

Nutrition Supplementation

Summary

- Malnutrition is a widespread and difficult problem in the developing world. Two billion people worldwide are believed to suffer from some combination of micronutrient deficiency. This undermines their ability to work, learn, fight off infections, successfully bear healthy children, and live a normal life
- Except under emergency conditions, the *quantity* of calorific intake is generally at adequate levels in most impoverished areas and countries around the world. It is *quality* that remains an issue.
- Inadequate nutritional quality and lack of micronutrients can increase susceptibility to infections across the population.
- Poor food nutrient content impacts each person's risk of disease and death. This not only causes family and community suffering, but adverse economic consequences to a country as a whole.
- Malnutrition affects the normal development of infants and children, and can leave them with potential physical and mental deficits. These can permanently affect their ability to learn or earn in later life.
- Women of child-bearing age, particularly those having closely spaced children, are at high vulnerability to malnutrition. The mother's own malnutrition can undermine her potential to bear a healthy child and survive childbirth.
- Appropriate levels of micronutrients can reduce the severity and duration of acute problems such as diarrhoea and respiratory tract infections. These are common causes of under-fives mortality in the developing world.
- The Copenhagen Consensus has drawn up a list of priority actions to address the most severe global challenges. The 2008 list highlights micronutrient supplementation for children (vitamin A and zinc) as the most cost effective solution to the challenge of malnutrition.
- 87% of our currently recommended charities carry out activities directly or indirectly related to the promotion of better nutritional quality.
- Direct nutritional activities particularly support the intake of vitamin A and iron.
- Indirect activities help develop improved economic self-sufficiency and so contribute to better quality food consumption for families.
- The remainder of our charities are involved in areas that will improve economic development and health in the long-term, such as education or vision correction.
- The promotion of zinc and iodine supplementation is not an area in which individual charities can contribute greatly, as these are problems requiring national campaigns and attention on a wider scale.

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Summary

Malnutrition through micronutrient deficiency is one of the world's greatest development challenges. According to the Copenhagen Consensus, it is the most important of them all. In May 2008, the Copenhagen Consensus produced the second of what it intends to be a four-yearly list – the ranking of a list of solutions to some of the world's biggest development problems. Top of the 2008 priority list was 'Micronutrient supplements for children (vitamin A and zinc)'. This paper summarises the reasons why this is so important and how Development Ratings' charities are helping with the issue.

Development Ratings doesn't have specific expertise in the medical sector; however, we've taken the following micronutrient information from sources that we feel are reliable. We've then looked through our recommended charities for activities each is working on which help with the micronutrient issue in the developing world, either from natural sources or via supplementation.

Currently, 87% of our recommended charities by number carry out activities *directly* or *indirectly* related to improving the nutritional intake of their beneficiaries. Direct action relates to specific nutritional promotion in various ways. Indirect activities help improve economic self-sufficiency and therefore the ability to afford food of higher quality and micronutrient content. The balance of 13% are charities involved in education and health work, both fields that will ultimately contribute to development in alternative ways.

Our charities spent £25m on their charitable activities in the latest financial year - a drop in the ocean compared to national and international development spending, and a fraction of the sums envisioned by the Copenhagen Consensus exercise. But it is real money spent in the field, with tangible benefits. It is estimated to have benefitted 18m people directly and almost 49m indirectly. Development Ratings can be proud that its recommended charities are contributing in a real way to this essential global development solution.

What is the Copenhagen Consensus?

The Copenhagen Consensus is a theoretical exercise. It was first carried out in 2004 when some of the world's top economists got together to prioritise issues and solutions affecting ten global challenges. The question they set themselves? If a sum of money (\$50bn at the time) were available to address pressing development issues, what would be the most effective way of using it? The panel of 8 economists included 5 Nobel Laureates. Thirty proposals were considered. The result was a ranked list of 10 solutions, assessed by the efficiency and cost-effectiveness with which they could get real results. The 2004 list had as its top four priorities: the control of HIV/AIDS; the provision of micronutrients to address malnutrition (iron deficiency anaemia); trade liberalisation; and the control of malaria (such as by using chemically treated bed nets).

