

HIV, Nutrition, and Food

A Practical Guide for Technical Staff and Clinicians

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Acronyms

AFASS	Acceptable, feasible, affordable, sustainable, and safe
AIDS	Acquired immune deficiency syndrome
ART	Antiretroviral therapy
BIA	Bioelectrical impedance analysis
BMI	Body mass index
CHBC	Community home-based care
FANTA	Food and Nutrition Technical Assistance Project
FAO	Food and Agriculture Organization of the United Nations
FHI	Family Health International
HIV	Human immunodeficiency virus
IEC	Information, education, and communication
LBW	Low birth weight
MSM	Men who have sex with men
MTCT	Mother-to-child transmission
NCE	Nutrition counseling and education
NGO	Nongovernmental organization
OI	Opportunistic infection
OVC	Orphans and other vulnerable children
PLHIV	People living with human immunodeficiency virus
PMTCT	Prevention of mother-to-child transmission
PWID	People who use injection drugs
RNI	Recommended nutrient intake
SOAP	Subjective, Objective, Assessment, Plan
TB	Tuberculosis
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	United Nations Children's Fund
VCT	Voluntary counseling and testing
WFP	World Food Programme
WHO	World Health Organization
WHR	Waist to hip ratio

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1. Introduction

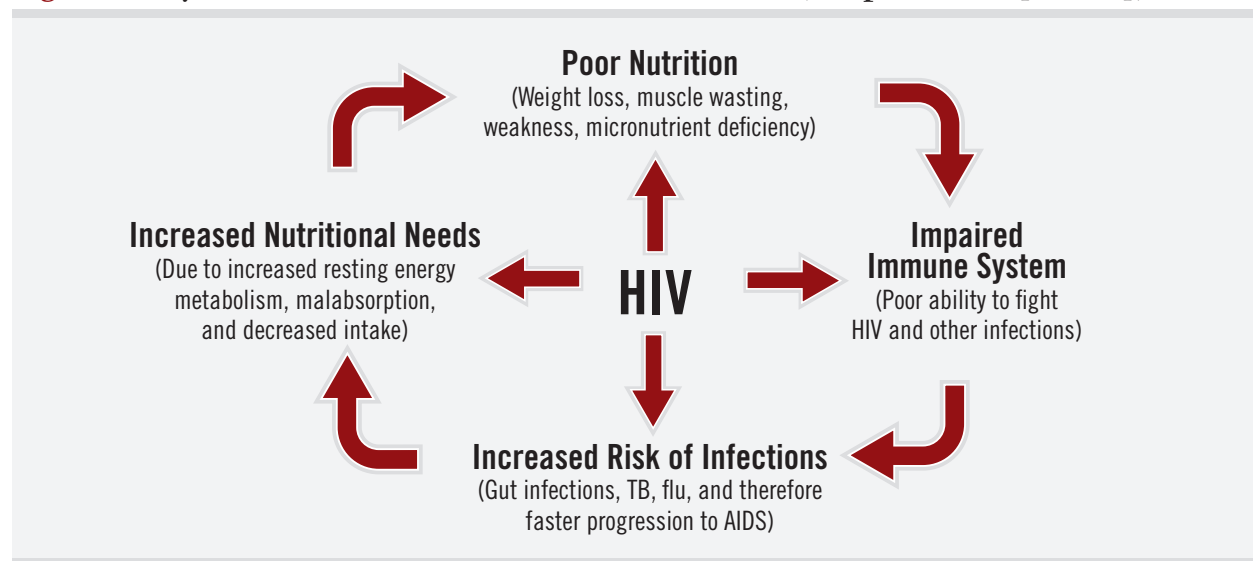
The purpose of this document is to provide a concise, practical guide for technical staff and clinicians. This is an evidence-based guide, and we suggest you use the reference section to complete further reading. This guide first provides an overview of the links between food, nutrition, and HIV. Subsequently it provides details on the nutritional needs of specific groups and summarizes commonly used food and nutrition interventions. Finally it provides an overview of FHI case studies. All of the information presented in this document is targeted to resource limited settings.

2. Links Between Food Insecurity, Nutrition, and HIV

The impact of HIV infection and associated complications on overall nutritional status has been identified from the early stages of the epidemic [1-3]. The spread of HIV through many regions of the world is highlighting the complex and evolving relationship between food, HIV infection, and nutritional status. At an individual level, a broad range of factors may contribute to declining health and nutritional status for people with HIV and people who are the most vulnerable to HIV. **Nutrition interventions can improve health outcomes and are an integral part of HIV care at any stage of disease and throughout the life cycle** [4].

