

# Growth and nutrition of children under 5 years of age

Educational material for teachers in Tanzania

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## TIIVISTELMÄ

Koponen, Marja. Alle 5-vuotiaiden lasten ravitsemuksen ja kasvun opetusmateriaalin tuottaminen Tansaniassa toimivien opettajien koulutukseen. Syksy 2018. 41 sivua, 9 liitettä, 1 käsikirjoitus. Diakonia-ammattikorkeakoulu, Hoitotyön koulutusohjelma, Hoitotyön suuntautumisvaihtoehto, sairaanhoitaja (AMK).

Opinnäytetyön tarkoituksena oli tuottaa afrikkalaisten lasten ravitsemuksen opetusmateriaalia Tansaniassa Ilembula Institute of Health and Allied Sciences oppilaitoksessa toimiville opettajille. Opinnäytetyö toteutettiin tuotteistamisen keinoin. Opinnäytetyön yhteistyökumppanina oli Diakonia-ammattikorkeakoulu. Opinnäytetyön tavoitteena oli kehittää oppilaitoksen opettajien koulutusta.

Opettajille kohdistettu terveysalan koulutus sisälsi verkkopedagogiikkaan soveltuvan materiaalin toteutuksen Moodle-ympäristöön ja materiaalin tulostettavan esiteversion. Opetusmateriaali on hyödynnettävissä Ilembula Institute of Health and Allied Sciences -oppilaitoksen koulutuksissa sekä Diakonia-ammattikorkeakoulun hankkeissa Afrikassa.

Jatkossa olisi kiinnostava tietää miten opettajat hyödyntävät materiaalia opetustyössä.

Avainsanat: lapsen kasvu, ravitsemus, aliravitsemus, koulutusmateriaali.

## ABSTRACT

Koponen, Marja. Producing teaching material about growth and nutrition of children under 5 years of age for teachers training in Tanzania. Autumn 2018. 41 pages, 9 appendices, 1 manuscript. Diaconia University of Applied Sciences. Bachelor's Degree Programme in Health Care. Registered Nurse.

The purpose of the thesis was to produce teaching material about nutrition of African children for the educators in Ilembula Institute of Health and Allied Sciences, Tanzania. The thesis was made through productization. The thesis partner was Diaconia University of Applied Sciences. The objective was to develop teaching in the mentioned educational establishment.

Health education for teachers contained material suitable for web pedagogy, its execution in the Moodle environment and a printable booklet. The material is usable in the training programmes of Ilembula Institute of Health and Allied Sciences and in the African projects of Diaconia University of Applied Sciences.

In the future it would be interesting to see how teachers exploit the material in teaching.

Keywords: child's growth, nutrition, malnutrition, teaching material.

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## 1. PREFACE

United Republic of Tanzania has national programs which aim to reduce maternal and child death rates by three-quarters of current level. Undernutrition, weak growth, stunting, wasting and micronutrient deficiencies together with inaccurate breastfeeding are the main causes for 45 per cent of deaths among children under age of five. Undernutrition, stunting and wasting lead to failure in mental and physical growth and it reduces schooling and productivity afterwards.

Diaconia University of Applied Sciences (DIAK) has a Healthy Tanzania 2018 Project, for health care sector in Tanzania. Its developmental object is to improve maternal and infant health services by advancing and improving their health by strengthening practical skills of personnel. Project aims to change the attitudes in healthcare services and to improve the quality of education in health sector. DIAK offers schooling in Ilembula Institute of Health and Allied Sciences (IIHAS). Co-operation also strengthens the fulfilment of curriculum by improving new schooling methods and online teaching. Training is provided to the teachers. DIAK has developed an intensive course, teaching materials and online training.

In this thesis the rate of child mortality, child's nutritional status, nutrition and child's development are examined. This thesis addresses means to observe and measure undernutrition, and gives criteria for severe acute malnutrition, it guidelines new-born, infant and child nutrition, breastfeeding and weaning, and feeding children under five years old. Inclusive background research justifies which information is essential in thesis and final product ergo teaching material. Foundational question "How to improve the nutrition of children under 5 years of age in Tanzania?" determines content of Thesis and verifies product's content. This Thesis gives helpful answers to generate the schooling material, which meets the client's needs.

## 2. PROMOTING CHILD NUTRITION IN TANZANIA

### 2.1 Child mortality and malnutrition in Sub-Saharan Africa and in Tanzania

There has been a substantial progress in reducing child mortality. Globally the mortality rate of children under 5 years of age has dropped from 56 deaths per 1,000 lives to 41 from 1990 to 2016. Second largest number of new-born deaths, 38 per cent, occurred in sub-Saharan Africa. The neonatal mortality fell from 37 to 19 per cent mortality from 1990 to 2016. In sub-Saharan Africa about 1 of 36 new-borns dies in their first month and 1 child in 13 dies before their fifth birthday. Most deaths of children under five are caused by infectious diseases and neonatal complications. Each year undernutrition, fatal growth restriction, stunting, wasting and micronutrient deficiencies and suboptimum breastfeeding cause nearly 3,1 million deaths of children younger than five years worldwide. Considering of 45 percent of all deaths in this age group suboptimum breastfeeding and fatal growth restriction together are causing over 1,3 million deaths of all deaths among children under age five years. Mortality rate among young children is the best single indicator of child health in low- and middle-income countries. They are also used as indicators of general social and economic development. Widely used measure of child mortality has been the mortality rate of children under five. Stunting prevalence is highest in the poorest population and in rural areas. The number of deaths of children under age five years decline slowest in sub-Saharan Africa. (Das, Salam, Imdad & Bhutta, 2016, 225; Hug, Sharrow & You, 2017, 1.; Liu etc. 2016, 71, 73.) APPENDIX 1 & 2. Country, regional and global estimates of mortality among children under age 5 and children aged 5—14 & Estimates of mortality among children under age 5 and children aged 5—14 by Sustainable Development Goal region.

Stronger nutrition surveillance gives better detection and management of child under nutrition. In Tanzania The National Nutrition Strategy was established to strengthening nutrition surveillance, and the Accelerated Nutrition Improvements (ANI) project strengthened child growth monitoring in routine surveillance. Reviews on nutrition in Tanzania have had series of gaps in available data, few or no indicators are able at regional and district levels. In ANI-supported districts health workers were trained on anthropometric measurements, on growth monitoring and promotion, and the use of

WHO Child Growth Standards. Nutrition surveillance has improved in nutrition services by enhancing the skills of health workers and ensuring the availability of equipment. ANI-project was linked to counselling on infant and young child feeding and management of severe acute malnutrition, and it helped strengthen health workers skills on nutrition and to link surveillance activities to essential nutrition actions. (Chikoko, M. & Ravonimanantsoa; Kamwa & Banda, 16—18.)

Children in Sub-Saharan Africa can also be overweight yet malnourished due to the modern diet trend with food items rich in saturated fat, sugar and salt and also the lack of fruit and vegetables. They are receiving more than enough energy but not necessary nutrients. Still major causes of death and deceases among vulnerable and socially disadvantaged people like children under five years of age is malnutrition, including undernutrition and nutrition deficiencies. Dietary habits are often rooted locally and traditionally. (WHO Africa.)

A poor start of life can lead to poor health and inadequate learning. Early childhood is a critical time when the benefits of early interventions are amplified, and the risk of negative effects can be reduced. Stable environment that promotes children's health and nutrition protect children from hazard, gives opportunities to early learning and has life-long benefits. Families need material and financial support to provide nurturing care for children and provision of services, including health and nutrition. Childhood development is a growth process of perceptual, motor, cognitive, language, socio-economical and self-regulation skills. Health, nutrition, responsive caregiving, security and safety, and early learning are domains on nurturing care for children to reach their developmental potential. The basic needs poverty in Tanzania has significantly declined from 34.4 percent in 2006 to 28.2 percent in 2011/12. (The Lancet i.a., 2-3; National Bureau of Statistics Dar es Salaam, 51.) APPENDIX 3. Poverty status by Area, Tanzania Mainland, 2007 and 2011/12.

## 2.2. Significance of nutrition and criteria for severe acute malnutrition

Stunting, wasting, and underweight are associated with increased hazards of death from diarrhea, pneumonia, measles, and other infectious diseases, and malaria has complex interplay between undernutrition and infection. Association between micronutrient deficiencies and the increased risk of childhood infections and mortality is established. Vitamin A deficiency increases the risk of severe diarrhea and diarrhea mortality. Other micronutrient deficiencies, such as zinc deficiency, is associated with increased risk of morbidity and mortality. (Das etc. 2016, 227.)

Good nutrition is essential for children to achieve their full developmental potential. Undernutrition has critical consequences for physical and cognitive growth and development. Malnutrition leads to failure in early physical growth, delayed motor skills, cognitive and behavioural development, it diminishes immunity and increases morbidity and mortality. Those children who survived malnutrition in early childhood have disadvantages compared to those who have had adequate nutrition and a healthy living environment. Undernutrition is associated with shorter adult height, less schooling, and reduced economic productivity and women's offspring can have lower birth weights. Undernutrition in childhood has also been associated with increased risk of developing metabolic syndrome and cardiovascular disease, systolic hypertension, obesity, insulin resistance, and diabetes in adulthood. Malnutrition in childhood includes diminished intellectual performance, low work capacity, and increased risk of delivery complications. Deficiencies together with stunting limit the ability of children to realize and achieve their potential. (Das etc. 2016, 161, 227; Holden & MacDonald 2000, 161.)

WHO and UNICEF recommend the use of a cut-off for weight-for-height of below -3 standard deviations (SD) of the WHO standards to identify infants and children as having severe acute malnutrition (SAM). Children below this cut-off have a highly elevated risk of death compared to those who are above, and they have a higher weight gain when receiving a therapeutic diet and faster recovery compared to other diets. WHO standards for mid-upper arm circumference (MUAC) show that well-nourished population have few children aged 6–60 months with a MUAC less than 115 mm. Children with a MUAC less than 115 mm have a highly elevated risk of death. When using the WHO child growth standards to identify the severely malnourished children among 6–



60 month, the below -3SD cut-off for weight-for-height classifies two to four times as many children compared with the National Centre for Health Statistics reference. (A Joint Statement by the World Health Organization and the United Nations Children's Fund i.a., 2.) APPENDIX 4. Box 1. Diagnostic criteria for SAM in children aged 6—60 months.

WHO published new child growth standards in 2006, for attained weight and height to replace the previously recommended child growth reference. The new WHO growth standards confirm that the effect of ethnic differences on the growth of infants and young children in populations is small. Epidemiological studies showed that children with a weight-for-height below -3 SD have a 9 times higher risk of death than children with a weight-for-height above -1 SD. Children with weight-for-height above -2 SD and below -1 SD, have a lower mortality risk than children under -3 SD. Child with a weight-for-height above -1 SD have an even lower risk of death. Similar studies using MUAC as diagnostic criteria showed that the risk of dying is increased under 115 mm. The risk of death in these cut-offs requires the implementation of intensive nutritional and medical support. Children with severe acute malnutrition are treated with special therapeutic foods, usually with Ready-to-Use-Therapeutic Foods or F75 and F100 milk-based diets. Infants and children 6—60 months of age with a weight-for-height above -3 SD also benefit from these therapeutic diets, and the children who are above -3 SD but are below -3 SD are most likely to benefit from therapeutic feeding. (A Joint Statement by the World Health Organization and the United Nations Children's Fund i.a., 3—5.) APPENDIX 5 A & 5 B. Weight-for-length Reference Card.

Research of growth and nutrition is simple and inexpensive process to make measurements that can be compared with data of children with standard growth. Child's growth is a critical indicator of child health and WHO identifies growth assessment as the best single measure to define child's nutritional status and health. Failure to grow at an appropriate rate may be associated with primary growth disorder, or due of general failure, infections or poor feeding practise. Short length- or height-for-age is one of the biggest risk factors for poor mental development. Stunting is a commonly used indicator of chronic undernutrition and it increases rapidly after age six months, by the age of 24-months 50 percent of children in low-and-middle income countries are stunted. (Das etc. 2016, 225; Holden & MacDonald 2000, 161—162.)

Measurements of growth, body dimensions and body composition are easy, rapid and non-invasively performed. It is important that measurements are performed consistently, using appropriate equipment and made by trained staff. Weight can be measured without expensive equipment and with minimal training. Weight gain is a poor guide to estimate child's health, because it says nothing about nutritional status. A child who has low weight is not necessarily thin, and child with height weight is not necessarily fat. It is needed to compare weight with height. Weight and height can be used as an indicator when expressed as percentage of ideal body weight (IBW). Body mass index (BMI) is used in adults, but it is problematic when used to children, because the BMI varies throughout childhood. Skinfold thickness gives an indication of subcutaneous fat and hence of nutritional status. Despite bone, muscle, fat and skin, the mid-arm circumference gives a good reflection of nutritional status. It can be used in all age groups to estimate under- and overweight. Head circumference can be most accurate and repeatable measurement and it is routinely measured up until the age of 2 years. The head circumference and mid-arm circumference are easily performed and reproducible measurements in children aged 3 to 48 months, they are independent from age and sex, and can be used to recognise both over- and undernutrition. (Holden & MacDonald 2000, 164—166.)

### 2.3 New-born and child nutrition

Child's nutrition status starts before birth. Maternal nutritional status and maternal stunting and underweight lead to small for gestational age and prematurity. The volume of reproductive, maternal, new-born and child health, is based on the link between interventions at each stage. Interventions need to deliver integrated and be preventive and therapeutic interventions for mother and children. One of the recognised factor to decline child mortality is maternal education. Women with secondary or higher education have strong association to reduce child mortality. According to prognosis economic growth continues in sub-Saharan Africa. (Black, Laxminarayan, Temmerman & Walker 2016, xiii; Das etc. 2016, 229; Liu etc. 2016, 76.)

Optimal infant and young child feeding means that mothers receive optimal antenatal care, are empowered to begin breastfed within one hour of birth, continue breast feeding for the first six months and keep on breast feeding for two years or more. After six months of age child's food is supplemented by nutritionally adequate, nutrient-dense, safe and age-appropriate feeding of solid, semisolid, and soft foods. Early ending of breast feed and early introduction and poor-quality complimentary feeding dominates in feeding habits. Strategies to protect, promote and support early breast feeding are needed at health system. The health systems strategies include baby-friendly and initiative hospital personnel, the education of health staff about breast-milk substitutes and building a capacity for health-workers to provide breast feed counselling. Counselling and educational interventions increased early breastfeed by 43 percent at day one, by 30 percent until the age of one month, and by 90 percent from the age of one month to five months. Significant reductions with mothers who do not breastfeed, reduction at day one is 32 percent, 30 percent until one month, and 18 percent for one month to five months. Combined individual and group counselling is more efficient than individual or group counselling alone. (Das etc. 2016, 229, 235.)

Optimum nutrition during pregnancy and first two years is known as the 1.000 days window of opportunity. It is essential to health and growth and its benefits can be life-long. A major component of infant and young child feeding is provision of breast milk and appropriate, nutrient-dense complementary food. These elements include pregnancy nutritional status of the mother, child's birth weight and linear growth of the infant, and

child birth conditions, mother's mental health and environmental conditions. (Aboud & Yousafzai 2016, 242—244; Das etc. 2016, 225.). Breastfeeding within 24 hours of birth is associated with a 44—45 percent reduction in all-cause and infection-related neonatal mortality. Breastfeeding provides immunologic, psychological, social, economic, and environmental benefits. Breastfeeding improves nutrition status directly or by reducing infections and morbidity. Promoting early breastfeed is important in preventing both stunting and overweight among children. Evidence show that breastfed babies have better mental development and children who have been breastfed longer had higher verbal intelligence at age six years. Breast milk's long-chain polyunsaturated fatty acids support mental development and supplementation with milk lipid, ganglioside, have positive effects on early mental development. (Aboud & Yousafzai 2016, 249, 251; Das etc. 2016, 229—230.)

All babies, whether they are well or sick, preterm or term, new-born or toddler benefit from being breastfed. Breastmilk changes to suit baby's needs. It changes from colostrum (a form of milk few days after birth) to mature milk and it changes during feeding. Mature milk also changes from day to day and between feeding. At the beginning of feeding breast milk's lactose content is high and has low fat, and at the ending of feeding milk is four to five times fatter and provides more calories and is more satisfying. It is important that baby gets high lactose and high fat parts of the milk. Therefore, mothers should allow baby to empty first breast before nursing the second breast. Babies who are breastfed receive great protection against disease in long and short term. Breastfeeding is also beneficial to mother, because it reduces risk of breast and ovarian cancer, and osteoporosis. (Holden & MacDonald 2000, 18.)