The Consensus group aims for the exercise to be quadrennial - a sort of Olympic Games of international development brainstorming. The 2008 list has produced 30 ranked solutions that could be addressed if \$75bn were available. The top four solutions, in descending order, are: micronutrient supplements for children (vitamin A and zinc); the Doha development agenda on trade; micronutrient fortification (iron and salt iodisation); and expanded immunisation coverage for children.

Other proposals included in the Consensus' 2008 list to address the challenges of malnutrition included biofortification (fortifying foods to grow with higher nutritional content), deworming and other nutrition programmes in schools (deworming rids the body of intestinal parasites that divert food nutrients for their own use), and community-based nutrition promotion. So, of the top 10 solutions, five are nutrition-based to address malnutrition. Clearly, the Consensus panel sees this as a cost-effective way of supporting individual, family, community and national health and development in the developing world.

Increases in food production: A double-edged sword?

The International Food Policy Research Institute (IFPRI) notes that food production increases have solved most calorific energy intake issues in the developing world. Apart from during crises, carbohydrate consumption is sufficient to sustain life across most of the world, and national or localised famine is no longer the significant issue it was. But an increase in food production often has a flip-side – a reduced diversity of food crops and an over-reliance on carbohydrates. These food production increases have not solved the micronutrient deficiency problems that can limit development, productivity, human growth and the overall health of the poor. 2 billion people are estimated to suffer from micronutrient deficiencies.

The promotion of large-scale economic and agricultural development, adopted in many developing countries to help solve the shortfall in calorie intake amongst the poor, can reduce the diversity of agricultural production. The commercialisation of markets can reduce the demand for low-volume crops from small producers, impacting the health and livelihoods of the poor in particular. There is evidence that the promotion of the production of diverse crops has been successful when accompanied by promotion to consumers of the benefits of a varied diet, and technical support for small farmers to create market opportunities.

The effects of malnutrition

Diet-related chronic diseases are considered to be at epidemic proportions in the developing world. Four out of five worldwide deaths from chronic diseases, such as heart disease and diabetes, occur in the least developed countries. But, in addition to such diet-related diseases, food micronutrient deficiency impacts the growth and development of individuals in poverty and their overall ability to fight a range of infections. In other words, the cycle of poverty is perpetuated by micronutrient deficiency – condemning the poor to further generations of poverty, with no real prospects of escaping.

Vitamins and minerals

Vitamins and minerals cannot be manufactured by the body. A variety of micronutrients is needed for essential functions. When not available in the diet or from built up stores, the body exhausts all available sources, reducing its biological capacity for processes such as cell division or membrane repair. This can lead to increased susceptibility to contracting air- or water-borne infections, or to limited growth and development in foetuses, babies and children. The problem is most serious for children and child-bearing women. The growing foetus extracts from the pregnant mother all the energy, vitamins and minerals it can get for its own development, regardless of whether it is slowly starving the mother. When the mother is already deficient in vitamins and minerals herself, this can mean that the foetus' micronutrient needs are not met, limiting and retarding its growth and mental development. This can have a life-long and ruinous effect. It also leaves the mother more than normally depleted of the nutrients that her body needs for its own functioning and infection protection, and so doubly undermines her health. The same issue occurs during lactation when the production of milk can extract essential nutrients from the mother, in extreme cases ultimately taking calcium from her bones and teeth. As a result, pregnancy, child birth and early infant care are particularly severe on poor women with a limited diet - over and above the 'normal' difficulties faced by women giving birth in the developing world. The tragically high neonatal, infant and maternal mortality statistics of many developing countries are no doubt exacerbated by the effects of malnutrition.

Few people experience significant micronutrient deficiencies in the developed world. Although a poor diet can contribute to chronic diseases such as heart disease, a normal diet - or even one somewhat inadequate in specific micronutrients - is unlikely to lead to any serious medical problems. Malnutrition is not a major issue or significant contributor to stunted growth or maternal mortality in the developed world.

The important role of micronutrients in the diet has been unfolding over time. In the days of long ship voyages, scurvy in sailors was eventually solved by including citrus fruits in the diet to introduce vitamin C. Micronutrient deficiency problems have been highlighted by some unusual medical cases. One patient living for years on only unleavened bread had serious skin and internal organ problems as a result of a deficiency of micronutrients, particularly zinc. Certain conditions in dark-skinned people living in northern climates were found to be caused by a lack of vitamin D from sunlight. Discoveries are continuing as medical experts analyse the functions of micronutrients and the causes of complex diseases and conditions.