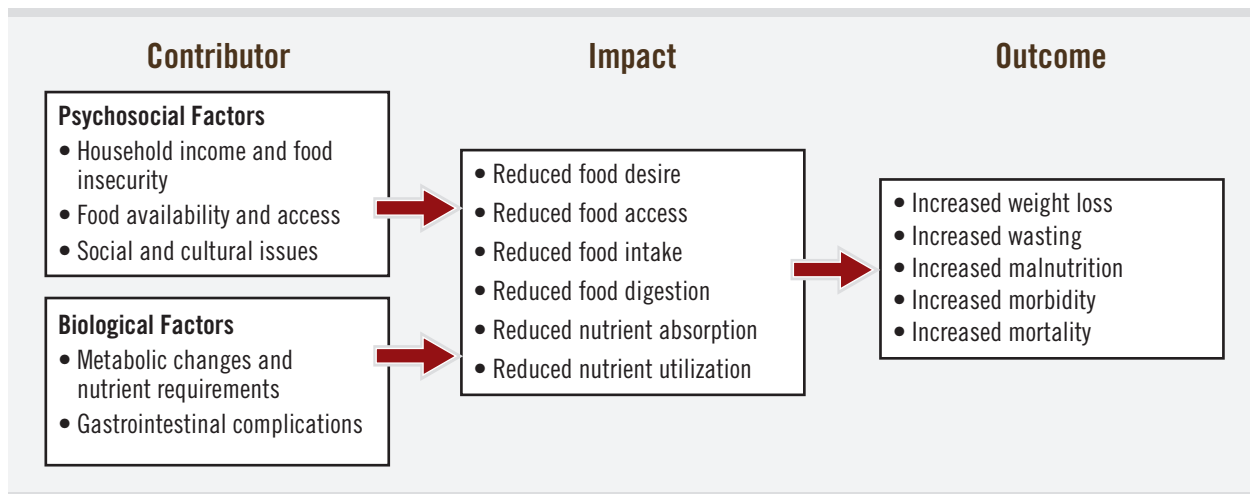
It is well understood that poor nutritional status has a detrimental effect on immune system development and function [5]. Similarly, declining immune function, as is experienced in HIV infection, has a direct and indirect impact on nutritional status [4]. The progressive decline in nutritional status is the result of a cumulative range of impacting factors that compound the problem of malnutrition [2, 6-11]. The cycle of malnutrition and HIV has been well documented. Figure 1 provides an overview of the interrelationship between nutritional status, HIV infection, and the impact on immune function.

Figure 1. Cycle of Malnutrition and Infection in HIV (adapted from [12, 13])



If optimal nutritional status is not restored or maintained, a progressive cycle for people living with HIV (PLHIV) can occur involving impaired immune function, increased risk of opportunistic infection, and increased nutritional needs [6, 14]. Broadly these contributing factors can be divided into two categories: psychosocial and biological factors. Figure 2 illustrates this relationship.

Figure 3. Contributing Factors to Poor Nutritional Status Among People Living with HIV (PLHIV)



Psychosocial Factors

- **Household income and food insecurity** – The majority of HIV infections occur in the most productive section of the population, which is among adults ages 15-49 [15]. As HIV disease progresses, an individual’s work participation, productivity, and income-generating capacity also decline, thus reducing household income [8, 16]. At the same time, rising expenses, such as medical costs, reduce resources available for food [17].
- **Food availability and access** – Many PLHIV face difficulty in accessing a reliable and safe food supply, particularly as their health and mobility decline [8, 15].
- **Social and cultural issues** – Social and cultural norms may have an impact on a diverse range of cognitive issues (e.g., depression, anxiety, and social isolation) [18] and skills-based issues (e.g., food preparation) that all contribute to reducing an individual’s ability to consume a nutritionally adequate diet [4, 19].
- **Personal beliefs** – Religious and cultural beliefs may prohibit the consumption of certain foods and influence behavior change [4]. Beliefs about the curative powers of certain foods and herbal therapies may prevent achievement of optimal nutritional status.

Biological Factors

- **Metabolic changes and nutrient requirements** – HIV changes the basic nutritional requirements of an individual as the body struggles to maintain optimal immune function and repair damaged cells [6]. Evidence suggests that this loss of lean tissue is directly linked to survival in HIV infection [1]. Anorexia and poor dietary intake is a common problem reported by many PLHIV not receiving antiretroviral therapy (ART) [19-24] and is a contributor to reduced energy intake among PLHIV [25]. HIV increases metabolic rate [25-30]. Research regarding micronutrients in HIV has consistently shown that deficiencies are common among both adults and children living with HIV [11, 31-33]. A summary of nutritional requirements can be found in Box 1.