Colostrum is produced for the first 3—4 days after baby is born. It is valuable fluid, highly concentrated nutrition to the new-born. Fat and lactose content is lower than it is in breastmilk, but it contains higher concentration of fat-soluble vitamins such as vitamin A and E. Colostrum has a vital part in protecting infant from infections. It also prevents bilirubin's reabsorption. Colostrum's typical yellow colour is caused by the fact that it has a ten times greater amount of concentrated carotene than breastmilk. In some cultures, mothers refuse to give yellow-coloured colostrum to new-born. Mothers believe that milk is dirty or spoiled or has been too long in breast. Health-workers must

explain and educate mother of the benefits of giving colostrum. (Holden & MacDonald 2000, 20.)

The WHO and UNISEF International code of marketing of breast milk substitutes, promotes breastfeeding and ensures infant formulae is correctly used. Health workers should ensure that parents know how to make, sterilize and storage infant formulae, teach the proper preparation and use of infant formulae. Formulae should be mixed exactly according the manufactures instructions. Follow-on formulae are designed for older infants over age 6 months and it should not replace breast milk or standard instant formula, if milk's volume is adequate (over 400 ml/day). Cow's milk has low iron, vitamin C and D, and it is not recommended as the main drink before age 1 year, but it can be used in preparation of solid food. (Holden & MacDonald 2000, 38—39.)

#### 2.4 Nutrient intake and early childhood development

Appropriate nutrition is essential for optimal development and growth of an infant and it also influences adulthood health. National Dietary strategies recommend energy balanced and healthy weight, limit intake from saturated fats to unsaturated fats, increase fruit and vegetable consumption, limit the intake of sugars and limit salt consumption and ensure that salt is ionized. Infants are vulnerable to under- or inappropriate nutrition for five reasons. First, infants have poor fat and protein stores, secondly, they grow and develop rapidly, and nutrient and energy requirements are high. Third reason is their neuronal development, brain grows rapidly the first two years of life. Fourth, body system is immature and inadequate feeding can result in problems with digestion, poor absorption, impaired excretion or infection. Fifth, poor growth is a contribution to develop adult diseases such as coronary artery diseases, hypertension and diabetes. (Chikoko & Ravonimanantsoa i.a.; Holden & MacDonald 2000, 33; WHO Africa. Africa's health depends on improved nutrition.)

The WHO estimates, 190 million preschool children and 19.1 million pregnant women have vitamin A deficiencies. Estimated 5.17 million preschool-age children have night blindness and 90 million (33.3 percent) have subclinical vitamin A deficiencies. Vitamin A supplementation decreases all-cause mortality and mortality due to diarrhea and

measles. Approximately 1.62 billion people have iron shortage and suffer from anemia and 1.5 percent of children have anemia or severe anemia. Sub-Saharan Africa have the highest prevalence of all iron deficiency anemia and it also has the highest prevalence of severe iron deficiency anemia. Vitamin B6 and B12 statuses are also inadequate in many low-and-middle-income countries. Zinc deficiency is associated with growth failure and increased risk of morbidity and mortality as a result diarrheal and respiratory illness. Zinc supplementation promotes linear growth and therapeutic zinc given to children with diarrhea reduces severity and the duration of illness. (Das etc. 2016, 231.)

Appropriate complementary feeding is a proven intervention that can significantly reduce stunting during the first two years of life. Complementary feeding interventions are most efficient in reducing malnutrition and promoting adequate growth and development. For improving complementary feeding, it is important to provide nutritional counselling for mothers to promote healthy feeding practices. Sufficient quantities of adequate, safe, and appropriate complementary feeding after age six months are essential to meet nutritional requirements when breast milk alone is no longer sufficient. In health system it is important to improve maternal knowledge of feeding practices by education and secure optimal complementary feeding practices by maternal counselling. Educational messages should be clear and include the promotion of nutrient-rich animal products or protein-rich plant food sources. Among food-insecure populations financial constraints may limit the possibility of adequate amounts of animal products in children's diets. (Das etc. 2016, 230—321, 236.)

Sufficient macronutrients are important to linear growth and mental development. In the first six months, exclusive breastfeeding provides sufficient nutrients to support healthy growth and immunity. After age six months, diversity of diet is positively related to linear growth. Improving dietary diversity, especially with animal-source foods, is a critical message in nutrition education interventions. Nutrition education about foods to feed and number of meals for mothers of children ages 6—24 months, led child to gains in length. Micronutrients such as iron and iodine are important for mental development in the first 24 months. In Sub-Saharan Africa 20 percent of children younger than age five years are anemic. Both an iron-deficient diet and hookworm disease are responsible for low levels of hemoglobin. Anemic children have lower levels of mental development than non-anemic children in case-control studies, and differences remain over the

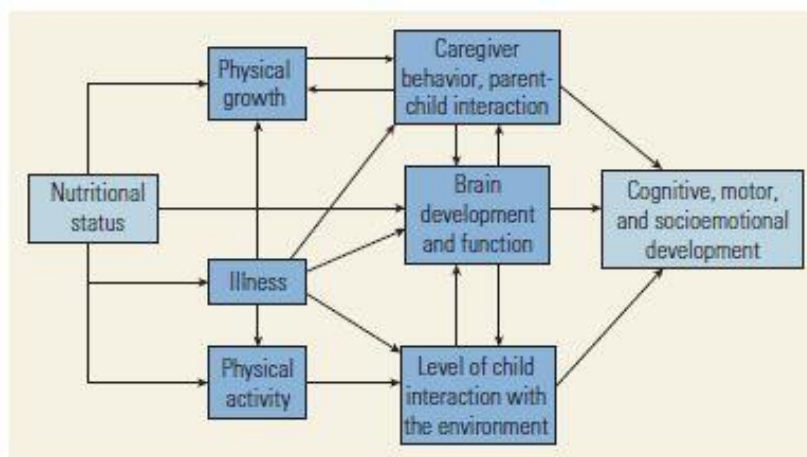
long term. Anemic children show socially isolating behaviours, such as wariness and sleepiness. Iron therapy is not alone adequate to raise child's mental development, they also need stimulation in home environment. Iodine deficiency is associated with poor school achievement, but its effect on the mental development of children younger than age 24 months is less known. Estimated 40 percent of the Sub-Saharan African population are iodine deficient. Mental development scores of children with inadequate iodine levels at birth were half a standard less than those with healthy levels. (Aboud & Yousafzai 2016, 245.)

In many low-and-middle income countries are approaches needed to estimate and address multiple micronutrient supplementation. These approaches include strengthening education, dietary modification, food provision, agricultural interventions either alone or in combination. Multiple micronutrient fortification in children shows an increase in hemoglobin levels and reduced risk of anemia. Nutrition-specific interventions reduces fatal growth restriction and small for gestational age births and improves nutrition among children younger than age five years. If these identified interventions could be scaled up to 90 percent coverage would it reduce deaths among children younger than age five years by nearly 15 percent and stunting by 20 percent and severe wasting by 61 percent. (Das etc. 2016, 232—233.) APPENDIX 6. Maternal interventions.

Developmental potential is the ability to think, learn, remember, relate, and articulate ideas appropriate to age and level of maturity, and an estimated 39 percent of the world's children under age five years do not attain this potential (Aboud & Yousafzai 2016, 241). The main reason to give attention to mental development from conception through the first 24 months of life is that early disadvantageous conditions can impair brain's normal development. Failure is often progressive and is noticed not until school begins. A second reason for take care of early mental development is that individuals are healthier and more productive if their mental skills have full-grown. More educated adults are healthier and wealthier than less educated adults and educated mothers have healthier children, they are more likely to recognize symptoms of illness, they follow medical advice and feed their children nutritious foods. (Aboud & Yousafzai 2016, 241.)

The conditions that affect the health and growth of children in the first 1,000 days can also affect mental development. These elements include pregnancy nutritional status of the mother, child's birth weight and linear growth of the infant, and child birth conditions, mother's mental health and environmental conditions. Short length- or height-for-age is one of the strongest risk factors for poor mental development. It is not clear why length and height are so strongly related to cognitive and language development, it may be that linear growth nutrition processes are related to brain and behavioural development. One conclusion is that nutrients support the structure and activity of brain for mental development, other conclusion offers that nutrition enhances health and engagement with the environment and so promotes mental development. (Aboud & Yousafzai 2016, 242—244.)

DIAGRAM 1. Illustrating Pathways from Nutritional Status to Mental Development.



(Aboud & Yousafzai 2016, 244.)

Children are often deficient in many minerals, such as iron, zinc and vitamins. They are critical for health and growth, and they effect on mental development. Multiple micro-nutrients work together to improve health, they are necessary for linear growth and they are found in the brain. Linear growth is the strongest correlate of mental development, so it is important to estimate the effects of macro- and micronutrient interventions on children's height. Linear growth gains are lowest for micronutrient fortification and better for energy food with extra proteins and nutrients. Programs which emphasizing dietary diversity and animal-source foods are most effective. In food-insecure countries short-term supplementation can lead to permanent fortification and lead to better mental development. (Aboud & Yousafzai 2016, 245.)



### 3. THESIS PURPOSE AND OBJECTIVE

Thesis purpose was to produce a teaching material about growth and nutrition of children under 5 years of age for the teachers training in Ilembula Institute of Health and Allied Sciences. Material was executed in Moodle environment and as a printable booklet.

Thesis objective was to develop teaching in Ilembula Institute of Health and Allied Sciences. Material can be re-used in the training programmes of the mentioned educational establishment and in the African projects of Diaconia University of Applied Sciences.

## 4. PRODUCTIZATION OF THE TEACHING MATERIAL

### 4.1 The teaching environment and users of teaching material

Concept of a project is defined by determine the beneficiaries and the end users of the product, and who and which departments are using it, what the short, medium and long-term goals are, which principles and values product is hoping to verify, and guide planning and producing. (Jämsä & Manninen 2000, 51.) Thesis outcome is a course about nutrition, which is a part of the Healthy Tanzania Project 2018 - Capacity building for health care sector in Tanzania project, and it is funded by the Ministry of Foreign Affairs in Finland. The developmental objective of the Healthy Tanzania Project 2018 - Capacity building for health care sector in Tanzania is to improve the impact of Tanzanian health services, especially of maternal and infant health services by training interventions. DIAK's intensive course is provided to the educators of learning institution, therefore also doctors and nurses, and staff in hospitals and health clinics.

Development of an innovation into a concrete product is administrated in a multidisciplinary team at the field of Social and Healthcare. The intensions of multidisciplinary team are guided by scientific information and dialog with the circumstances of the society. In this way the customers objectives are contained with team's objectives. (Jämsä & Manninen 2000, 25.) DIAK has planned the contents of material in agreement with IIHAS and provides teaching material, platform and technology for intensive course. Thesis outcome is to produce a clear teaching material in English. Nutrition course material is targeted to participants of course who already have knowledge in healthcare, medicine and nursing. For this reason, the content is widespread, but factual content is limited. The purpose is to give means for educators of nurse students who put information into practice when working in child health centre.

Innovations are used to find solutions to the public and organizational problems. Characteristic to creative problem solving is to openly find an answer to resolve the matter and address to the need. (Jämsä & Manninen 2000, 35.) Diaconia University of applied sciences project and intensive course takes place in Moodle-environment. Learning Management Systems are designed for teaching and education and contain tools for

informing, schedules, assignments and publishing teaching materials, return of worksheets and guidance as well as evaluation. Learning Management Systems are suitable for designing study modules and free links from social media are easy to connect to the content. Wide accessibility increases the possibilities to produce student friendly studying processes. (Ammattipedagogiikan eOppimisen aineistoja.)

#### 4.2 Planning, processing and producing the product content

In a product development can five different phases be found. To recognise a problem and need for development is the first phase and it leads to generate an idea to solve the problem, sketching the product, developing and finishing it. Proceeding from one phase to another does not necessarily mean that the previous phase has ended. The initial plan and structuring help to avoid distractions and strays and helps to choose essential content's and keeping focus in it. Product development can be clarified by having a contact with client. The goals and what must be done, are determined by individual project. If the decision of the product is made beforehand, the focus is in production. It is problematic to choose content and quantity for information transmitting product, there is also a chance to use outdated and transformed data. (Airaksinen & Vilkkä 2003, 106; Jämsä & Manninen 2000, 28, 54)

Projects problem was insufficiency of teaching material for the educators in Ilembula Institute on Health and Allied Sciences. Diaconia University of Applied Sciences Healthy Tanzania Project 2018 has strong experience about teaching, teaching methods, and necessary knowledge to produce functional teaching environment. In this Thesis product answers to need of nutritional content and focus was in teaching materials production. Product started by specifying the content, limiting age group, finding arguments of importance and finding trustable sources of information. After research, developing the content and manuscript, all material was compressed, read thru by customers and finished to the final form.

Needed and used subject matters, its components and by-products must also be defined, as well as what kind of co-operation and specialists are needed to produce the product, and how planning and development are evaluated during process. (Jämsä & Manninen

2000, 51—52.) In this Thesis the form and platform of teaching material was already decided. Materials entirety is defined by DIAK and ITHAS. Objectives of the course are to develop teaching and pedagogy focusing on maternity and child health issues and to deepen and update knowledge in maternity and child health care. Also learning how to develop teaching and pedagogy, and how to effectively search for evidence-based materials and information are important. This Thesis focuses solely in content and therefore the re-training is left out. As an ex-graphic designer, the layout, visualization and readability are authors own expertise therefore extra help from visual professional was not needed.

Because the students live in Tanzania and their educational need is to enhance the impact of Tanzanian health services, the subject of thesis and its outcome focuses especially on infant health care. The reasons for child mortality are important to address and to pass information on how to prevent and intervene the causes of it. Product content and material concentrate on nutritional causes of child mortality. Mortality of children under the age of five is highest, therefore age limit is restricted to it. Material is based on reliable and adequate information concerning nutritional and regional needs in Tanzania. Subject and theme concerns Sub-Saharan African and informational sources are chosen to meet the needs. Materials were collected from reliable operators such as World Health Organization, which works closely in developing countries and make significant research and publications.

It is required to delve into the scientific evidence when clarifying product content. It is essential to be familiar with the newest information, medical research and code of nursing when planning a product to social and healthcare sector. In some cases, studies made abroad can be the head of development. (Jämsä & Manninen 2000, 47.) When producing content selected material was chosen by newest publications and research. Subjects regional area was taken away from Europe and Scandinavia to Sud-Saharan Africa and Tanzania. By choosing regionally significant sources product content is appropriate.

### 4.3 The design and production of teaching material

Many Social- and Healthcare sectors products are aimed to carry out information for the public, the employees or the co-operative partners. The central content is built on facts which are reposted as exact and in as comprehensive manner as possible, and taking the recipients need of information in consideration (Jämsä & Manninen 2000, 54). When planning and processing a product, are supplementary knowledge, skills and planning, and production methods as well as equipment's needed. To purchase professional knowledge and getting familiar with literature can help to recognize what makes quality product. (Jämsä & Manninen 2000, 50.)

The teaching material which is an outcome of this thesis, is a part of a bigger course content, defining as an independent part of Child Health Care. Because teaching material involves a state in Sub-Saharan Africa must the angle of re-search and content be widened outside Europe. Therefore, information was collected mainly from World Health Organization, UNICEF and Word Bank. In their publications and report continents, the conditions of countries and environments have been taken into consideration. Material was divided in sections from Child mortality and undernutrition to Child growth and anthropometric measurements, criteria for severe acute malnutrition to new-born, infant and child nutrition and nutritional interventions. In the end of Moodle-course there is also a group assignment which combines the content of Growth and nutrition of children under 5 years of age course. Teaching material contains issues about child mortality in general and in Tanzania, undernutrition, child growth and anthropometric measurements, and gives means to detect criteria for severe acute malnutrition. Material also covers nutrition's impact to child's development. It gives examples what nutrition of new-born, infant and child should contain and how nutritional interventions are made. There are also guidelines to feeding child under age of five.

Analysing the ready-made information will reveal the need of improvement of service. Problem solving approach aims to improve the existing services and product's continuing development when it's quality no longer respond to the need. Breeding earlier product can also be customer's objective. A new technical innovation can start a process of a new product or service. (Jämsä & Manninen 2000, 29—30, 32.) Moodle is a free, online Learning Management system where educators can create website with learning courses

that can be used regardless of place and time. Moodle is a free and open-source learning management system and under the General Public License (GNU). It is developed on pedagogical principles, and it can be used for e-learning projects in schools, universities, workplaces and other sectors. Moodle's interface is easy to navigate on both desktop and mobile devices. It has a simple text editor where media and images can be placed easily, and a Moodle theme is also customisable for own design. Organisation and course displays, tasks and messages, collaborative tools and activities allows learning together in forums. Moodle's calendar tool helps to track course deadlines, group meetings, and users can receive automatic alerts on new assignments and forum posts and send private messages to one another. Educators and learners can track progress and completion by tracking individual activities. (Wikipedia; Moodle.)