The role of each vitamin or mineral in the body varies and overlaps in a complementary fashion. Some of the main micronutrients' functions are: vitamin B1 (supporting the nervous system, muscles, and heart); vitamin B2 (the skin, hair & nails, growth, eyesight, the breaking down of protein, fat and carbohydrate); vitamin B6 (the skin and the nervous system, and helps the body absorb protein and carbohydrate); vitamin B12 (the making of red blood cells and nerve formation); vitamin C (the immune defence system, providing protection from viruses and bacteria, and the healing of wounds); vitamin D (the formation of strong bones and teeth); vitamin E (fighting toxins); folic acid (the production of red blood cells, and the prevention of birth defects in foetuses); calcium (the formation of strong bones and teeth, nerve function, muscle contraction and blood clotting); magnesium (the conversion of food into energy, cell repair, strong bones, teeth and muscles).

The two Copenhagen Consensus lists concentrate on vitamin A, zinc, iron and iodine. This summary will concentrate on the natural sources of these, the symptoms of their deficiency, and possible solutions.

Vitamin A

Vitamin A is involved in maintaining the health of the skin and mucous membranes, the immune system, and eyesight. It is involved in cell repair and growth and helps to prevent anaemia.

As a result, a lack of vitamin A leads to increased susceptibility to infections contracted through the mucous membranes, such as air-borne diseases and HIV/AIDS. It also contributes to vulnerability to skin infections and to slow wound healing. The immune system in general can be compromised. A combination of any of these separate body malfunctions can be potentially life threatening under conditions of poverty. In addition, a lack of vitamin A can damage foetal growth and development with life-long consequences for learning and earnings power, reducing the individual's potential to climb out of poverty. For children and adolescents, inadequate cell growth and repair can stunt growth and lead to malformation and disability. And the unbreakable cycle of poverty continues.

Apart from dietary causes, vitamin A deficiency can occur through significant exposure to primary and second-hand cigarette smoke. A short spacing between births can also contribute. This multiplies the reduced immunity to diseases of the mother and child, the risks to the healthy development of the foetuses, and the implications of both of these on maternal and neonatal mortality.

Natural sources of vitamin A

Dairy products, such as milk and cheese
Oily fish
Liver
Eggs
Red & yellow vegetables and fruits: sweet potato, carrots, pumpkin, squash, melon, mango, papaya
Leafy green vegetables: kale, collard greens, spinach

Sources of vitamin A include dairy products, which require refrigeration for storage - not always available for most of the target population. The promotion of breastfeeding by healthy mothers (and dissuasion from early weaning) can help increase dietary vitamin A for infants and young children. Fresh oily fish is likely to only be available to those living near appropriate water sources. Liver is only available to people able to afford a reasonable amount of meat in their diet, clearly less common for the poorest families. Therefore, for most older children and adults, this leaves fruits and vegetables as the predominant regular potential source. Additionally, animal milk might be available, if they own livestock, or eggs might be obtainable. The remaining option for most poor families is supplementation. A steady supply of micronutrients is best, so this is only practical if the target population can be regularly reached, such as at schools or by medical staff who visit regularly.

Solutions to vitamin A deficiency: the promotion of family or community nutrition gardens; support for small scale farmers to produce a variety of crops; promotion in the community of the benefits of a varied diet; encouragement of micro-development (local production and consumption); encouragement for wider birth spacing through family planning; promotion of livestock ownership; discouragement from smoking; supplementation.

Zinc

Zinc deficiency impacts cell growth and repair, as well as the immune system. Zinc is involved in protein synthesis, an essential function for healthy cells and cell walls. Similarly to vitamin A deficiency, zinc deficiency can lead to slow growth and development, skin infections and slow wound healing, but also to chronic diseases of the liver, kidneys and blood. Deficiency during pregnancy can cause abnormal labour, retarded foetal growth and foetal abnormalities. Pregnant and lactating women need higher levels of zinc than other people. In a rather cruel biological irony, a lack of zinc impairs the absorption by the body of vitamin A, multiplying the effects of any deficiency of that nutrient.

