities and economies to provide adequate health and nutritional care. Innovative "next generation" RUTFs that facilitate not only home care but also local manufacturing could be powerful weapons in the continuing fight against hunger.



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Eimear began her career as a Clinical Dietitian after which she spent four years working in research at Trinity College's Institute of Molecular Medicine and the National Children's Research Centre. In her current role as Nutrition Scientist with Kerry, Eimear is responsible for development of nutrition solutions targeted at specific life stages and need states and coordinating nutrition research.

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