To change social and health behaviour, communication images are essential. Images and visual materials with informative details and context with given information help to aid comprehension and provides credibility to the message. Visual aids with high-quality images also give a professional appearance which helps people to trust the information. It is important to use images that people can relate to. If a person can identify with characters in pictures, it improves practices and promotes adoption of these practices. In 2010, UNICEF developed and launched the Community Infant and Young Child Feeding Counselling Package, an overall package of materials as well as high quality graphic illustrations. The generic C-IYCF package and the corresponding images have been adapted by UNICEF and partners in over 70 countries. The Image Bank is a collection of over 700 images and generic illustrations are available for organizations to create print materials and other visual aids aimed at promoting maternal, infant, and young child nutrition. These images are available for download, adapt, and use freely for any not-for-profit purposes. (IYCF Image Bank.)

After the preliminary information was collected from liable sources it was edited into manuscript. The content of teaching material continues logically from basic problem, it deals the problem and gives solutions. Supporting diagrams and charts were made and modified to look visually alike and to support textual message. Illustrations with African aspect were chosen from C-IYCF Image Bank. Manuscript, diagrams and illustrations were exported to Moodle-environment. Fonts, font sizes and paragraph formatting were set beforehand, therefore personal and individual graphic design was restricted.

Moodle's model of page layout creates same outlook for the whole course and all teaching material. In Growth and nutrition of children under 5 years of age course the similarity of diagrams and illustrations made course section look solid and plain. Content is visually clear, and artwork is easy to identify. APPENDIX 7. Layout examples from Moodle environment.

The teaching material is available during the intensive course in Moodle-environment for a short period, therefore also a printable version of teaching material was made. Booklets content and non-textual matter are the same, but it was made for practical printer friendly size A4. APPENDIX 8. Layout examples of downloadable booklet. It is loadable from Moodle for later use and education professionals can utilize it in their own teaching. Because the content of Growth and nutrition of children under 5 years of age course is wide, the material had to be narrowed and therefore some of the excluded materials were collected as a useful Material Bank and placed in Moodle. By loadable Booklet and Material Bank the educators are given a compact material to use and exploit it afterwards. Child nutrition Material Bank contains inter alia reference cards, growth records and guidebooks for measuring. Content of Material Bank are produced by trustworthy operatives such as WHO.

#### 4.4 The valuation and testing of teaching material

In the development of product, feedback and valuation are necessary during the whole process. The trial run is a perfect way for testing material, and feedback should be asked also from the end users, not only from customers or clients, because they do not have preconceptions about the product. Finishing the product starts when the feedback is received. In the final stage the preparation of details, instructions and execution instructions are refined. (Jämsä & Manninen 2000, 80—81.) Products manuscript was given to the customer, DIAK's teachers who are operatives in Healthy Tanzania 2018 Project. After approval material was exported to Moodle-environment and direct feedback from customer was taken. Project personnel were satisfied about the content and visualization, and found content meet up with expectations. The structure of manuscript worked well in Moodle environment, textual content placed well in the chosen Moodle inter-

face. Visualisation, diagrams and pictures lighten the entirety and made information easier to receive.

Diaconia University of Applied Sciences representatives, teachers and project personnel visited Ilembula Institute of Health and Allied Sciences. On this occasion seven persons explored and examined Growth and nutrition of children under 5 years of age course material and answered the questionnaire about it. The questionnaire was made to assess contents, its significance and usefulness, as well as its visualisation. Questionnaire about material included the personal status of the answerers and nine questions about the content with simple answer yes or no, furthermore, there was also a possibility to give written feedback. APPENDIX 9.

DIAGRAM 2. Questionnaire about nutrition teaching material.

Personal data	I am a teacher.	I take part in planning curriculum.		Neither above, I am a	
	6	1	BE		
Chosen answer	yes	no	neither above, why		
1. I find material important.	7	-			
2. I find material trustable.	7	-			
3. Material is logical.	7	-			
4. Diagrams are useful and support content.	7	-			
5. Artwork is useful and supports the content.	7	-			
6. Material is useful in my work.	7	-			
7. I could use material in my work.	7	-			
8. I could exploit material in my own teaching.	7	-			
9. If you answer two questions above YES, please estimate how likely you are going to use it. If you answer no, do not answer question no. 9. Mark Your answer by drawing a circle.	1 = very unlikely	2 = unlikely	3 = probably	4 = very likely	5 = extremely likely
	1			3	2



DIAGRAM 3. Questionnaire`s written feedback about nutrition teaching material.

1. I find material important.	- <i>It comprises all important Materials on nutrition as well as pictures.</i> - <i>It helps to take care to child`s about Nutrition.</i>
2. I find material trustable.	- <i>It contains information which are true as well as reliable quotation e.g. WHO.</i>
3. Material is logical.	- <i>It tells the realistic for content.</i>
4. Diagrams are useful and support content.	- <i>All diagrams are relevant to its information explained.</i> - <i>For helping to gate the real meaning or for greater meaningful.</i>
5. Artwork is useful and supports the content.	
6. Material is useful in my work.	- <i>Yes, it`s useful because there are a lot of data which are evidence based which can be used as a reference during providing care to patients.</i> - <i>For base understanding.</i>
7. I could use material in my work.	- <i>Because its well-arranged, evidence based and interested.</i> - <i>For supporting working/learning</i>
8. I could exploit material in my own teaching.	- <i>Because its evidenced based materials.</i> - <i>This material has clear and short and easy to understand the student.</i>

A successful and viable product is made when the knowledge of Social and Healthcare is exploited, technological information and art are combined without losing the perspective of Health and Welfare. During the process all its elements are modified into wholeness that supports main goal. (Jämsä & Manninen 2000, 104.) The feedback given from clients and the actual users allows to assume product managed to answer the need and established objectives. One of the original objective was to produce a useful material for educators training. Thesis ethical aspiration was to create long-term material for educators later use. From the answers can following conclusions be made; content is trustworthy and logical, visualization supports the content and promotes understanding, and material is likely to be used in educator`s own study programs.

## 5. REFLECTION

### 5.1 The Significances of Thesis

Intended outcome of a product in Social- and Healthcare field is to improve clients or patient's health, well-being and support the skills of life. (Jämsä & Manninen 2000, 24.) The developmental objective of the DIAK's Healthy Tanzania 2018 project is to improve the impact of Tanzanian health services, especially of maternal and infant health services and services for children with disabilities by training interventions. Good nutrition status protects child from malnutrition, wasting and death. It also improves child's physical and mental health and prosperity in later and adult life. By bettering children's health, society betters itself.

When scientific research is applied in practise it is called instrumental i.e. direct use. It's target is to change behaviour or start a new procedure. Conceptual i.e. indirect use of scientific research aims to raise awareness and understanding. New strategies need to be culturally appropriate and challenge cultural influences and changes take time. (WHO Africa. Africa's health depends on improved nutrition; Kankkunen & Vehviläinen-Julkunen 2013, 32.) The educators who take part in course will carry on new information to the students and consequently to the staff working in health centres. Because teaching material is accurate in a long run, the content of this course is also available as on pdf-document, and trainees can re-use and complement it in their own work and as well as in teaching. By providing a new way to study in a new learning environment, new possibilities to expand information have been introduced.

In the future it would be interesting to see how educators in Tanzania will carry on with the provided materials, new form of teaching, learning management system Moodle, and what kind of courses and contents they produce for students.

## 5.2 The Ethics of Thesis

Standards of scientific research base on universality and its true value is estimated with general criticism, it is communal property, it is neutral and favours neither supports any points of view and it is revealed for inspection in scientific community. (Kankkunen & Vehviläinen-Julkunen 2013, 28.) The contents of this Thesis were selected from reliable sources from provides who do not have financial purposes. Information is neutral and based on facts and research are made by trustworthy research groups of scientific community. Sources are verified by professionals and have been thru inspection before released.

Social- and healthcare's clients are not necessarily product's primary users or beneficiaries, but benefit can be indirectly advantageous for the provider and personnel. When client is a beneficiary in the end, also their needs, problems and interests should be researched. When both parts are considered at the starting point of planning, will the content and product itself reply to purpose. (Jämsä & Manninen 2000, 44—45.) The content of Nutrition Course gives instruments to observe and measure child's malnutrition and therefore it is easier for personnel of Healthcare to find more children in need. By educating the Healthcare sectors workers the primary Beneficial's are the weakest members of society, in this case the children. Thesis has pursued to collect a content what will indirectly decrease human suffering and improve the quality of life.

From the user's point of view the quality of a product reveals itself, when it meets the needs and it impresses the client's expectations. Useful life of a product can be determined to begin as soon as it available for the users. Products life circle and its usable age can vary, and the length of time is not an absolute value itself. Technical perspective gives a new importance for products life circle. New product development can promote development of the next product and be a model for standardisation of service products. With the same concept can various contents be made, by using same model, only updating its message. Renewability is an asset to take into consideration when valuing useful life of a product. Product can have long term impact despite its short lifetime. (Jämsä & Manninen 2000, 110—111, 127.)

During process client's opinion has been enquired and product was made in collaboration with project personnel. Content was chosen from the selection of users defined subjects. Thesis outcome, the Growth and nutrition of children under 5 years of age course, replies for the need of education in IHHAS. Inquiry made to the users gives distinct answer for later use in educator's work, contents importance is verified. Updated education, curriculum and content are easily provided in other organizations and projects. Diaconia University of Applied Sciences has request permission to use course material in DIAK's another project in Africa. Product can be exploited in other low-income countries, because the contents information is universal after modification of local details.

Copyright protects writing and artwork. Without any separately made application, copyright is valid until 70 years has passed away after author is deceased. Trade dress covers the appearance of product not the idea. (Airaksinen & Vilkkä 2003, 99—100.) Copyright and trade dress has been considered when producing products visualization. Artwork is chosen from UNICEF's and its partners administered Community Infant and Young Child Feeding Counselling Image Bank. C-IYCF's illustrations are free to use in printed materials and other visual aids which aim to promote maternal, infant, and young child nutrition. Commercial use of these images and materials is prohibited. Products diagrams are made by author, for consistent visual appearance, also for avoiding possible problems with trade dress. Artwork and diagram sources were marked in every diagram and artwork, for the policy of Thesis and for ethical reasons.

Copyright belongs automatically to the author, but copyright is not same as property rights. Learning institution does not automatically get the completed works copyrights regardless project is made by using school's resources. Also, mentor receives no copyrights by supervision and pedagogical guidance. (Airaksinen & Vilkkä 2003, 162.) It has been agreed, that copyright of this Thesis and it's product, Growth and nutrition of children under 5 years of age courses, copyright is given to Diaconia University of Applied Sciences (DIAK) and Ilembula Institute of Health and Allied Sciences (IHHAS). This decision favours authors personal ethics, to shear information and knowledge to those in need. Usefulness of material and it's wide exploitation is significant commendation and gives meaning for authors hard work.

### 5.3 The Reliability of Thesis

Nursing, nursing science and its scientific knowledge and research are tightly connected (Kankkunen & Vehviläinen-Julkunen 2013, 26). Nursing is based on scientific research and the meaning of information is emphasized in investigative development activities. In practice nursing combines different sources of information as well as observation of professionals. Evidence-based knowledge is based on scientific research about demographic groups health, need for health, management, coping and taking care of health problems. (Kankkunen & Vehviläinen-Julkunen 2013, 26—27, 31.) This Thesis product was made for nursing teachers and contains the newest information, which educators will carry on to the nurse students. In this way new information and scientific knowledge passes on. Thesis research was made with in theoretical framework and appropriate definition. Origin of information was collected from several reliable operators, whose evidence-based information is scientifically approved and contain no incoherence's in facts.

Direct lending's and citations make textual work disorganized and do not show authors understanding of the issue and content. By summarizing original textual content with own textual output, better results are made. Facts and opinions must be able to separate, the reliability of information must be transmitted in proper way. Verify citations with references, and if there are personal comments, be sure reader can separate them. (Airaksinen & Vilkkä 2003, 106.)

During the research process, and producing content of teaching material, precise markings of direct lending's and citations were made. When combining information from different sources, all references were put together. Thesis references are marked in accordance with DIAK's guidelines for written schoolwork and in product, all references are found from reference list and the end of manuscript. Translation from Finnish text to English, has been carefully made. Straight translation from word to word have been avoided, more important has been the languages natural translation. Figure of speech and expressions have different variations between languages. For the reliability of theses, subject matter is pedantic even expressions varies from original. Conscious decision to use English throughout the whole Thesis decreases chances of misinformation and diminishes the possibility of misunderstanding.

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## APPENDIX 1—9:

APPENDIX 1. Country, regional and global estimates of mortality among children under age 5 and children aged 5—14 & Estimates of mortality among children under age 5 and children aged 5—14 by Sustainable Development Goal region.

Country, regional and global estimates of mortality among children under age 5 and children aged 5–14															
	Under-five mortality rate (U5MR) with 90 per cent uncertainty interval (deaths per 1,000 live births)									Number of under-five deaths with 90 per cent uncertainty interval (thousands)					
	1990			2016			Annual rate of reduction (ARR) (per cent) 1990-2016			1990			2016		
	Country	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound	ARR	Lower bound	Upper bound	Underfive deaths	Lower bound	Upper bound	Underfive deaths	Lower bound
United Republic of Tanzania	179	169	189	57	46	71	4.4	3.6	5.2	192	181	203	117	96	146
Estimates of mortality among children under age 5 and children aged 5–14 by Sustainable Development Goal region															
	Under-five mortality rate (U5MR) with 90 per cent uncertainty interval (deaths per 1,000 live births)									Number of under-five deaths with 90 per cent uncertainty interval (thousands)					
	1990			2016			Annual rate of reduction (ARR) (per cent) 1990-2016			1990			2016		
	Country	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound	ARR	Lower bound	Upper bound	Underfive deaths	Lower bound	Upper bound	Underfive deaths	Lower bound
Sub-Saharan Africa	183	179	187	79	73	89	3,2	2,8	3,5	3,787	3,714	3,869	2,777	2,570	3,113

(Hug, Sharrow & You, 2017, 30)

APPENDIX 2. Country, regional and global estimates of mortality among children under age 5 and children aged 5—14 & Estimates of mortality among children under age 5 and children aged 5—14 by Sustainable Development Goal region.

Country, regional and global estimates of mortality among children under age 5 and children aged 5–14																
Country	Number of under-five deaths with 90 per cent uncertainty interval (thousands)				Infant mortality rate (deaths per 1,000 live births)		Number of infant deaths (thousands)		Neonatal mortality rate (deaths per 1,000 live births)		Number of neonatal deaths (thousands)		Probability of dying among children aged 5–14 (deaths per 1,000 children aged 5)		Number of deaths among children aged 5–14 1990 2016 (thousands)	
	Male 1990	Female 1990	Male 2016	Female 2016	1990	2016	1990	2016	1990	2016	1990	2016	1990	2016	1990	2016
United Republic of Tanzania	185	172	60	53	108	40	118	84	41	22	47	46	31	12	23	20
Estimates of mortality among children under age 5 and children aged 5–14 by Sustainable Development Goal region																
Sub-Saharan Africa	192	173	84	73	109	54	2,301	1,910	46	28	1,008	1,003	42	19	604	513

(Hug, Sharrow & You, 2017, 31)

APPENDIX 3. Poverty status by Area, Tanzania Mainland, 2007 and 2011/12

Poverty Status by Area, Tanzania Mainland, 2007 and 2011/12				
Year	Area	% of Population below, Food Poverty Line	% of Population below, Basic Needs Poverty Line	% of Female Headed Households
2007	Dar es Salaam	3.2	14.1	24.4
	Other Urban	8.9	22.7	30.1
	Rural	13.5	39.4	23.0
	Total	11.8	34.4	24.5
2011/12	Dar es Salaam	1.0	4.1	22.5
	Other Urban	8.7	21.7	27.6
	Rural	11.3	33.3	24.3
	Total	9.7	28.2	24.7

(National Bureau of Statistics Dar es Salaam, 52)

APPENDIX 4. Box 1. Diagnostic criteria for SAM in children aged 6—60 months.