Particularly important for addressing under fives child mortality, adequate zinc intake reduces the incidence and duration of acute and chronic diarrhoea and acute respiratory tract infections in children. Pneumonia – clearly a severe case of a respiratory infection – is believed to kill more children than any other disease, more than AIDS, malaria and measles combined (Source: DFID).

In addition, a study in Burkina Faso showed a major reduction in malaria morbidity following combined vitamin A and zinc supplementation in young children under six years old. One large dose of vitamin A and six months of daily zinc supplementation was followed by a 30% decrease in malarial cases in the supplemented group compared to a control group. Similar benefits have been demonstrated in studies in Papua New Guinea, Peru and Tanzania. Over 300 million new cases of malaria are estimated to occur annually in sub-Saharan Africa. The trial implies that potentially 100 million or more of these cases could be prevented by improved immune response through combined vitamin A and zinc supplementation. Of the estimated 1 million annual child deaths from malaria, this study suggests the potential for preventing 300,000 child deaths each year. Moral imperatives aside, the economic benefit for countries of such reductions in malaria-related costs is enormous.

Children who are underdeveloped for their age are more likely to die from infections than normally developed children, as any infection caught will be attacking a child's body that is not only smaller in volume (and so less robust), but is also already stressed and depleted. Under-developed children will not have sufficient surplus fat or nutrient stores to help them through a serious illness to recovery. Zinc supplementation on its own has been shown to have a significant effect on height and weight gain in children. This suggests that dietary zinc supplementation could help children develop and grow sufficiently to reduce the risk of infections and deaths that are more likely to occur due to a lack of size and weight gains alone. This is before any other biological, physiological or immune system benefits of adequate zinc intake.

Natural sources of zinc

High protein foods such as meat (particularly dark meat), shellfish, peanuts and other legumes.

Fruits and vegetables are not good sources of zinc. A diet high in vegetables – common in poor and ultra poor communities in the target populations – may result in zinc deficiency. Poorer families are less likely to be able to afford meat or shellfish in their regular diets.

Solution to zinc deficiency: promoting dietary zinc is difficult for impoverished families so, until economic development means that meat might be a regular part of a family's diet, *supplementation* is the best way of avoiding the problems of zinc deficiency.

Iron

Iron has an important role in creating red blood cells which carry oxygen around the body, an essential function for the respiration of all the body's cells. Respiration is the conversion of fuel (glucose from food) into energy for the cells to function. Iron deficiency, or anaemia, results in fewer or smaller red blood cells, meaning that less oxygen is carried to the cells. This leaves the individual feeling tired and weak. It can lead to poor concentration, which can undermine the ability of children to learn and adults to work, with clear short and long term economic effects. In addition, lack of iron can reduce a child's growth and cause behavioural and learning difficulties of its own. Babies and adolescents need more iron in their diets to support the normal growth spurts occurring during these times.

Natural sources of iron

Meat (particularly lean red meat and liver)
Oily fish
Eggs
Green leafy vegetables
Beans and nuts
Dried fruit
Whole grains

The WHO estimates that iron deficiency alone affects more people than any other condition with 2 billion people estimated to be anaemic. Diseases such as malaria, HIV/AIDS, hookworm infestation, schistosomiasis and tuberculosis are contributing factors to the high levels of anaemia. As with the other micronutrients mentioned, pregnancy can lead to anaemia in child-bearing women as the foetus takes the iron it needs from the mother. Anaemia is believed to contribute to 20% of all maternal deaths. Iron deficiency contributes to economic costs, through lower productivity and reduced school performance, as well as through mortality rates particularly from maternal haemorrhaging and vulnerability to infection. It is estimated that national productivity levels could be raised by up to 20% if iron deficiency was eliminated. The WHO has stated that iron deficiency “drains the life and vitality out of development”.

Solutions to iron deficiency: eating a varied diet from various iron-rich sources; addressing the spread and prevalence of the major infections that deplete iron from the body; promotion of education on eating foods rich in vitamin C at the same time as foods high in iron to help the body absorb iron better; national policy to fortify foods with iron, such as flour; supplementation.