- **Gastrointestinal complications** – HIV infects nearly every cell in the body, including the gastrointestinal system. This has a significant impact on the body’s ability to digest and absorb nutrients from food [34-36]. One of the most common symptoms of gastrointestinal problems caused by HIV is diarrhea, particularly in the later stages of infection [37].
- **Chronic infections and illnesses** – Opportunistic infections (OIs) that accompany an HIV infection can result in greater nutrient requirements [38], lower appetite, and lower food intake, and can result in poor use of nutrients by the body.
- **Antiretroviral therapy** – See section 3.4.

Box 1: Summary of Nutritional Requirements for PLHIV

Energy [39]

- Energy requirements for asymptomatic adults and children living with HIV increase by 10%.
- During periods of recovery from illness (for both adults and children) and child catch-up growth, energy requirements for people living with HIV increase 20 to 50%.
- Resting metabolic rate can increase by 100% in advanced stages of HIV infection or when OIs are present in adults and children [25-30, 40].

Protein [39]

- There is insufficient evidence to recommend a higher intake for PLHIV than for the general population.
- Protein should provide at least 10 to 12% of the person’s total energy intake.

Micronutrients [41]

- Micronutrient deficiencies are common [31-33] and should be treated according to appropriate WHO guidelines.
- Maintaining adequate intake is recommended. Recommended Nutrient Intake (RNI) of all essential vitamins and minerals is particularly desirable in areas where both malnutrition and HIV infection are endemic [41].
- Vitamin A in HIV-infected and uninfected children reduces overall morbidity and diarrhea morbidity as well as all-cause mortality. If available, vitamin A supplements should be given in accordance with the World Health Organization (WHO)-recommended high-doses prevention schedule for children at high risk of vitamin A deficiency [40].

Evidence for these nutritional recommendations for PLHIV comes from a series of reviews completed following a consultation held in Durban, South Africa, in April 2005. See http://www.who.int/nutrition/topics/consultation_nutrition_and_hivaids/en/index.html.

3. Nutrition Issues for Specific Groups

Food and nutritional support are important components of comprehensive HIV care, and nutrition issues for specific population groups need to be taken into account in order to design the most appropriate programs and interventions. Groups not mentioned below that may require special consideration include men who have sex with men, sex workers, and others.

3.1 Infants (birth to 12 months), Children (1 to 10 years), and Adolescents (10 to 19 years)

It is estimated that 2.3 million children under 15 years old are HIV positive, with 530,000 new infections in 2006 [42]. Without treatment, one in every two infected infants will die before age 2 [42, 43]. The principle source of HIV infection in young children is mother-to-child transmission (MTCT) [42, 44], occurring during pregnancy, labor, delivery, and breastfeeding [45]. In HIV-infected children, wasting has been associated with reduced survival and increased infectious complications. Conversely, HIV has been associated with nutritional disorders, immune status, and level of viral replication, and may be important in predicting growth outcomes [40].

Diminished growth is highly prevalent in HIV-infected children. Children with unexplained growth failure/moderate malnutrition (loss of body weight of -2 standard deviation from the mean) meet WHO Stage 3 (advanced) disease criteria. Unexplained weight for height or weight for age of more than -3 standard deviation from the mean with or without edema meets WHO Stage 4 (severe) disease criteria [46].

Nutritional Issues

Social

- **Poverty** – Malnourished mothers are likely to give birth to low birth weight (LBW) infants, who are then susceptible to disease and premature death, continuing the cycle of poverty and malnutrition [6].
- **Barriers to replacement feeding** – Barriers include stigmatization (not breastfeeding may signal the mother's HIV status) and disclosure of HIV status [47]; psychological, social, and cultural factors; the financial costs of replacement feeding; the risk of becoming pregnant again [40, 44, 48]; access to voluntary HIV testing and counseling (VCT) [48]; levels of knowledge of mothers and healthcare workers [40] about replacement feeding; illiteracy; and religion.
- **Cultural** – Prolonged breastfeeding and mixed feeding in the first six months of an infant's life is common, especially in Africa [40, 45, 49, 50].

Biological

- **Prevention of mother-to-child transmission (PMTCT)** – The postnatal HIV transmission rate is estimated to be 15 to 20 percent for prolonged breastfeeding (about two years) [44, 45, 51]. This can be reduced by approximately 5 percent by cessation of breastfeeding at six months (i.e., mixed feeding in the first six months) and by half with exclusive breastfeeding for six months with rapid cessation [44, 45, 51]. Risk factors influencing the outcomes include low maternal CD4 count; high maternal viral load; recent maternal HIV infection; duration of feed-

ing; condition of the breasts/nipples; oral thrush in the infant; and mixed feeding [44, 45, 51, 52]. ART can reduce viral load in breast milk [53].