Box 1. Diagnostic criteria for SAM in children aged 6–60 months		
Indicator	Measure	Cut-off
Severe wasting (2)	Weight-for-height (1)	< -3 SD (standard deviations)
Severe wasting (2)	MUAC (mid-upper arm circumference)	< 115 mm
Bilateral oedema (3)	Clinical sign	
1 Based on WHO Standards ( <a href="http://www.who.int/childgrowth/standards">www.who.int/childgrowth/standards</a> )		
2,3 Independent indicators of SAM that require urgent action		

(The World Health Organization and UNICEF 2009. i.a., 2)

## APPENDIX 5 A. Weight-for-length Reference Card (86 and under)

Weight-for-Length Reference Card (86 cm and under)										
Boys' weight (kg)					Height		Girls' weight (kg)			
-4 SD	-3 SD	-2 SD	-1 SD	Median	(cm)	Median	-1 SD	-2 SD	-3 SD	-4 SD
1.7	1.9	2.0	2.2	2.4	45	2.5	2.3	2.1	1.9	1.7
1.8	2.0	2.2	2.4	2.6	46	2.6	2.4	2.2	2.0	1.9
2.0	2.1	2.3	2.5	2.8	47	2.8	2.6	2.4	2.2	2.0
2.1	2.3	2.5	2.7	2.9	48	3.0	2.7	2.5	2.3	2.1
2.2	2.4	2.6	2.9	3.1	49	3.2	2.9	2.6	2.4	2.2
2.4	2.6	2.8	3.0	3.3	50	3.4	3.1	2.8	2.6	2.4
2.5	2.7	3.0	3.2	3.5	51	3.6	3.3	3.0	2.8	2.5
2.7	2.9	3.2	3.5	3.8	52	3.8	3.5	3.2	2.9	2.7
2.9	3.1	3.4	3.7	4.0	53	4.0	3.7	3.4	3.1	2.8
3.1	3.3	3.6	3.9	4.3	54	4.3	3.9	3.6	3.3	3.0
3.3	3.6	3.8	4.2	4.5	55	4.5	4.2	3.8	3.5	3.2
3.5	3.8	4.1	4.4	4.8	56	4.8	4.4	4.0	3.7	3.4
3.7	4.0	4.3	4.7	5.1	57	5.1	4.6	4.3	3.9	3.6
3.9	4.3	4.6	5.0	5.4	58	5.4	4.9	4.5	4.1	3.8
4.1	4.5	4.8	5.3	5.7	59	5.6	5.1	4.7	4.3	3.9
4.3	4.7	5.1	5.5	6.0	60	5.9	5.4	4.9	4.5	4.1
4.5	4.9	5.3	5.8	6.3	61	6.1	5.6	5.1	4.7	4.3
4.7	5.1	5.6	6.0	6.5	62	6.4	5.8	5.3	4.9	4.5
4.9	5.3	5.8	6.2	6.8	63	6.6	6.0	5.5	5.1	4.7
5.1	5.5	6.0	6.5	7.0	64	6.9	6.3	5.7	5.3	4.8
5.3	5.7	6.2	6.7	7.3	65	7.1	6.5	5.9	5.5	5.0
5.5	5.9	6.4	6.9	7.5	66	7.3	6.7	6.1	5.6	5.1
5.6	6.1	6.6	7.1	7.7	67	7.5	6.9	6.3	5.8	5.3
5.8	6.3	6.8	7.3	8.0	68	7.7	7.1	6.5	6.0	5.5
6.0	6.5	7.0	7.6	8.2	69	8.0	7.3	6.7	6.1	5.6
6.1	6.6	7.2	7.8	8.4	70	8.2	7.5	6.9	6.3	5.8
6.3	6.8	7.4	8.0	8.6	71	8.4	7.7	7.0	6.5	5.9
6.4	7.0	7.6	8.2	8.9	72	8.6	7.8	7.2	6.6	6.0
6.6	7.2	7.7	8.4	9.1	73	8.8	8.0	7.4	6.8	6.2
6.7	7.3	7.9	8.6	9.3	74	9.0	8.2	7.5	6.9	6.3
6.9	7.5	8.1	8.8	9.5	75	9.1	8.4	7.7	7.1	6.5
7.0	7.6	8.3	8.9	9.7	76	9.3	8.5	7.8	7.2	6.6
7.2	7.8	8.4	9.1	9.9	77	9.5	8.7	8.0	7.4	6.7
7.3	7.9	8.6	9.3	10.1	78	9.7	8.9	8.2	7.5	6.9
7.4	8.1	8.7	9.5	10.3	79	9.9	9.1	8.3	7.7	7.0
7.6	8.2	8.9	9.6	10.4	80	10.1	9.2	8.5	7.8	7.1
7.7	8.4	9.1	9.8	10.6	81	10.3	9.4	8.7	8.0	7.3
7.9	8.5	9.2	10.0	10.8	82	10.5	9.6	8.8	8.1	7.5
8.0	8.7	9.4	10.2	11.0	83	10.7	9.8	9.0	8.3	7.6
8.2	8.9	9.6	10.4	11.3	84	11.0	10.1	9.2	8.5	7.8
8.4	9.1	9.8	10.6	11.5	85	11.2	10.3	9.4	8.7	8.0
8.6	9.3	10.0	10.8	11.7	86	11.5	10.5	9.7	8.9	8.1

(The World Health Organization and UNICEF 2009. i.a., 7)

## APPENDIX 5 B. Weight-for-length Reference Card (87 cm and above)

Weight-for-Length Reference Card (87 cm and above)										
	Boys' weight (kg)				Height		Girls' weight (kg)			
<b>-4 SD</b>	-3 SD	-2 SD	-1 SD	Median	(cm)	Median	-1 SD	-2 SD	-3 SD	-4 SD
<b>8.9</b>	9.6	10.4	11.2	12.2	87	11.9	10.9	10.0	9.2	8.4
<b>9.1</b>	9.8	10.6	11.5	12.4	88	12.1	11.1	10.2	9.4	8.6
<b>9.3</b>	10.0	10.8	11.7	12.6	89	12.4	11.4	10.4	9.6	8.8
<b>9.4</b>	10.2	11.0	11.9	12.9	90	12.6	11.6	10.6	9.8	9.0
<b>9.6</b>	10.4	11.2	12.1	13.1	91	12.9	11.8	10.9	10.0	9.1
<b>9.8</b>	10.6	11.4	12.3	13.4	92	13.1	12.0	11.1	10.2	9.3
<b>9.9</b>	10.8	11.6	12.6	13.6	93	13.4	12.3	11.3	10.4	9.5
<b>10.1</b>	11.0	11.8	12.8	13.8	94	13.6	12.5	11.5	10.6	9.7
<b>10.3</b>	11.1	12.0	13.0	14.1	95	13.9	12.7	11.7	10.8	9.8
<b>10.4</b>	11.3	12.2	13.2	14.3	96	14.1	12.9	11.9	10.9	10.0
<b>10.6</b>	11.5	12.4	13.4	14.6	97	14.4	13.2	12.1	11.1	10.2
<b>10.8</b>	11.7	12.6	13.7	14.8	98	14.7	13.4	12.3	11.3	10.4
<b>11.0</b>	11.9	12.9	13.9	15.1	99	14.9	13.7	12.5	11.5	10.5
<b>11.2</b>	12.1	13.1	14.2	15.4	100	15.2	13.9	12.8	11.7	10.7
<b>11.3</b>	12.3	13.3	14.4	15.6	101	15.5	14.2	13.0	12.0	10.9
<b>11.5</b>	12.5	13.6	14.7	15.9	102	15.8	14.5	13.3	12.2	11.1
<b>11.7</b>	12.8	13.8	14.9	16.2	103	16.1	14.7	13.5	12.4	11.3
<b>11.9</b>	13.0	14.0	15.2	16.5	104	16.4	15.0	13.8	12.6	11.5
<b>12.1</b>	13.2	14.3	15.5	16.8	105	16.8	15.3	14.0	12.9	11.8
<b>12.3</b>	13.4	14.5	15.8	17.2	106	17.1	15.6	14.3	13.1	12.0
<b>12.5</b>	13.7	14.8	16.1	17.5	107	17.5	15.9	14.6	13.4	12.2
<b>12.7</b>	13.9	15.1	16.4	17.8	108	17.8	16.3	14.9	13.7	12.4
<b>12.9</b>	14.1	15.3	16.7	18.2	109	18.2	16.6	15.2	13.9	12.7
<b>13.2</b>	14.4	15.6	17.0	18.5	110	18.6	17.0	15.5	14.2	12.9
<b>13.4</b>	14.6	15.9	17.3	18.9	111	19.0	17.3	15.8	14.5	13.2
<b>13.6</b>	14.9	16.2	17.6	19.2	112	19.4	17.7	16.2	14.8	13.5
<b>13.8</b>	15.2	16.5	18.0	19.6	113	19.8	18.0	16.5	15.1	13.7
<b>14.1</b>	15.4	16.8	18.3	20.0	114	20.2	18.4	16.8	15.4	14.0
<b>14.3</b>	15.7	17.1	18.6	20.4	115	20.7	18.8	17.2	15.7	14.3
<b>14.6</b>	16.0	17.4	19.0	20.8	116	21.1	19.2	17.5	16.0	14.5
<b>14.8</b>	16.2	17.7	19.3	21.2	117	21.5	19.6	17.8	16.3	14.8
<b>15.0</b>	16.5	18.0	19.7	21.6	118	22.0	19.9	18.2	16.6	15.1
<b>15.3</b>	16.8	18.3	20.0	22.0	119	22.4	20.3	18.5	16.9	15.4
<b>15.5</b>	17.1	18.6	20.4	22.4	120	22.8	20.7	18.9	17.3	15.6

(The World Health Organization and UNICEF 2009. i.a., 8)

## APPENDIX 6. Maternal interventions

INTERVENTION	ESTIMATES
<b>Child interventions</b>	
Breastfeeding	<ul style="list-style-type: none"> <li>• Exclusive breastfeeding rates increased by 43 percent at four to six weeks, with 89 percent and 20 percent significant increases in LMICs and HICs, respectively. Exclusive breastfeeding improved at age six months by 137 percent, with a sixfold increase in LMICs.</li> </ul>
Complementary and supplementary feeding	<ul style="list-style-type: none"> <li>• Statistically significant difference of effect for length during the intervention in children</li> </ul>
Iron supplementation	<ul style="list-style-type: none"> <li>• Anemia (RR: 0.51; 95 percent CI: 0.37–0.72)</li> <li>• Iron deficiency (RR: 0.24; 95 percent CI: 0.06–0.91), hemoglobin (MD: 5.20 g/l; 95 percent CI: 2.51–7.88), ferritin (MD: 14.17 mcg/l; 95 percent CI: 3.53–24.81)</li> </ul>
Vitamin A supplementation	<ul style="list-style-type: none"> <li>• All-cause mortality reduced by 24 percent (RR: 0.76; 95 percent CI: 0.69–0.83)</li> <li>• Diarrhea-related mortality reduced by 28 percent (RR: 0.72; 95 percent CI: 0.57–0.91)</li> <li>• Incidence of diarrhea reduced by 15 percent (RR: 0.85; 95 percent CI: 0.82–0.87)</li> <li>• Incidence of measles reduced by 50 percent (RR = 0.50; 95 percent CI 0.37–0.67)</li> <li>• Nonsignificant impacts on measles and ARI-related mortality</li> </ul>
Zinc supplementation	<ul style="list-style-type: none"> <li>• Height improved by 0.37 centimeters (SD 0.25) in children supplemented for 24 weeks</li> <li>• Diarrhea reduced by 13 percent</li> <li>• Pneumonia reduced by 19 percent</li> <li>• Nonsignificant impacts on mortality</li> </ul>
<b>Disease prevention and management</b>	
WASH interventions	<ul style="list-style-type: none"> <li>• Diarrhea reduced by 48 percent (RR: 0.52; 95 percent CI: 0.34–0.65) with handwashing with soap, 17 percent with improved water quality, and 36 percent with excreta disposal</li> </ul>
Deworming	<ul style="list-style-type: none"> <li>• Prophylactic single and multiple dose deworming had a nonsignificant effect on hemoglobin and weight gain.</li> <li>• Treating children with proven infection showed that single dose of deworming drugs increases weight (0.58 kg; 95 percent CI: 0.40–0.76) and hemoglobin (0.37 g/dl; 95 percent CI: 0.1–0.64).</li> </ul>
Malaria prevention and treatment	<ul style="list-style-type: none"> <li>• Antimalarial to prevent malaria in pregnant women reduced antenatal parasitemia (RR: 0.53; 95 percent CI: 0.33–0.86)</li> <li>• Birth weight increased (MD: 126.7 g; 95 percent CI: 88.64–164.75)</li> <li>• LBW and severe antenatal anemia reduced by 43 percent and 38 percent, respectively</li> <li>• ITNs in pregnancy reduced LBW by 23 percent (RR: 0.77; 95 percent CI: 0.61–0.98) and reduced fetal loss (first to fourth pregnancies) by 33 percent (RR: 0.67; 95 percent CI: 0.47–0.97)</li> <li>• Nonsignificant impacts on anemia and clinical malaria</li> </ul>
<p>Note: ARI = acute respiratory infection; CI = confidence interval; g = grams; g/dL = grams per decilitre; g/l = grams per litre; HIC = high-income country; ITNs = insecticide treated bednets; kg = kilogram; LBW = low birth weight; LMICs = low- and middle-income countries; mcg/l = micrograms per litre; MD = mean difference; RR = relative risk; SD = standard deviation; SGA = small for gestational age; WASH = water, sanitation, and hygiene.</p>	

(Das etc. 2016, 234—235.)

# APPENDIX 7. Layout examples from Moodle environment.

**Dick**

My Courses / IDPA\_2018 / Session 5: Child health / Child health care

## "Healthy Tanzania" Project 2018

My Courses

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### Child health care

#### 1. Nutrition

##### 1.1. Growth- and nutrition of a 0 to 5-year-old child

**Preface**

A poor start of life can lead to poor health and inadequate learning. Childhood development is a growth process of perceptual, motor, cognitive, language, socio-economical and self-regulation skills. Health, nutrition, responsive caregiving, security and safety, and early learning are domains on nurturing care for children to reach their developmental potential.

In this Moodle Room -class You can find information and materials about Child's nutrition from new-born to school-age, and You will have access to useful material bank. Content starts with justification of nutrition's significance and material varies from undernutrition, anthropometric measurements and criteria of severe acute malnutrition to feeding practises.

In the end of this content You carry out Assignment "How to identify Child with malnutrition". Directions are on the bottom this sheet.

← Previous: 1. Nutrition
Next: 1.2. Child mortality →

◀ Search and evaluate articles of pain relief methods for newborns
Jump to...
▶ Guiding ▶

### Child health care


#### 1. Nutrition

##### 1.7. New-born, infant and child nutrition

**Mother's influence on child's nutrition**

Child's nutrition status starts before birth. Maternal nutritional status and maternal feeding and underweight lead to small for gestational age and prematurity. Fast growth restriction is an important contributor to emaciation and wasting in children. Optimal lactation and young child feeding status that mothers receive optimal maternal care, are empowered to initiate breastfeeding, and use breast milk, continue breast feeding for the first six months and long as breast feeding for two years or more.

Continuing and substantial interventions increased early breastfeeding by 43 percent at day one, by 30 percent until age six months, and by 30 percent from age six months to age five months. Discontinue interventions with mother who do not breastfeed, reduction in day one is 30 percent, 30 percent until six months, and 40 percent for one month to five months. Continued lactation and group counseling increase efficient than individual or group counseling alone.




**Breastfeeding (BF)**

Breastfeeding within 24 hours of birth is associated with a 44–45 percent reduction in all-cause and infection-related neonatal mortality. Interventions to promote breastfeeding are a key component of expanding life size. All babies are they well or sick, premature or term, singleton or multiple benefit from being breastfed.

Breast milk changes to suit baby's needs. It changes from colostrum (a form of milk the days after birth) to mature milk and it changes during feeding. Mature milk also changes from day to day and between feeding. At the beginning of feeding breast milk's lactose content is high and has low fat, and at the ending of feeding milk has low lactose and more fat and provides more calories and is more satisfying. It is important that baby gets high lactose and high fat parts of the milk. Therefore, mothers should allow baby to empty first breast before moving the second breast. Babies who are breastfed receive great protection against disease in long and short term. Breastfeeding is also beneficial to mothers, because it reduces risk of breast and ovarian cancer, and osteoporosis.

Evidence show that breastfed babies have better mental development and children who have been breastfed longer had higher verbal intelligence at age six years. Breast milk's important nutrient fatty acids have relation to mental development in high-income-countries. Long-chain polyunsaturated fatty acids support mental development and eye development with a high DHA, phospholipids, has positive effects on early mental development. Mental development benefits of fatty acids in children.



#### 1. Nutrition

##### 1.10. Weaning and feeding Children under 5

**Weaning**

Weaning is a process when infants start to eat (depending on lactate feeds) and drinks. Weaning starts with semi-solid foods in 4–6 months and progress continues up to 1 year's age, when child should manage with similar food as the rest of family. Weaning requires energy and protein coming from milk, breast milk substitutes, develop chewing and suckle's after similar to family's food.