Iodine

Iodine is necessary to keep cells and the thyroid gland healthy, and to stabilise the metabolic system. It is only needed by the body in trace amounts, but a deficiency can be serious. The thyroid gland manufactures hormones that regulate the metabolism of the body’s cells. Iodine is also used by the skin, breast and prostate gland, as well as the kidneys, spleen, liver, blood and intestine. Iodine is known to have anti-bacterial, anti-parasitic, anti-viral and anti-carcinogenic properties.

A lack of iodine can cause goitre - a swelling of the neck due to an enlarged thyroid gland, a disfiguring and painful condition. More seriously, however, significant iodine deficiency during pregnancy can cause cretinism in children, or permanent severely stunted physical and mental growth.

A study comparing intelligence in patients from iodine-deficient communities (of patients born during a period of severe iodine deficiency) with those from communities with adequate dietary iodine showed a significant correlation between IQ and iodine levels. Cretinism involves mental retardation of 10 to 15 IQ points in affected individuals. It is also associated with nerve deafness and deaf-mutism, and abnormal neurological conditions such as physical disorders and motor impairments that affect the stance and proper walking. All these effects can be disabling and have a life-long effect on earnings ability and poverty.

As with a lack of iron, a lack of iodine can cause lethargy and low energy levels due to reduced metabolic activity, which can negatively affect economic productivity. It can also cause skin problems, mental confusion, and excessive menstrual bleeding (exacerbating anaemia). Low zinc levels also undermine a lack of iodine.

Natural sources of iodine

Fish and shellfish (iodine naturally occurs in seawater, so seaweed is also a source)
Milk
Eggs
Cereals & grains

Some foods can interfere with the uptake of iodine by the body and the thyroid gland. These include brassicas (cabbage, etc.), soy beans, cassava, sweet potatoes, maize and millet. Many of these are common foods in Africa and Asia. As a result, frustratingly, some of the good foods that contribute other micronutrients to the body act to partially deplete the body of iodine. Bromine commercially added to bread as a conditioner also inhibits the absorption of iodine. Iodised salt has contributed to improved dietary iodine in the West but recommendations to reduce salt intake is undermining this gain.

Outside the developed world? Many African countries have borders that were arbitrarily designated by colonising nations in the first half of the 20th century, and are landlocked as a result. Apart from all the other geopolitical and economic consequences of this, it reduces people’s access to sea fish and iodine-rich foods. Even with a coastal border, in some cases a country’s shape and topography also reduces access. In other

words, the underlying poverty of remote communities and the dietary deficits associated with this is compounded by politics, geography and topography. As with many other micronutrients, some level of iodine deficiency is believed to affect up to 2 billion people worldwide, particularly in Asia (notably India) and Africa.

Solutions to iodine deficiency: national campaigns on the importance and sources of iodine, and of the benefits of a varied diet; national programmes to support iodised salt and iodised bread and flour; supplementation, particularly for children and women of child-bearing age.

Development Ratings' charities addressing the issue of micronutrient deficiency

Development Ratings' recommended charities contribute solutions to the problem of nutrition quality in both direct and indirect ways.

Thirteen of the 23 currently recommended charities have - as a major or minor part of their activities - the *direct* promotion of better quality nutritional intake. This includes crop diversification for a varied diet (African Initiatives, Africa Now, Andrew Lees Trust, Excellent Development, Pump Aid, Self Help Africa (UK), Tree Aid). It also includes health checks and vitamin supplementation, for disability prevention or for maternal and newborn health (Afghan Connection, Health Unlimited, IMPACT Foundation, Riders for Health, Women & Children First). This is because good obstetric care includes supplementing mothers and newborns with vitamins to boost the body's ability to ward off infections. Four charities encourage the development of nutrition gardens, so that the gardens can contribute a varied crop of vegetables to the diet of families (Excellent Development, IMPACT Foundation, Pump Aid, Women & Children First). Several are involved in spreading health messages directly in different ways, which will include food and nutrition information (Andrew Lees Trust, Health Unlimited, IMPACT Foundation, Riders for Health, Women & Children First). Several more are spreading that message through their activities, such as by encouraging tree planting and the consumption of the nutritious fruits and nuts the trees produce (Excellent Development, Self Help Africa (UK), Tree Aid). Several charities promote agriculture using natural fertilisers, which helps stop the nutrient depletion of some chemical additives (African Initiatives, Africa Now, Self Help Africa (UK)). Pestalozzi Overseas Children's Trust promotes work with the hands, particularly agriculture, as one of its three principal educational policies. As a result, the Pestalozzi scholars learn practical skills and the theory of a varied diet which they can teach to their communities when they return home.