After six months, diversity of diet is positively related to linear growth, improving dietary diversity, especially with animal-source foods, is a critical message in nutrition education interventions. Nutrition education about foods in food and number of meals for mothers of children aged 6–24 months, had child's height in length. Interventions such as iron and folate are important for mental development in the first six months.

**Example of a weaning plan (6–18 months)**

Age	Infant drinks to introduce	8:00 am	10:00 am	1:00 pm	4:00 pm	6:00 pm
6 months	1) 2 teaspoons of porridg baby food	+	+	+	+	+
8 months	4 teaspoons of porridg baby food	+	+	+	+	+
10 months	6 teaspoons of porridg baby food	+	+	+	+	+
12 months	2) 2 teaspoons of porridg baby food	+	+	+	+	+
18 months	2) 2 teaspoons of porridg baby food	+	+	+	+	+

+ Infant feed (breast or formula milk)  
 + Solid food

**At the age of 4 to 5 months**

Food should be thin, smooth and semi-solid. Suitable foods are porridg fruits, vegetables, mashed potatoes, mashed, mashed yogurt and baby rice. Other infant accept eating from a spoon, different tastes and textures can be introduced. Irons and zinc-rich can be added to the food to give more energy and nutrient density. Salt should not be used, and sugar should be avoided. Weaning starts by offering one or two teaspoons of porridg food, to one longer with in about five. Quality, quantity and frequency are increased gradually up to three times a day. The breast milk or infant formula should still be the main source of nutrition because breast milk is still.

**At the age of 6 to 9 months**

Food should be mashed or crushed, and baby can also have finger food. Suitable foods are porridg meat, well cooked fish, wholemeal cereal and porridg, mashed soft-cooked egg, soft fruits, soft cereals, slices of soft bread, food can have stronger texture and mildly spiced. Solid foods can be offered three times a day. Proximal volume of milk is 25% and milk feed 40%. Child should be encouraged to use cup for drinking.



**At the age of 10 to 18 months**

Food should be minced or chopped and child is encouraged to self-feed. At the 1 year, infant should be eating same food as the rest of the family, get three meals ready and in it should supply 40–45% of energy needs. Home-made weaning food has advantages which are adjust to the taste of child's food, food is cheap and easy to prepare. Instead of home-made food is nutrition quality, they can be low in energy, less fat, and less. Commercial weaning foods are easy to use, manufacturers have strict regulations of safety, composition and added vitamins and minerals. They are however expensive and storage can be high.

#### 1. Nutrition

##### 1.5. Criteria for severe acute malnutrition (SAM)

WHO and UNICEF recommend the use of a cut-off for weight-for-height of below -3 standard deviation (SD) of the WHO standards to identify infants and children as having severe acute malnutrition (SAM). Children below this cut-off have a highly elevated risk of death compared to those who are above, and they have a higher weight gain when receiving a therapeutic diet and faster recovery compared to other cases. Children with a MUAC less than 125 mm have a highly elevated risk of death.


**Weight-for-length -standard deviation (SD)**

The use WHO growth standards confirm that the effect of ethnic differences on the growth of infants and young children in population is small. WHO has defined severe malnutrition in children as a weight-for-height in below -3 SD and/or the presence of oedema. After the WHO released child growth standards, analysis showed that children with a weight-for-height below -3 SD have a three higher risk of death than children with a weight-for-height above -3 SD.

Using the new WHO standards increase 3–4 times the number of infants and children being below -3 SD compared to using the former reference. Weight-for-height below -3 SD is highly specific, criterion to identify severely acutely malnourished infants and children. Children with weight-for-height above -3 SD and below -3 SD, have a lower mortality risk than children under -3 SD. Child with weight-for-height above -3 SD has an one lower risk of death. Children selected at <math>+3</math> SD weight-for-height, a decrease by <math>+3</math> SD and <math>+3</math> SD corresponds to 9% and 19% weight gain. For children with oedema, the same criterion should be used with the weight after oedema has disappeared.

**MUAC-upper arm circumference -standard (MUAC)**

Using MUAC as diagnostic criteria showed that the risk of dying is less around under 10% less. The risk of death in those one-offs require the high concentration of intensive nutritional and medical support. WHO standards for MUAC-for-age, the recommended MUAC-for-age cut-off of 125 mm as an independent diagnostic criteria for severe acute malnutrition was necessary. A higher cut-off of 125 mm is recommended as it will identify more infants and children with severe acute malnutrition.



**Resulting a 3-outdoor steps:**

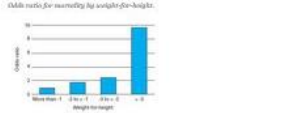
- Red (125mm) means Severe Malnutrition. The child should be immediately referred for treatment.
- Yellow (125 - 115mm) means Moderate Malnutrition and risk of Severe Malnutrition. The child should be immediately referred for supplementary care and at risk of severe acute malnutrition.
- Green (125mm) means no risk of Malnutrition. The child is well nourished.

**Criteria for severe acute malnutrition (SAM)**

Indicator	Measure	Cut off
Severe wasting (W)	Weight-for-height (Z)	<math>-3</math> SD (95th percentile)
Severe wasting (W)	MUAC (mid upper arm circumference)	<math>125</math> mm
Severe wasting (W)	Presence of oedema	Yes
Severe wasting (W)	Presence of oedema	Yes

(Adapted from the World Health Organization and the United Nations Children's Fund)


**Child ratio for mortality by weight-for-height.**



(Adapted from the World Health Organization and the United Nations Children's Fund)

# APPENDIX 8. Layout examples of downloadable booklet.

## UNDER 5-YEAR-OLD CHILD'S GROWTH AND NUTRITION



**Under 5-year-old child's growth and nutrition**

Children aged 0-59 months are the most vulnerable to malnutrition. This booklet provides information on how to monitor their growth and nutrition, and what to do if they are not growing well.

## NUTRITION RELATED CHILD MORTALITY

**Child mortality rates**

Under-5 mortality rate (U5MR) is the number of children under-5 years of age who die each year from all causes. It is expressed as the number of deaths per 1,000 live births.

Year	U5MR
2000	100
2001	98
2002	96
2003	94
2004	92
2005	90
2006	88
2007	86
2008	84
2009	82
2010	80
2011	78
2012	76
2013	74
2014	72
2015	70
2016	68
2017	66
2018	64
2019	62
2020	60


## UNDERNUTRITION

**Undernutrition prevalence with stunting and wasting**

Undernutrition is a state of being deficient in energy, protein, and/or essential vitamins and minerals. It is a leading cause of child mortality and morbidity.

**Undernutrition's impact on growth and child development**

Undernutrition affects a child's physical, cognitive, and emotional development. It can lead to stunted growth, wasting, and micronutrient deficiencies.



## CHILD GROWTH AND ANTHROPOMETRIC MEASUREMENTS

**Weight**

Weight is a measure of a child's body mass. It is measured in kilograms (kg) or grams (g).

**Height**

Height is a measure of a child's body length. It is measured in centimeters (cm) or meters (m).

Age (months)	Weight (kg)	Height (cm)
0	3.5	50
1	7.5	65
2	11.5	80
3	14.5	90
4	17.5	100
5	20.5	110
6	23.5	120
7	26.5	130
8	29.5	140
9	32.5	150
10	35.5	160
11	38.5	170
12	41.5	180
13	44.5	190
14	47.5	200
15	50.5	210
16	53.5	220
17	56.5	230
18	59.5	240
19	62.5	250
20	65.5	260
21	68.5	270
22	71.5	280
23	74.5	290
24	77.5	300
25	80.5	310
26	83.5	320
27	86.5	330
28	89.5	340
29	92.5	350
30	95.5	360


## NEW-BORN INFANT AND CHILD NUTRITION

**Breastfeeding (BF)**

Breastfeeding is the best source of nutrition for a newborn infant. It provides all the nutrients and antibodies needed for a healthy start.

**Complementary feeding (CF)**

Complementary feeding is the process of introducing other foods and liquids to a child's diet. It should be done gradually and safely.



## Infant and young child feeding

**Infant and young child feeding (IYCF) indicators**

IYCF indicators are used to assess the quality of infant and young child feeding. They include: exclusive breastfeeding, minimum acceptable diet, and breastfeeding practices.

Indicator	Definition
Exclusive breastfeeding	Feeding only breast milk for the first 6 months of life.
Minimum acceptable diet	Consumption of a diet that includes a minimum of 10 food groups.
Breastfeeding practices	Frequency and duration of breastfeeding sessions.


## Special therapeutic feeds

**Special therapeutic feeds (STF)**

STF are used to treat children with severe acute malnutrition. They are high in energy and protein, and easy to digest.

**Complementary feeding (CF)**

CF is the process of introducing other foods and liquids to a child's diet. It should be done gradually and safely.



## After a disaster

**Infant and young child feeding (IYCF) in disaster situations**

In disaster situations, IYCF practices may be disrupted. It is important to ensure that children continue to receive adequate nutrition and care.

**Special therapeutic feeds (STF)**

STF are used to treat children with severe acute malnutrition. They are high in energy and protein, and easy to digest.

## WEANING AND FEEDING CHILDREN UNDER 5

**Weaning**


Weaning is the process of introducing other foods and liquids to a child's diet. It should be done gradually and safely.

**At the age of 6 to 8 months**

At this age, children should be introduced to semi-solid foods. These include purees of fruits, vegetables, and grains.

**At the age of 9 to 12 months**

At this age, children should be introduced to soft, finger foods. These include small pieces of fruits, vegetables, and grains.



## Child age 1 to 5 feeding

**Child age 1 to 5 feeding**


At this age, children should be introduced to a variety of foods. This includes fruits, vegetables, grains, and protein sources.

**Reasonable child feeding**

Reasonable child feeding is the process of providing a child with a diet that is adequate in energy and protein, and easy to digest.

**Severe acute malnutrition (SAM)**


SAM is a life-threatening condition characterized by extreme wasting and malnutrition. It requires immediate medical attention.



## EFOLOGUE

**EFOLOGUE**

EFOLOGUE is a program that provides information and support to parents and caregivers. It helps them to understand the importance of nutrition and to take steps to improve their child's diet.



## Diak

**Diak**

Diak is a program that provides information and support to parents and caregivers. It helps them to understand the importance of nutrition and to take steps to improve their child's diet.

## APPENDIX 9. Questionnaire about Nutrition teaching material



## Cover letter to questionnaire

*Dear Participant,*

*my Thesis purpose is to produce a clear and comprehensible teaching material from growth and nutrition of children under 5-year-old. In this questionnaire I ask You to estimate the content of the Nutrition chapter, by nine questions. Your answers are used to estimate my Thesis product, the teaching material.*

*Answers are anonymous and voluntary. The answers are used with confidential manners and are used only by me. I use Your answers to value the teaching material I have produced. After process of analysing, your answers are destroyed by appropriate means.*

*Answer to the questions by marking the suitable answer. After answering the questionnaire, fold it and give to the DIAK's representative.*

*Thank You for Your answers!*

*Your sincerely,*

A handwritten signature in blue ink that reads "Marja Koponen".

*Miss Marja Koponen*

*Registered Nurse student*

*Diaconia University of Applied Sciences*



## QUESTIONNAIRE ABOUT NUTRITION TEACHING MATERIAL

### PERSONAL DATA

- I am a teacher.
- I take part in planning curriculum.
- Neither above, I am a \_\_\_\_\_.

### CHILD HEALTH CARE'S, NUTRITION TEACHING MATERIAL CHAPTER

Answer to the Thesis by choosing answers yes and no.

When necessary, give Your free word on the blank row.

1. I find material important.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
2. I find material trustable.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
3. Material is logical.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
4. Diagrams are useful and support content.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
5. Artwork is useful and supports the content.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
6. Material is useful in my work.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
7. I could use material in my work.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
8. I could exploit material in my own teaching.
  - yes
  - no
  - neither above, why \_\_\_\_\_.
9. If you answer two questions above YES, please estimate how likely you are going to use it. If you answer no, do not answer question no. 9. Mark Your answer by drawing a circle.  
 1 = very unlikely    2 = unlikely    3 = probably    4 = very likely    5 = extremely likely

*Thank You for Your effort!*

## MANUSCRIPT: Growth and nutrition of children under 5 years of age

### Educational material for teacher's in Tanzania

#### GROWTH AND NUTRITION OF CHILDREN UNDER 5 YEARS OF AGE



Picture: Family - Family of four - 00 - Nigeria, USAID/SPRING-UNICEF IYCF Digital Image Bank (iyf.spring-nutrition.org)

#### Preface

A poor start of life can lead to poor health and inadequate learning. Childhood development is a growth process of perceptual, motor, cognitive, language, socio-economical and self-regulation skills. Health, nutrition, responsive caregiving, security and safety, and early learning are domains on nurturing care for children to reach their developmental potential.

In this Moodle Room -class You can find information and materials about Child's nutrition from new-born to school-aged, and You will have access to useful material bank. Content starts with justification of nutrition's significance and material varies from undernutrition, anthropometric measurements and criteria of severe acute malnutrition to feeding practises.

In the end of this content You carry out Assignment "How to identify Child with malnutrition". Directions are on the bottom this sheet.

#### NUTRITION RELATED CHILD MORTALITY

##### Child mortality rates

In Sub-Saharan Africa mortality rate of new-borns is 38 percent. Children have the highest risk of dying in their first months, after the first month but before age 1 and before turning 5 years. In sub-Saharan Africa about 1 new-borns from 36 dies in their first month and 1 child in 13 dies before child's fifth birthday. Each year undernutrition, fatal growth restriction, stunting, wasting and micronutrient deficiencies and suboptimum breastfeeding underlie nearly 3,1 million deaths of children younger than five years worldwide. Suboptimum breastfeeding and fatal growth restriction together are responsible over 1,3 million deaths of all deaths among children under age five years. Stunting is a commonly used indicator of chronic undernutrition and it increases rapidly after age six months, by 24-month 50 percent of children in low-and-middle income countries are stunted. Widely used measure of child mortality is the under-five mortality rate.

A staggering 43 percent on children under five years of age living in low- and middle-income countries are at risk of suboptimal development due to poverty and stunting. Stunting prevalence is highest in the poorest population and in rural areas. Mortality rates among young children are the best single indicator of child health in low- and middle-income countries. They are also used as indicators of general social and economic development.

Country, regional and global estimates of mortality among children under age 5 and children aged 5–14 & Estimates of mortality among children under age 5 and children aged 5–14 by Sustainable Development Goal region.

Country, regional and global estimates of mortality among children under age 5 and children aged 5–14															
	Under-five mortality rate (USMR) with 90 per cent uncertainty interval (deaths per 1,000 live births)									Number of under-five deaths with 90 per cent uncertainty interval (thousands)					
	1990			2016			Annual rate of reduction (ARR) (per cent) 1990-2016			1990		2016			
	USMR	Lower bound	Upper bound	USMR	Lower bound	Upper bound				ARR	Lower bound	Upper bound	Underfive deaths	Lower bound	Upper bound
United Republic of Tanzania	179	169	189	57	46	71	4.4	3.6	5.2	192	181	203	117	96	146
Estimates of mortality among children under age 5 and children aged 5–14 by Sustainable Development Goal region															
	Under-five mortality rate (USMR) with 90 per cent uncertainty interval (deaths per 1,000 live births)									Number of under-five deaths with 90 per cent uncertainty interval (thousands)					
	1990			2016			Annual rate of reduction (ARR) (per cent) 1990-2016			1990		2016			
	USMR	Lower bound	Upper bound	USMR	Lower bound	Upper bound				ARR	Lower bound	Upper bound	Underfive deaths	Lower bound	Upper bound
Sub-Saharan Africa	183	179	187	79	73	89	3,2	2,8	3,5	3,787	3,714	3,869	2,777	2,570	3,113

(Hug, Sharrow & You, 2017, 30)

Country, regional and global estimates of mortality among children under age 5 and children aged 5–14 & Estimates of mortality among children under age 5 and children aged 5–14 by Sustainable Development Goal region.

Country, regional and global estimates of mortality among children under age 5 and children aged 5–14																
	Number of under-five deaths with 90 per cent uncertainty interval (thousands)				Infant mortality rate (deaths per 1,000 live births)		Number of infant deaths (thousands)		Neonatal mortality rate (deaths per 1,000 live births)		Number of neonatal deaths (thousands)		Probability of dying among children aged 5–14 (deaths per 1,000 children aged 5)		Number of deaths among children aged 5–14 1990 2016 (thousands)	
	Country	Male 1990	Female 1990	Male 2016	Female 2016	1990	2016	1990	2016	1990	2016	1990	2016	1990	2016	1990
United Republic of Tanzania	185	172	60	53	108	40	118	84	41	22	47	46	31	12	23	20
Estimates of mortality among children under age 5 and children aged 5–14 by Sustainable Development Goal region																
Sub-Saharan Africa	192	173	84	73	109	54	2,301	1,910	46	28	1,008	1,003	42	19	604	513

(Hug, Sharrow & You, 2017)

## UNDERNUTRITION

### Undernutrition associates with morbidity and mortality

Stunting, wasting, and underweight are associated with death from diarrhea, pneumonia, measles, and other infectious diseases, also malaria has complex interplay between undernutrition and infection. Association between micronutrient deficiencies and mortality is established. Vitamin A deficiency increases the risk of severe diarrhea and diarrhea mortality. Other micronutrient deficiencies, such as zinc, is associated with increased risk of morbidity and mortality.

### Undernutrition's impact for growth and child's development

Undernutrition has important consequences for physical and cognitive growth and development. Malnutrition leads to early physical growth failure, delayed motor, cognitive and behavioural development, it diminished immunity and increased morbidity and mortality. Those children who survived malnutrition in early childhood have disadvantages compared with those who have had adequate nutrition and a healthy environment in life.

Undernutrition is associated with shorter adult height, less schooling, and reduced economic productivity and low offspring birth weight. Undernutrition in childhood is also associated with increased risk of developing metabolic syndrome and cardiovascular disease, systolic hypertension, obesity, insulin resistance, and diabetes in adulthood. Malnutrition in childhood includes diminished intellectual performance, low work capacity, and increased risk of delivery complications.

### How to improve nutrition surveillance and nutrition?

Health workers should be trained on anthropometric measurements, on growth monitoring and promotion, and the WHO Child Growth Standards. Nutrition surveillance has improved in nutrition services by strengthening health

workers skills and ensuring the availability of equipment. Also counselling on infant and young child feeding and management of severe acute malnutrition is important.



Picture: Sick Baby Health Care - Malnourished baby 6-24 mo - 00 - Niger, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

### CHILD GROWTH AND ANTHROPOMETRIC MEASUREMENTS

Child's growth is a critical indicator of child health and WHO identifies growth assessment as the best single measure to define child's nutritional status and health. Failure to grow at an appropriate rate may be associated with primary growth disorder, or due of general failure, infections or poor feeding practise.

Measurements of growth, body dimensions and body composition are easy, rapid and non-invasively performed. It is important that measurements are performed consistently, using appropriate equipment and made by trained staff.

#### Height

During the first year of life infant grows more rapidly than in any other period of his or her life. During the first months an infant can grow 2,5 cm in a month and 2 years old child has approximately gained half the adult height, meaning that 50% of growth has occurred in the first two years. In childhood starts slowly growth around age 2 to 3 years, and it continues until puberty. By age eight most children have gained three quarters of their final height.

#### Measuring height before Child can stand

Height is traditionally measured lying down until age 2 to 3 years. This measurement needs to have two persons, one hold head and other straighten the knees and hold feet flat against footboard while measurement is taken. Standing height measurement is recommended from 2 years of age. It is commonly used as soon as child can stand.



Picture: Sick Baby Health Care - Sick baby being measured at clinic 9-12 mo - 01A - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

#### Measuring height after Child can stand

Measurement is performed without shoes and the head is held so that child looks forward with heels and back in contact with an upright wall. Repeated height measurement should be taken at the time of day. Growth is not a continuous process, it has growth spurts and stops and seasonal variations in growth. In the first 6 months child grows around 14 cm, and by the age of 2 years growth rate is 9 cm per year.

Percentage of final height achieved:

Age (years)	Boys (%)	Girls (%)
2	50	52
3	55	58
4	58	62
5	62	66
6	66	69
7	69	73
8	73	77
9	76	80
10	78	83
11	81	87
12	84	92
13	88	97
14	92	98
15	97	100
16	99	100
17	100	100

(Holden & MacDonald 2000, 163)

### Measuring weight

Infants under 2 years of age are usually measured naked, and then after in light clothing only, nappies and shoes are removed. Infant scales are graduated to 10 g, and toddlers to 100 g. Weight gain is a poor guide to estimate child's health, because it says nothing about nutritional status.



Picture: Sick Baby Health Care - Sick baby being weighed at clinic 9-12 mo - 02B - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

### Measuring skinfold thickness

Skinfold thickness gives an indication of subcutaneous fat and hence of nutritional status. Measurement is made by pinching the skin between two fingers and measuring the skinfold thickness by using skinfold callipers. A trained person can reach an accuracy of 1,0 to 1,5 mm. Standard sites for skinfold measurement are triceps and subscapular are-as.

### Measuring mid-upper arm circumference, MUAC

Mid-arm circumference (mid-upper arm circumference, MUAC) is an easy measurement to perform, and error is less than 0,5 cm. Measurement is taken at the midpoint of the upper arm. Despite bone, muscle, fat and skin, the mid-arm circumference gives a good reflection of nutritional status. It can be used in all age groups to estimate under- and overweight.



Picture: Baby Health Care - Measuring a child's arm 12-24 mo - 00 - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

### Measuring head circumference

Head circumference can be most accurate and repeatable measurement. The maximum head circumference is taken from the midpoint of the forehead to the occipital prominence. Measurement should be made to the nearest millimetre and it is routinely measured up until the age of 2 years. The head circumference and mid-arm circumference are easily performed and reproducible measurements in, and are independent from age and sex, and can be used to recognise both over- and under-nutrition.

### CRITERIA FOR SEVERE ACUTE MALNUTRITION (SAM)

WHO and UNICEF recommend the use of a cut-off for weight-for-height of below -3 standard deviations (SD) of the WHO standards to identify infants and children as having severe acute malnutrition (SAM). Children below this cut-off have a highly elevated risk of death compared to those who are above, and they have a higher weight gain when receiving a therapeutic diet and faster recovery compared to other diets. Children with a MUAC less than 115 mm have a highly elevated risk of death.

#### Weight-for-length -standard deviations (SD)

The new WHO growth standards confirm that the effect of ethnic differences on the growth of infants and young children in populations is small. WHO has defined severe malnutrition in children as a weight-for-height is below -3 SD and/or the presence of oedema. After the WHO released child growth standards, analysis showed that children with a weight-for-height below -3 SD have a 9 times higher risk of death than children with a weight-for-height above -1 SD.

Using the new WHO standards increases 2–4 times the number of infants and children falling below -3 SD compared to using the former reference. Weight-for-height below -3 SD is a highly specific criterion to identify severely acutely malnourished infants and children. Children with weight-for-height above -2 SD and below -1 SD, have a lower mortality risk than children under -3 SD. Child with a weight-for-height above -1 SD have an even lower risk of death. Children admitted at -3 SD weight-for-height, a decrease to -2 SD and -1 SD corresponds on 9% and 19% weight gain. For children with oedema, the same criterion should be used with the weight after oedema has disappeared.

#### Mid-upper arm circumference -standard (MUAC)

Using MUAC as diagnostic criteria showed that the risk of dying is increased under 115 mm. The risk of death in these cut-offs requires the implementation of intensive nutritional and medical support. WHO standards for MUAC-for-age, the recommended MUAC cut-off of 110 mm as an independent diagnostic criterion for severe acute malnutrition was necessary. A higher cut-off of 115 mm is recommended as it will identify more infants and children with severe acute malnutrition.

Picture: Nutrition ruler



#### Using a 3-colour tape:

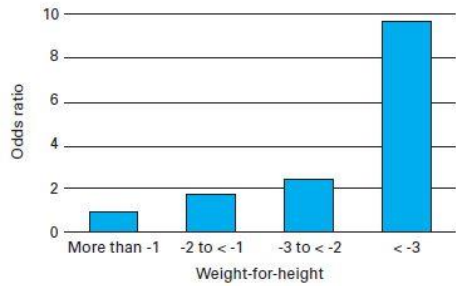
- Red ( $\leq 115$ mm) means Severe Malnutrition: The child should be immediately referred for treatment.
- Yellow (115 – 125mm) means Moderate Malnutrition and risk of Severe Malnutrition: the child should be immediately referred for supplementation and is at risk of severe acute malnutrition.
- Green ( $\geq 125$ mm) means no risk of Malnutrition: the child is well nourished.

#### Criteria for severe acute malnutrition (SAM).

Diagnostic criteria for SAM in children aged 6–60 months		
Indicator	Measure	Cut-off
Severe wasting (2)	Weight-for-height (1)	< -3 SD (standard deviations)
Severe wasting (2)	MUAC (mid-upper arm circumference)	< 115 mm
Bilateral oedema (3)	Clinical sign	
1 Based on WHO Standards ( <a href="http://www.who.int/childgrowth/standards">www.who.int/childgrowth/standards</a> )		
2,3 Independent indicators of SAM that require urgent action		

(The World Health Organization and UNICEF 2009).

Odds ratio for mortality by weight-for-height.



(The World Health Organization and UNICEF 2009).

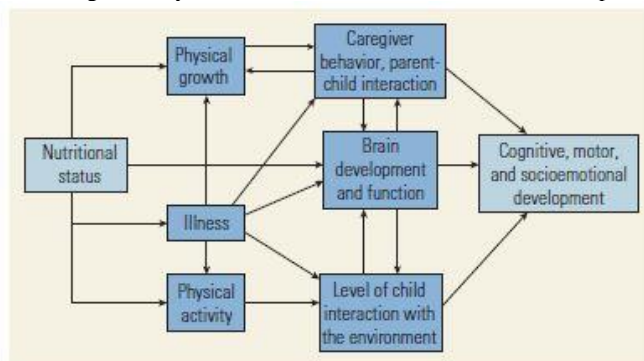
## NUTRITION'S IMPACT TO CHILD'S MENTAL DEVELOPMENT

The conditions that affect the health and growth of children in the first 1,000 days can also affect mental development. These elements include pregnancy nutritional status of the mother, child's birth weight and linear growth of the infant, and child birth conditions, mother's mental health and environmental conditions. Short length- or height-for-age is one of the strongest risk factors for poor mental development.

Good nutrition is essential for children to achieve their full developmental potential. Deficiencies of essential vitamins and minerals have effects on child survival and development. Deficiencies of vitamin A and zinc adversely affect child health and survival. Deficiencies of iodine and iron can together with stunting limit the ability of children to realize their developmental potential.

It is not clear why length and height are so strongly related to cognitive and language development, it may be that linear growth nutrition processes are related to brain and behavioural development. One conclusion is that nutrients support the structure and activity of brain for mental development, other conclusion offers that nutrition enhances health and engagement with the environment and so promotes mental development.

Illustrating Pathways from Nutritional Status to Mental Development:



(Aboud & Yousafzai 2016)

### Effect of micronutrient's in Child's development

Short length- or height-for-age is one of the strongest risk factors for poor mental development. It is not clear why length and height are so strongly related to cognitive and language development, it may be that linear growth nutrition processes are related to brain and behavioural development. One conclusion is that nutrients support the structure and activity of brain for mental development, other conclusion offers that nutrition enhances health and engagement with the environment and so promotes mental development.

### Mental development

Developmental potential is the ability to think, learn, remember, relate, and articulate ideas appropriate to age and level of maturity, and an estimated 39 percent of the world's children under age five years do not attain this potential. Early disadvantageous conditions from conception through the first 24 months of life can impair brain's normal development. Failure is often progressive and is noticed not until school begins. Impairment can lead to gradual deletion of unused brain synapses. The lack of synapses use may be due to the absence of stimulation in the family environment or lack of available energy for brain activity.

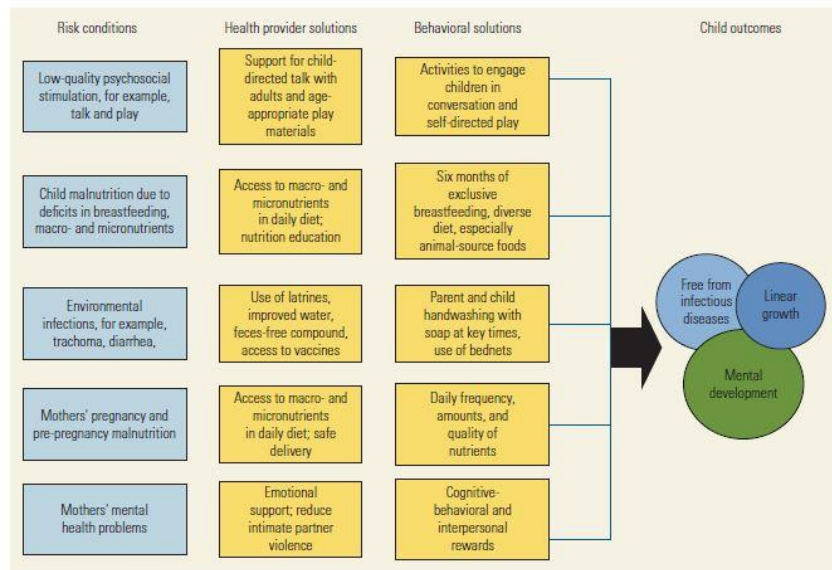
Children who do not have good vocabulary in the early years will have difficulties to learn how to read and children who do not learn strategies to solve simple problems in the first 24 months will have difficulties to understand math concepts. A second reason for take care of early mental development is that individuals are healthier and more pro-

ductive if their mental skills have full-grown. More educated adults are healthier and wealthier than less educated adults and educated mothers have healthier children, they are more likely to recognize symptoms of illness, they follow medical advice and feed their children nutritious foods.

The conditions that affect the health and growth of children in the first 1,000 days can also affect mental development. These elements include:

1. Pregnancy nutritional status of the mother.
2. Child's birth weight and linear growth of the infant.
3. Child birth conditions.
4. Mother's mental health
5. Environmental conditions.

Conditions That Put Children at Risk of Poor Mental Development, and Solutions En-tailing Health Provider Support and Parental Behaviour Changes:



(Aboud & Yousafzai 2016)

## MATERNAL, NEW-BORN AND CHILD NUTRITION

### Mother's influence on child's nutrition

Child's nutrition status starts before birth. Maternal nutritional status and maternal stunting and underweight lead to small for gestational age and prematurity. Fatal growth restriction is an important contributor to stunting and wasting in children. Optimal infant and young child feeding means that mothers receive optimal antenatal care, are empowered to initiate breastfeed within one hour of birth, continue breast feeding for the first six months and keep on breast feeding for two years or more.

Counselling and educational interventions increased early breastfeed by 43 percent at day one, by 30 percent until age one month, and by 90 percent from age one month to age five months. Significant reductions with mothers who do not breastfeed, reduction at day one is 32 percent, 30 percent until one month, and 18 percent for one month to five months. Combined individual and group counselling is more efficient than individual or group counselling alone.



Picture: Counseling - Breastfeeding counseling - 01B - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))



### **Breastfeeding (BF)**

Breastfeeding within 24 hours of birth is associated with a 44–45 percent reduction in all-cause and infection-related neonatal mortality. Interventions to promote breastfeeding are a key component of expanding its use. All babies are they well or sick, preterm or term, new-born or toddler benefit from being breastfeed.

Breastmilk changes to suit baby's needs. It changes from colostrum (a form of milk few days after birth) to mature milk and it changes during feeding. Mature milk also changes from day to day and between feeding. At the beginning of feeding breast milk's lactose content is high and has low fat, and at the ending of feeding milk has four to five times fatter and provides more calories and is more satisfying. It is important that baby gets high lactose and high fat parts of the milk. Therefore, mothers should allow baby to empty first breast before nursing the second breast. Babies who are breastfeed receive great protection against disease in long and short term. Breastfeeding is also beneficial to mother, because it reduces risk of breast and ovarian cancer, and osteoporosis.

Evidence show that breastfed babies have better mental development and children who have been breastfed longer had higher verbal intelligence at age six years. Breast milk's important nutrient fatty acids have relation to mental development in high-income-countries. Long-chain polyunsaturated fatty acids support mental development and supplementation with a milk lipid, ganglioside, has positive effects on early mental development. Mental development benefits of fatty acids in colostrum.



Picture: Breastfeeding - Exclusive breastfeeding 0-6 mo - 01B - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

### **Colostrum**

Colostrum (a form of milk few days after birth) is produced for the first 3–4 days after baby is born. It is valuable fluid, highly concentrated nutrition to the new-born. Fat and lactose content is less than it is in breastmilk, but it contains higher concentration of fat-soluble vitamins such as vitamin A and E. Colostrum has a vital part in protecting infant from infections. The anti-infective properties of lactoferrin, immunoglobulins and lysosomes are in colostrum in very high concentrations. Colostrum has a mild laxative effect and helps to clear meconium from the gut. It also prevents bilirubin's reabsorption. Colostrum's typical yellow colour is caused by the fact that it has a ten times greater amount of concentrated carotene than breastmilk has. In some cultures, mothers refuse to give yellow-coloured colostrum to new-born. Mothers believe that milk is dirty or spoiled or has been too long in breast. Health-workers must explain and educate mother of the benefits of giving colostrum.