Thirteen of the 23 charities also support higher quality food intake *indirectly* through economic development and related activities. The micro-enterprise development focus of several of our charities encourages improved economic self-sufficiency and local economic development. Micro-enterprise development is the principal focus of two of our recommendations (MicroLoan Foundation, MyC4), and a subsidiary focus of several others (African Initiatives, Africa Now, Andrew Lees Trust, Build Africa, Excellent Development, Self Help Africa (UK), Survivors Fund, Tools for Self Reliance, Tree Aid). Tools for Self Reliance and SolarAid both principally promote local economic development through their activities. Amongst other books, Book Aid International supplies vocational skills books, including the teaching of agricultural skills (and those that may help with nutrition advice), not to mention books to develop early literacy. By this, the charity helps develop self-sufficiency in a different way. Through whichever approach, local and family economic development can help individuals, families and communities to be able to afford a more varied and nutrient-rich diet. Prosperity has a knock-on effect on diet quality. Of course, some new micro-businesses that are developed might be specifically in the field of raising small livestock. This can have a real direct benefit on the diet of the owners' families, and of those who buy from them, in the form of more regular meat, liver and eggs in the case of chickens. Several of the charities that have an activity with a *direct* nutritional contribution also contribute *indirectly*, too (African Initiatives, Africa Now, Andrew Lees Trust, Excellent Development, Self Help Africa (UK), Tree Aid).

Only three of our recommended charities do *not* specifically touch on the nutrition issue. One of these is a tertiary student scholarship charity (Prospect Burma) and the other two are involved in different aspects of health that do not have a specific food-related element (Target Tuberculosis, Vision Aid Overseas). However, addressing the education and health of beneficiaries will benefit societies as a whole and is crucial to general socio-economic development. One of these charities (Target Tuberculosis) also exclusively addresses one of the diseases – tuberculosis – that undermines iron in the body, so its efforts will have an indirect effect. Other health-related charities we recommend also help treat and protect against malaria, known to deplete the body of iron (Health Unlimited, IMPACT Foundation, Riders for Health). Malaria prevention is fourth on the list of solutions in the Copenhagen Consensus 2004. In addition, these charities work to protect people from and treat other illnesses that use up precious stores of micronutrients in the body, as well. Further, our health

charities are involved in child immunisation work, which is fourth on the Copenhagen Consensus 2008 list of cost-effective solutions. Only Vision Aid Overseas has a less clearly nutrition-related activity, but improving sight has obvious economic benefits to the individual and will increase learning and earnings potential.

The area where our charities do not make any clear direct contribution is in iodine and zinc deficiency. There is little they can do to encourage a national salt iodisation policy or a policy on the enrichment of flour, for instance, or to provide zinc supplementation on a wide or national scale. (One of our charities, however, *does* encourage the enrichment of school bread rolls with vitamin A and iron in one particular region [IMPACT Foundation]. Spreading the benefits of this policy could help elsewhere.) However, vitamin A and iron can be boosted by varied vegetable crop production and consumption. Local production in particular helps reduce nutrient loss through exposure from transporting goods to distant towns. And iron especially can be further boosted by economic development that might lead to increased meat consumption. Ultimately, this could help address zinc deficiency as well.

Overall, we feel that our charities coverage of the micronutrient issue is quite comprehensive. In addition, the charities' tangible activities are being carried out on an ongoing basis and do not require further action or political consensus to be achieved. To a good extent, much of the funds are either in place or are committed or are being raised, with the help of donors, to address the problem. The will and the dynamism of the management is also there to drive the achievement of results. We hope that our attention to this issue and to the charities we recommend will further support their efforts.

Appendix I

	DR Charity	Micronutrient focus	Direct/indirect
1	Afghan Connection	Obstetrics involves vitamin supplementation for mothers and newborns (education could involve nutrition lessons)	Direct
2	African Initiatives	Ghana: organic farmers support to increase nutrient content and yield	Direct
3	Africa Now	Women's credit; support for agricultural crop diversification; economic development activities	Indirect & direct
4	Andrew Lees Trust	Access to agricultural and nutritional information + income development ideas and practical help	Direct & indirect
5	Book Aid International	Supporting economic development – vocational skills & literacy	Indirect
6	Build Africa	Youth economic development support	Indirect
7	Excellent Development	Terracing and tree planting + indigenous plant promotion + income stability development	Direct & indirect
8	Health Unlimited	Health messages through field officers and radio, practical supplementation (malarial bed nets, treating other diseases)	Direct & indirect
9	IMPACT Foundation	Direct supplementation + health messages + nutrition gardens	Direct
10	MicroLoan Foundation	Micro-economic development	Indirect
11	MyC4	Micro-economic development	Indirect
12	Pestalozzi Overseas Children's Trust	"Hands" part of educational policy = agricultural learning + nutrition gardens + nutrition education	Direct
13	Prospect Burma	No nutritional focus but can improve economic potential	None
14	Pump Aid	Nutrition gardens	Direct
15	Riders for Health	Health messages, checks for nutrient deficiencies + supplementation	Direct
16	Self Help Africa (UK)	Focus is reliable food production and education in agricultural techniques for health & economic development	Direct & indirect
17	SolarAid	Micro-economic development	Indirect
18	Survivors Fund	Micro-economic security promotion	Indirect
19	Target TB	No direct nutrient focus, but addressing TB as a depleter of iron in the body	None
20	Tools for Self Reliance	Economic development + agricultural tool provision	Indirect
21	Tree Aid	Tree products for nutrients + increased economic security	Direct & indirect
22	Vision Aid Overseas	No nutritional focus, but improves economic potential	None
23	Women and Children First	Maternal and newborn health attention includes vitamin supplementation + nutrition advice	Direct

Appendix II

Nutrient	Contributes to	Natural sources
Vitamin A	Maintaining the health of the skin and mucous membranes, the immune system, the eyesight, and cell repair and growth. Helps prevent anaemia	Liver, dairy products, oily fish, eggs, red & yellow fruits and vegetables, green leafy vegetables
Vitamin B1	The nervous system, muscles, and heart	Liver, yeast, rice, wholemeal products, peanuts, milk, pork
Vitamin B2	The skin, hair & nails, growth, eyesight, the breaking down of protein, fat and carbohydrate	Dairy products, liver, yeast, green leafy vegetables, fish
Vitamin B6	The skin and the nervous system. Helps the body absorb protein and carbohydrate	Fish, bananas, chicken and pork, whole grains, dried beans
Vitamin B12	The making of red blood cells and of nerve formation	Fish, liver, beef, pork, dairy products

Vitamin C	The immune defence system, providing protection from viruses and bacteria, and the healing of wounds	Citric fruits, berries, tomatoes & peppers, potatoes, green leafy vegetables
Vitamin D	The formation of strong bones and teeth	Sunlight, oily fish, dairy products
Vitamin E	Fighting toxins	Nuts, beans, green vegetables, wholemeal, eggs
Folic acid	The production of red blood cells, and the prevention of birth defects in foetuses	Red & yellow fruits, yeast, liver, eggs, beans, whole wheat, green leafy vegetables
Calcium	The formation of strong bones and teeth, to nerve function, muscle contraction and blood clotting	Dairy products, green leafy vegetables
Iodine	Keeps cells healthy & stabilises the metabolic system	Fish and shellfish, cereals & grains
Iron	The functioning of red blood cells and muscles, as well as white blood cells and the immune system	Meat, oily fish, eggs, green leafy vegetables, nuts, whole grains
Magnesium	The conversion of food into energy, cell repair, strong bones, teeth and muscles	Green leafy vegetables, whole grains and nuts
Zinc	The immune system, skin and cell growth and repair, and the breakdown of protein, fat and carbohydrate	Meat, shellfish, peanuts, legumes, brown rice, whole grains

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