Picture: Breastfeeding - Early initiation of breastfeeding 0-24 mo - 01 - Nigeria, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

### **Breastmilk**

Breastfeeding provides immunologic, psychological, social, economic, and environmental benefits. The WHO recommends early breastfeeding for infants until age six months to achieve optimum growth. Early breastfeeding reduces the risk of hospitalization for lower respiratory tract infections in the first year by 72 percent. Any kind of breastfeeding compared with commercial infant formula feeding can reduce the incidence of otitis media by 23 percent, and

early breastfeed for more than three months reduces the risk of otitis media by 50 percent. Breastfeeding is associated with a 64 percent reduction in the incidence of nonspecific gastrointestinal tract infections and this effect lasts for two months after breastfeed ending. Breastfeeding is beneficial for preterm infants because it gives a 58 percent reduction in the incidence of necrotizing enterocolitis. Early breast-feed gives a protective effect for three to four months against the incidence of clinical asthma, atopic dermatitis and eczema. Breastfeed improves nutrition status directly or by reducing infections and morbidity. Promoting early breastfeed is important in preventing both stunting and overweight among children.

### Human milk

Human milk contains carbohydrates, fats, protein and vitamins. Lactose is the main carbohydrate and provides 37 percent of baby's need of energy. Lactose is easily broken into glucose and provides energy to brain and central nervous system. Lactose also helps calcium and iron to absorb and have an impact on enteropathy organism. Breast-milk contains enzyme amylases which helps carbohydrate to digest. Breast milk has plenty of long chain fatty acids.

Fat variations changes during every feed with lowest content in the foremilk and highest in the hindmilk. Fat quantity varies at different time of the day. Of all mammalian milk, mature breast milk has the lowest content of protein, therefore it is easily digested. Breastfed child is protected from the infections his or her mother has been exposed and has become or is becoming immune.

Vitamins quantity varies in breast milk, it contains both fat-soluble and water-soluble vitamins. Vitamin-K is an exception and breastmilk almost always meet the need of on infant, if breastfeed is regular. Because vitamin K is essential to the blood clotting mechanism and the K-vitamin quantity of breastmilk is uncertain, almost all babies should be given prophylactic to prevent haemolytic disease.

### Composition of human milk

Nutrient		Colostrum milk	Transitional milk	Mature milk
Energy	Kcal	56	67	69
	KJ	236	281	289
Protein	g	2,0	1,5	1,3
Fat	g	2,6	3,7	4,1
Carbohydrate	g	6,6	6,9	7,2
Sodium	mg	47	30	15
Calcium	mg	28	25	34
Iron	mg	0,07	0,07	0,07
Retinol	µg	155	85	58
Vitamin C	mg	7	6	4

(Holden & MacDonald 2000)

### Use of Infant formulae

The WHO and UNISEF International code of marketing of breast milk substitutes, promotes breastfeeding and ensures infant formulae is correctly used. Promoted principals are following: Milk formulae should not be advertised to the public and free samples are not given to the public, and health personnel is not allowed promote milk formulae, there should not be pictures of babies in bottle's label and all information on milk formulae must include reference to superior nature breastfeeding.

Health workers should ensure that parents know how to make, sterilize and storage infant formulae, teach the proper preparation and use of infant formulae. Formulae should be mixed exactly according the manufactures instructions. When powder is not boiled, and content of minerals and nitrates are saved.



Picture: HIV - Preparing infant formula 0-24 mo - 01 - Tanzania, USAID/SPRING-UNICEF IYCF Digital Image Bank (iycf.spring-nutrition.org)

### Complementary feeding (CF)

Complementary feeding for infants refers introduction of safe and nutritional foods in addition to breastfeeding. Clean and nutrient-dense additional foods introduced at age six months and typically provided until age 24 months. Appropriate complementary feeding can significantly reduce stunting during the first two years of life.

The quality of the food received is often inadequate, failing to provide sufficient protein, fat, or micro-nutrients for optimal growth and development. Children may not receive complementary foods at the right age, not being fed frequently enough during the day or food's quality may be poor. Inadequacy and insufficiency of complementary foods, poor feeding practices, and high rates of infections have unfavourable impacts on health and growth among children. Sufficient quantities of adequate, safe, and appropriate complementary feeding after age six months are essential to meet nutritional requirements when breast milk alone is no longer sufficient.

Complementary feeding interventions are most efficient in reducing malnutrition and promoting adequate growth and development. Complementary feeding should be timely, adequate, appropriate, and given in sufficient quantity. For improving complementary feeding, it is important to provide nutritional counselling for mothers to promote healthy feeding practices. Providing complementary foods offer extra energy, micronutrient fortification and increasing the nutrient density of complementary foods.

Counselling caregivers on the best use of available foods and feeding practices, also provision of micronutrient and food supplements if needed. It is essential to improve maternal knowledge of feeding practices by education and prepare culturally acceptable complementary foods that can lead to increased dietary intake and growth of infants. In health system it is important to secure optimal complementary feeding practices by maternal counselling. Educational messages should be clear and include the promotion of nutrient-rich animal products or protein-rich plant food sources. Among food-insecure populations financial constraints may limit the possibility of adequate amounts of animal products in children's diets.

#### **After 6 months of age**

After six months of age child's food is supplemented by nutritionally adequate, nutrient-dense, safe and age-appropriate feeding of solid, semisolid, and soft foods. Early ending of breast feed and early introduction and poor-quality complementary feeding dominates.

Follow-on formulae are designed for older infants over age 6 months. They are based on cow's milk and it contains less protein, calcium and phosphorous than cow's milk, but more than infant formulae. Follow-on formula should not replace breast milk or standard instant formula, if milk's volume is adequate (over 400 ml/day). Cow's milk has low iron, vitamin C and D percentage, and it is not recommended as the main drink before age 1 year, but it can be used in preparation of solid food.

#### **Special therapeutic foods**

Children with severe acute malnutrition are treated with special therapeutic foods, usually with *Ready-to-Use-Therapeutic Foods* or *F75 and F100* milk-based diets. Infants and children 6–60 months of age with a weight-for-height above -3 SD also benefit from these therapeutic diets, and the children who are above -3 SD but are below -3 SD are most likely to benefit from therapeutic feeding.

#### **Infant and young child feeding**

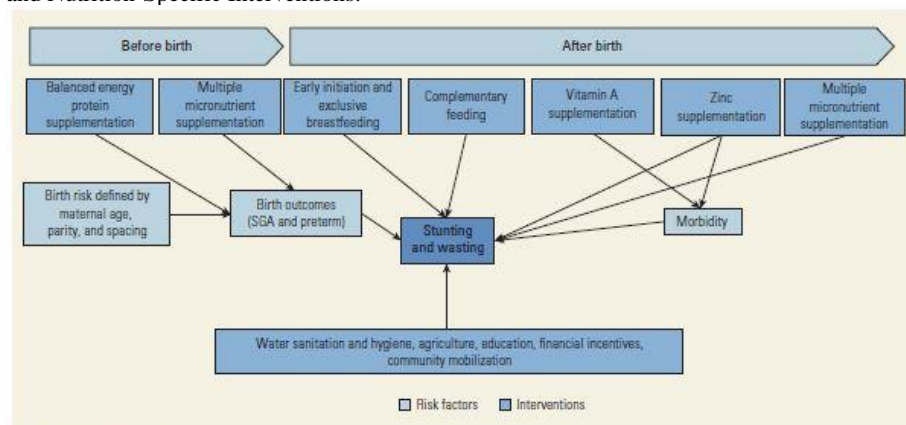
A major component of infant and young child feeding is to provision of breast milk and appropriate, nutrient-dense complementary food. WHO has published IYCF (Infant and Young Child Feeding) simple and practical indicators of appropriate feeding practises for children 6-23 months. It is a core of eight indicators, three for breast feeding (BF) and five for complementary feeding (CF). It includes measures of dietary diversity, feeding frequency and consumption of food with iron as well as appropriate BF practises.

World Health Organization's Infant and Young Child Feeding Core Indicators

World Health Organization's Infant and Young Child Feeding Core Indicators	
<b>Breastfeeding indicators</b>	
Early initiation of breastfeeding	Proportion of children born in the past 24 months who were breastfed within one hour of birth
Exclusive breastfeeding under age six months	Proportion of infants from birth to age five months who were exclusively breastfed during the previous day
Continued breastfeeding at age one year	Proportion of children ages 12–15 months who were fed any breast milk during the previous day
<b>Complementary feeding indicators</b>	
Introduction of solid, semisolid, or soft foods	Proportion of infants ages six months to eight months who received solid, semisolid, or soft foods during the previous day
Minimum dietary diversity	Proportion of children ages 6–23 months who received foods from four or more food groups during the previous day
Minimum meal frequency	Proportion of breastfed and non-breastfed children ages 6–23 months who received solid, semisolid, or soft foods (including milk feeds for non-breastfed children) the minimum number of times or more during the previous day
Minimum acceptable diet	Proportion of children ages 6–23 months who had at least the minimum dietary diversity and minimum meal frequency (apart from breast milk) during the previous day
Consumption of iron-rich or iron-fortified foods	Proportion of children ages 6–23 months who received iron-rich food or iron-fortified food specially designed for infants and young children, or fortified in the home, during the previous day

(Das etc. 2016)

Risk factors and the nutrition-specific interventions for childhood stunting and wasting: Malnutrition Risk Factors and Nutrition-Specific Interventions:



(Das etc. 2016)

Guidelines on the average number and volume on feeds at different ages

Approximate age	Approximate volume per feed	Number of feeds per day
1–2 weeks	50–70 ml	7–8
2–6 weeks	75–100 ml	6–7
2 months	110–180 ml	5–6
3 months	170–220 ml	5
6 months	220–240 ml	4

(Holden & MacDonald 2000, 35)

## NUTRIENT

### Nutrient intake for neonate, young and pre-school aged children

Appropriate nutrition is essential for optimal development and growth of an Infant and it also influences adulthood health. Neonate is almost immediately depended on energy for growth, metabolism and activity. Infants grow in different rates, so adequate daily weight gain varies between 10 to 12 g/kg per day.

Infants are vulnerable to under- or inappropriate nutrition for five reasons.

1. Poor fat and protein stores, secondly, they grow and develop rapidly and nutrient and energy requirements are high.
3. Neuronal development, brain grows rapidly the first two years of life.
4. Body system is immature and inadequate feeding can result in problems with digestion, poor absorption, impaired excretion or infection.
5. Poor growth is a contribution to develop adult diseases such as coronary artery diseases, hypertension and diabetes.



Picture: Food - Food storage - 00 - Ethiopia, USAID/SPRING-UNICEF IYCF Digital Image Bank (iycf.spring-nutrition.org).

## FAT, CARBOHYDRATE, PROTEIN, VITAMINS AND MINERALS

### Fat and carbohydrate

40% to 50% of the energy of breast and formula milk is fat and carbohydrate. Nutrient intake of protein for children aged 1 to 3 years is 14,5 g per day, and children aged 4 to 6 years it is 19,7 g per day. Amount is easily achieved by drinking 300 ml of cow's milk, eating two portions of meat, yoghurt, eggs or fish. Aspect of cardiovascular disease recommends that children age 5 years or older should not consume more than 35% of calories from fat. This does not apply to children under age of 2 years. Between years 2 to 5 it is recommended to reduce fat intake from 50% to 35%. 50% of energy should be supplied by carbohydrate, 39% of it comes from starch and milk sugars (e.g. fruits, vegetables) and no more than 11% should come from non-milk sugars (e.g. table sugar and honey). High carbohydrate intake from starch and sugar is appropriate for children under 2 years of age. From age 2 years, gradual increase of energy from starchy food and decrease in energy from fats.

Unitarization of energy in infancy

Energy use	kcal/kg per day
Resting metabolic rate	48–55
Growth	25–40
Activity	10–15
Thermogenic effect of food	5–10
Losses	5
Total	93–120

(Holden & MacDonald 2000, 34)

Estimated average requirements for energy in infancy

Age in months	Energy requirement kcal/kg per day
1	115
3	100
6	95
9	95
12	95

(Holden & MacDonald 2000, 34)

### Protein

Protein is necessary for body proteins, enzymes and hormones, and it is crucial for linear growth and infant should receive 7,5 to 12 % of their energy from protein.

Reference nutrient intake for protein in infancy

Age in months	Protein g/kg per day
0–3	2,2
4–6	1,6
7–9	1,6
10–12	1,5

(Holden & MacDonald 2000, 34)

### **Vitamins and micronutrients**

Children are often deficient in many minerals, such as iron, zinc and vitamins. They are critical for health and growth, and they effect on mental development. Multiple micro-nutrients work together to improve health, they are necessary for linear growth and they are found in the brain. Programs which emphasizing dietary diversity and animal-source foods are most effective. In food-insecure countries short-term supplementation can lead to permanent fortification and lead to better mental development.

In the first six months, exclusive breastfeeding provides sufficient nutrients to support healthy growth and immunity. Breastfed infants under 6 months do not need vitamin supplementation if mother has had adequate vitamin status. From 6 months infant should be given A, D and C vitamin drops. Formula milk fed infant do not need vitamin supplements if follow-on milk amount is more than 500 ml per day.

### **Vitamin A**

The WHO estimates, 190 million preschool children have vitamin A deficiencies. Estimated 5.17 million preschool-age children have night blindness and 90 million have subclinical vitamin A deficiencies. Vitamin A deficiency is the most common nutritional cause of blindness. Vitamin A controls cell differentiation and turnover and it is essential to growth and retinas normal function (eyesight).

Low vitamin A status is associated with increased diarrhea and measles, and disease development and mortality rate. Vitamin A deficiency affects immunity, can cause loss of appetite, retard growth, drying and even death. Beta-carotene is an antioxidant and precursor of vitamin A. It is recommended that all children under 5 years are given vitamins A, D and C, except breastfed babies under 6 months of age and bottle-fed infants who consume 500 ml of infant formula per day.

### **Vitamin B**

Vitamin B6 and B12 statuses are also inadequate in many low-and-middle-income countries. Vitamin B deficiency is rare among breastfed infants.

### **Vitamin C**

C vitamin is an important nutrient for young child, it is an antioxidant, aids wound to heal and assists absorption of iron. Between age 1 to 5 years vitamin C should be given in form of drops, unless adequate amounts of vitamins are taken from a diet. Breastfed children and children fed with normal infant formula seem not have shortage of vitamin or vitamin C.

### **Vitamin D**

Vitamin D has an important role in bones by enhancing calcium and phosphorus absorption in bones and teeth. Children between age 1 to 3 years are vulnerable to run out of vitamin D, because bones need much calcium. There are only few dietary sources of vitamin D and main source is sun's UV radiation in the skin. It is recommended for all children between age 1 to 5 years old to take vitamin D in form of drops. After 3 years of age Afro-children usually have satisfactory status of vitamin D and have no need to D vitamin requirement. Adequate volumes of normal infant formula do not develop rickets, because infants receive enough vitamin D from formula.



Picture: Food - Grains and starches - 00M - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

### **Iron**

Approximately 1.5 percent of children have anemia or severe anemia. In Sub-Saharan Africa 20 percent of children younger than age five years have iron deficiency anemia and have the highest prevalence of severe iron deficiency anemia. Occasional iron supplementation in children under two years of age reduced the risk of anemia by 49 percent and iron deficiency by 76 percent. Both an iron-deficient diet and hookworm disease are responsible for low levels of hemoglobin. Malaria-endemic areas have an increased risk of admission to hospital and serious illnesses to have iron supplementation, therefore the WHO recommends routine prophylactic iron supplements for prevention and treatment.

Infants are born with adequate stores of iron and it lasts for four months, therefore dietary source is not important for children under 4 months old. Young children have high iron requirements for tissue growth and to build iron stores,

and iron deficiency anemia is common in young children, therefore preschool aged children need to achieve appropriate amount of iron from the diet.

Anemic children show socially isolating behaviours, such as wariness and sleepiness. There is only a small gain of effect in iron supplementation in children on mental, motor development and intelligence scores. Iron therapy is not alone adequate to raise child's mental development, they also need stimulation in home environment.

### **Iodine**

Iodine deficiency is associated with poor school achievement, but its effect on the mental development of children younger than age 24 months is less known. Estimated 40 percent of the Sub-Saharan African population are iodine deficient. Mental development scores of children with inadequate iodine levels at birth were half a standard less than those with healthy levels.

### **Zink**

Zinc deficiency is associated with growth failure and increased risk of morbidity and mortality as a result diarrheal and respiratory illness. Zink supplementation promotes linear growth, a dose of 10 milligrams per day for 24 weeks led to gains growth of 0.37 centimetres. Therapeutic zinc given to children with diarrhea reduces severity and the duration of illness.

### **Calcium**

From infant formula milk absorption of calcium is relatively poor. Calcium absorption from breastmilk is 66 %, infant formula milk only 40 %. Calcium intakes for children from 1 to 4 years are less than in the first year of life, between year 1 to 10 years, daily calcium need rises from 70 to 150 mg per day, and only 35% of dietary calcium is absorbed.

Reference nutrient intake for vitamins and minerals

Nutrient	0–3 months	4–6 months	7–12 months
Vitamin A µg	350	350	350
Vitamin D µg	9	9	7
Vitamin C mg	25	25	25
Calcium mg	525	525	525
Iron mg	1,7	4,3	7,8

(Holden & MacDonald 2000, 35)

### **Water**

70–75 % of the weight of new-born and infant is water. Feeding with breast or formula milk should cover the healthy amount on fluids needed. In the first 4 months infants consume 150 to 200 ml/kg per day. After other foods are introduced to diet quantity of fluids tend to fall. Infants should not be given more than 1200 ml of feed in 24 hours.

Maintenance water requirements

Use	ml/kg per day
Insensible (lungs and skin)	20
Urine	60–75
Stool	5
Growth	1–3
Total	86–103

(Holden & MacDonald 2000, 35)



Picture: Objects - Water bottle - 01 - Sierra Leone, USAID/SPRING-UNICEF IYCF Digital Image Bank (iycf.spring-nutrition.org)

### **Infant formulae**

Infant formulae are design to match closely the nutritional composition of breast milk, but there are differences. Human milk has more nutrients than infant formula has, for example calcium and iron. Vitamins D and K are considered inappropriate for infant formulae. Immunological, hormonal and enzymes are not used in infant formulae. Full-term normal infant digest formula well. Infants with poor gastrointestinal function may have problems with casein-based formulae. Low birth-weight infants have better nitrogen and fat absorption with whey-based formulae.

Guidelines on the composition of infant formulae.

Nutrient		Analysis (per 100 kcal)
Energy	kcal	60–75 per 100 ml
Protein	g	1,8–3,0
Fat	g	3,3–6,6
Carbohydrate	g	7–14
Vitamin A	µg	60–180
Vitamin D	µg	1–2,5
Vitamin C	mg	8–NS
Calcium	mg	50–NS
Phosphorus	mg	25–90
Sodium	mg	20–60
Iron	mg	0,5–1,5
Zink	mg	0,5–1,5
NS = not stated		

(Holden & MacDonald 2000)

### Micronutrient supplementation

In many low-and-middle income countries are approaches needed to estimate and address multiple micronutrient supplementation. These approaches include strengthening education, dietary modification, food provision, agricultural interventions either alone or in combination.

Multiple micronutrient fortification in children shows an increase in hemoglobin levels and reduce anemia and iron deficiency in children younger than age two years. Multiple micronutrient food fortification also increased vitamin A serum levels. Multiple micronutrient powders are powdered vitamins and minerals that can be added to prepared foods. They are designed to provide the recommended daily nutrient intake of two or more vitamins and minerals.



Picture: Complementary Feeding - Adding micronutrient powder to complementary foods - 03B - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

### Nutrition interventions

Nutrition-specific interventions reduces fatal growth restriction and small for gestational age births and improves nutrition among children younger than age five years. Interventions include peri-conceptional folic acid supplementation or fortification, maternal balanced protein energy, iron-folate supplementation, multiple micronutrient supplementation, calcium supplementation for pre-eclampsia, breastfeed promotion, suitable complementary feeding, zinc and vitamin A supplementation and management of malnutrition in children. If these identified interventions could be scaled up to 90 percent coverage would it reduce deaths among children younger than age five years by nearly 15 percent and stunting by 20 percent and severe wasting by 61 percent.

Child Interventions



INTERVENTION	ESTIMATES
<b>Child interventions</b>	
Breastfeeding	<ul style="list-style-type: none"> <li>• Exclusive breastfeeding rates increased by 43 percent at four to six weeks, with 89 percent and 20 percent significant increases in LMICs and HICs, respectively. Exclusive breastfeeding improved at age six months by 137 percent, with a sixfold increase in LMICs.</li> </ul>
Complementary and supplementary feeding	<ul style="list-style-type: none"> <li>• Statistically significant difference of effect for length during the intervention in children</li> </ul>
Iron supplementation	<ul style="list-style-type: none"> <li>• Anemia (RR: 0.51; 95 percent CI: 0.37–0.72)</li> <li>• Iron deficiency (RR: 0.24; 95 percent CI: 0.06–0.91), hemoglobin (MD: 5.20 g/l; 95 percent CI: 2.51–7.88), ferritin (MD: 14.17 mcg/l; 95 percent CI: 3.53–24.81)</li> </ul>
Vitamin A supplementation	<ul style="list-style-type: none"> <li>• All-cause mortality reduced by 24 percent (RR: 0.76; 95 percent CI: 0.69–0.83)</li> <li>• Diarrhea-related mortality reduced by 28 percent (RR: 0.72; 95 percent CI: 0.57–0.91)</li> <li>• Incidence of diarrhea reduced by 15 percent (RR: 0.85; 95 percent CI: 0.82–0.87)</li> <li>• Incidence of measles reduced by 50 percent (RR = 0.50; 95 percent CI 0.37–0.67)</li> <li>• Nonsignificant impacts on measles and ARI-related mortality</li> </ul>
Zinc supplementation	<ul style="list-style-type: none"> <li>• Height improved by 0.37 centimeters (SD 0.25) in children supplemented for 24 weeks</li> <li>• Diarrhea reduced by 13 percent</li> <li>• Pneumonia reduced by 19 percent</li> <li>• Nonsignificant impacts on mortality</li> </ul>
<b>Disease prevention and management</b>	
WASH interventions	<ul style="list-style-type: none"> <li>• Diarrhea reduced by 48 percent (RR: 0.52; 95 percent CI: 0.34–0.65) with handwashing with soap, 17 percent with improved water quality, and 36 percent with excreta disposal</li> </ul>
Deworming	<ul style="list-style-type: none"> <li>• Prophylactic single and multiple dose deworming had a nonsignificant effect on hemoglobin and weight gain.</li> <li>• Treating children with proven infection showed that single dose of deworming drugs increases weight (0.58 kg; 95 percent CI: 0.40–0.76) and hemoglobin (0.37 g/dl; 95 percent CI: 0.1–0.64).</li> </ul>
Malaria prevention and treatment	<ul style="list-style-type: none"> <li>• Antimalarial to prevent malaria in pregnant women reduced antenatal parasitemia (RR: 0.53; 95 percent CI: 0.33–0.86)</li> <li>• Birth weight increased (MD: 126.7 g; 95 percent CI: 88.64–164.75)</li> <li>• LBW and severe antenatal anemia reduced by 43 percent and 38 percent, respectively</li> <li>• ITNs in pregnancy reduced LBW by 23 percent (RR: 0.77; 95 percent CI: 0.61–0.98) and reduced fetal loss (first to fourth pregnancies) by 33 percent (RR: 0.67; 95 percent CI: 0.47–0.97)</li> <li>• Nonsignificant impacts on anemia and clinical malaria</li> </ul>
<p>Note: ARI = acute respiratory infection; CI = confidence interval; g = grams; g/dL = grams per decilitre; g/l = grams per litre; HIC = high-income country; ITNs = insecticide treated bednets; kg = kilogram; LBW = low birth weight; LMICs = low- and middle-income countries; mcg/l = micrograms per litre; MD = mean difference; RR = relative risk; SD = standard deviation; SGA = small for gestational age; WASH = water, sanitation, and hygiene.</p>	

(Das et al. 2016)

## WEANING

Weaning is a process when infants diet is expanding to include foods and drinks. Weaning starts with semi-solid foods in 4–6 months and process continues up to 1 year's age, when child should manage with similar food as the rest of family. Weaning replaces energy and protein received from milk, it adds micronutrients, develop chewing and make's diet similar as family's food.

After age six months, diversity of diet is positively related to linear growth. Improving dietary diversity, especially with animal-source foods, is a critical message in nutrition education interventions. Nutrition education about foods to feed and number of meals for mothers of children ages 6–24 months, led child to gains in length. Micronutrients such as iron and iodine are important for mental development in the first 24 months.

### At the age of 4 to 5 months

Food should be thin, smooth and semi-solid. Suitable foods are pureed fruits, vegetables, mashed potatoes, custard, natural yoghurt and baby rice. After infant accept eating from a spoon, different tastes and textures can be introduced. Breast and formula-milk can be added to the food to improve energy and nutrient density. Salt should not be used, and sugar should be avoided. Weaning starts by offering one or two teaspoons of pureed food, to ease hunger milk is given first. Quality, quantity and frequency are increased gradually up to three times in a day. The breast milk or infant formulae should still be the main source of nutrition because intake of solid is small.

### At the age of 6 to 9 months

Food should be minced or smashed, and baby can also have finger food. Suitable foods are pureed meat, soft cooked fish, wholemeal cereal and porridge, scrambled well-cooked egg, raw soft fruits, soft carrot, slice of soft bread, food can have stronger flavour and mildly spiced. Solid foods can be offered three times a day. Provided volume of milk is 55% and solid food 45%. Child should be encouraged to use mug for drinking.



Picture: Complementary feeding - Complementary Feeding 6-9 months - 04A - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank (iycf.spring-nutrition.org)

#### At the age of 10 to 12 months

Food should be minced or chopped and child is encouraged to self-feed. At the age of 1 year, infant should be eating same food as the rest of the family, get three main meals and milk should supply 40–45% of energy intake. Home-made weaning food have advantages which are adjust to the taste of adult food, food is cheap and easy to prepare. Drawback of home-made food is nutrition quality, they can be low in energy, iron and zinc. Commercial weaning foods are easy to use, manufacturers have strict regulations of safety, composition and added vitamins and minerals. They are however expensive and wastage can be high.



Picture: Complementary feeding - Complementary feeding 12-24mo 12-24 mo - 08 - Non-country specific, USAID/SPRING-UNICEF IYCF Digital Image Bank (iycf.spring-nutrition.org).

#### Example of a weaning plan (0–6 months)

Age	Solids/drinks to introduce	6.00 am	10.00 am	2.00 pm	6.00 pm	10.00 pm
4 months	1–2 teaspoons of pureed baby food	✓	✓ ●	✓	✓	✓
4,5 months	3–4 teaspoons of pureed baby food	✓	✓ ●	✓	✓ ●	✓
5 months	6 teaspoons of pureed baby food	✓	✓ ●	✓ ●	✓ ●	✓
		8.00 am	12.00 am	5.00 pm	9.00 pm	
5,5 months	3–4 tablespoons on pureed baby foods	✓ ●	✓ ●	✓ ●	✓	
6 months	1–2 tablespoons of smashed baby food	✓ ●	✓ ●	✓ ●	✓	
✓ = infant feed (breast or formula milk) ● = solid food						

(Holden & MacDonald 2000, 41)

#### Child age 1 to 4 feeding

For pre-school children, food and mealtimes help to create good eating habits, supports communication skills and language, sets dietary model for later life and gives useful way for learning and play. Pre-school children have high nutrient requirements as they are still growing and developing rapidly and they are physically active. They should be offered small snacks between meals as well as meals at regular times. Young children need energy for basic metabolic functions, for keeping warm, for activity and for growth.

Nutrient intake of protein for children aged 1 to 3 years is 14,5 g per day, and children aged 4 to 6 years it is 19,7 g per day. Amount is easily achieved by drinking 300 ml of cow's milk, eating two portions of meat, yoghurt, eggs or fish. Aspect of cardiovascular disease recommends that children age 5 years or older should not consume more than 35% of calories from fat. This does not apply to children under age of 2 years. Between years 2 to 5 it is recommended to reduce fat intake from 50% to 35%. 50% of energy should be supplied by carbohydrate, 39% of it comes from

starch and milk sugars (e.g. fruits, vegetables) and no more than 11% should come from non-milk sugars (e.g. table sugar and honey).

High carbohydrate intake from starch and sugar is appropriate for children under 2 years of age. From age 2 years, gradual increase of energy from starchy food and decrease in energy from fats. Calcium intakes for children from 1 to 4 years are less than in the first year of life, between year 1 to 10 years, daily calcium need rises from 70 to 150 mg per day, and only 35% of dietary calcium is absorbed.

Requirements for pre-school aged children.

Age (years)	Daily energy requirements (kcal)	
	Boys	Girls
1 to 3	1230	1165
4	1715	1545
	Calcium requirements mg/day	
1 to 3	350	
4	450	
	Iron requirements mg/day	
1 to 3	6,9 mg	
4	6,1 mg	
	Vitamin C requirements mg/day	
1 to 3	30 mg	
4	30 mg	
	Vitamin D requirements µg/day	
1 to 3	7	
4	0	

(Holden & MacDonald 2000, 50–51)

### Pre-school-aged child feeding

Diet for pre-school age children is a variation of foods from all food groups. However, toddler's diet is notoriously and variation is narrow and based on a limited range of foods. Toddlers should have two to three serving with milk per day. There should be minimum 300 ml of cow's milk, but no more than 600–700 ml. Toddler should have daily two servings including beef, lamp, pork, fish, eggs, baked beans or lentils. Meat and meat products provide one quarter of all protein intake and red meat is good source of iron. On four serving in day, toddler should be offered bread, potatoes, pasta or rice.

Toddler's should have fruits and vegetables on four or more servings daily. Suitable fruits and vegetables are for example pears, bananas, orange, raisins, cooked carrot, cauliflower, cucumber etc. Partially cooked vegetables are better for young children and hard fruit and vegetables should be given to children after 3 years of age. It is recommended to establish regular eating and child should have plenty of time to eat and encouraged self-feeding.



Picture: Family - Adolescent nutrition - 00A - Nigeria, USAID/SPRING-UNICEF IYCF Digital Image Bank (iycf.spring-nutrition.org)

### School-aged child feeding

The health of school aged children is generally good, but children from poor conditions are likely to have inadequate intake of nutrition and weak growth. High quality diet is needed to gain adequate intakes of nutrients, particularly calcium and iron. Girls and boys have different need of nutrient when they grow older, but at young age their needs are the same.

### Epilogue

Early childhood is a critical time when the benefits of early interventions are amplified and the risk of negative effects can be reduced. Families need support to provide nurturing care for children and provision of services, including

health and nutrition. Stable environment that promotes children's health and nutrition protects children from threats, gives opportunity to early learning and has life-long benefits.

The volume of reproductive, maternal, new-born and child health is based on the link between interventions at each stage. Interventions need to deliver integrated, and be preventive and therapeutic interventions for mother and children. One of the recognised factor to decline child mortality is maternal education. Women with secondary or higher education has strong association to reduce child mortality.

Strategies to protect, promote and support early breast feeding are needed at health system. The health systems strategies include baby-friendly and initiative hospital personnel, the education of health staff about breast-milk substitutes and building a capacity for health-workers to provide breast feed counselling.



Picture: Counseling - Community Video - 10 - Nigeria, USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org))

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#### PICTURES:

USAID/SPRING-UNICEF IYCF Digital Image Bank ([iycf.spring-nutrition.org](http://iycf.spring-nutrition.org)):

Family - Family of four - 00 - Nigeria,  
 Sick Baby Health Care - Malnourished baby 6-24 mo - 00 - Niger,  
 Sick Baby Health Care - Sick baby being measured at clinic 9-12 mo - 01A - Non-country specific,  
 Sick Baby Health Care - Sick baby being weighed at clinic 9-12 mo - 02B - Non-country specific,  
 Baby Health Care - Measuring a child's arm 12-24 mo - 00 - Non-country specific,  
 Counseling - Breastfeeding counseling - 01B - Non-country specific,  
 Breastfeeding - Exclusive breastfeeding 0-6 mo - 01B - Non-country specific,  
 Breastfeeding - Early initiation of breastfeeding 0-24 mo - 01 - Nigeria,  
 HIV - Preparing infant formula 0-24 mo - 01 - Tanzania,  
 Food - Food storage - 00 - Ethiopia,  
 Food - Grains and starches - 00M - Non-country specific,  
 Objects - Water bottle - 01 - Sierra Leone,  
 Complementary Feeding - Adding micronutrient powder to complementary foods - 03B - Non-country specific,  
 Complementary feeding - Complementary Feeding 6-9 months - 04A - Non-country specific,  
 Complementary feeding - Complementary feeding 12-24mo 12-24 mo - 08 - Non-country specific,  
 Family - Adolescent nutrition - 00A - Nigeria,  
 Counseling - Community Video - 10 - Nigeria.

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