- **Malnutrition** – Infants born to HIV-positive mothers are more likely to be malnourished (LBW and postnatal growth) [54-57], and generally malnutrition is associated with 54 percent of child deaths [6, 58]. Severe wasting is a common clinical presentation of a child living with HIV [40]. Adolescent girls are at higher nutritional risk than boys, particularly if they are pregnant, and younger adolescents are at higher risk than older ones [59]. Pregnant adolescents with HIV are at particularly high nutritional risk [59].
- **Slow response to treatment** – Recovery from malnutrition takes longer and treatment failure and fatality rates are higher in children living with HIV [40, 42, 60], most likely due to infections [42]. The indications for the initiation of ART in children with severe malnutrition vary globally. Therapeutic feeding is recommended first, although this may not be effective [40]; if this is the case ART may need to be provided while malnutrition is still present [40].
- **Safe replacement feeding** – Safe replacement feeding is difficult to achieve due to infections of breast-milk substitutes and the inability of the substitutes to meet the infant’s nutritional requirements [44]. Unsafe replacement feeding has serious morbidity and mortality risks [49, 51, 53]. Other barriers to safe replacement feeding include the cost of the substitutes and access to a safe and regular water supply.

Recommendations and Interventions

WHO recommends that early nutrition intervention should be an integral part of the care of HIV-infected infants and children [40].

Infant Feeding in the Presence of HIV (when the mother or wet nurse is HIV positive)

United Nations (UN), WHO, UNICEF, UNAIDS Recommendations: WHO’s global public health recommendation for all infants is to breastfeed exclusively for the first six months and then introduce nutritionally adequate and safe complementary foods while breastfeeding continues, for up to 2 years of age or beyond, except in extremely difficult circumstances, including HIV infection of the mother [61]. For HIV-positive women with infants, UN (WHO) guidelines state that “when replacement feeding is acceptable, feasible, affordable, sustainable, and safe (AFASS), avoidance of all breastfeeding by HIV-infected mothers is recommended. Otherwise, exclusive breastfeeding is recommended during the first months of life.” (p. 58 [44]. Refer to the glossary for further information about the terminology.)

Recommendations for HIV-Positive Mothers with Infants:

- Use replacement feeding for at least 12 months only in ideal situations (AFASS). Introduce safe complementary foods at about 6 months [44, 60, 62].
- If replacement feeding is not AFASS, **exclusive breastfeeding** is strongly recommended for the first 6 months [44, 45, 51]. At around 6 months, cessation of breastfeeding and rapid (two days to three weeks) weaning is recommended [44, 45, 51, 60]. Commence family foods, especially *boiled* animal full-cream milk or yogurt and other animal products, fruits, and vegetables. A micronutrient supplement is recommended. If animal-source foods such as meat, poultry, fish, or eggs are eaten daily, then 200 to 400 ml/day of full-cream milk is needed; if animal-source

foods are not available, then 300 to 500 ml/day of full-cream milk is needed [63]. If adequate food (600 kcal/day at 6 to 8 months, 700 kcal/day at 9 to 11 months, and 900 kcal/day at 12 to 23 months [63]) is not available at 6 months, there is no other choice but mixed feeding.

- After 6 months of age, any liquids given to the infant should be fed by cup rather than by bottle, especially due to risk of infection from the bottle [44, 48].
- Home-modified animal milk should be considered only for short-term feeding of non-breastfed infants under 6 months [64].

For further information, see http://www.who.int/nutrition/publications/HIV_IF_guide_for_health-care.pdf [44].

For information on complementary feeding, see http://www.who.int/child-adolescent-health/New_Publications/NUTRITION/ISBN_92_4_159343_1.pdf [63].

For an overall practical guide, see <http://whqlibdoc.who.int/publications/2005/9241593016.pdf> [65].

Children and Adolescents Living with HIV – Feeding Recommendations

- Children experiencing growth failure should be targeted for overall healthcare, and the cause of their growth failure determined and addressed (e.g., treatment of opportunistic infections [40]).
- WHO suggests that severely malnourished HIV-infected patients be treated irrespective of their HIV status when resources permit [59]. It is recommended to treat malnourished children in the community or hospital setting [42, 66]. Effective community treatment for children with severe malnutrition is ready-to-use therapeutic food (RUTF) until they have gained weight [42]. There are a number of WHO resources providing guidance on malnutrition [42, 60, 66, 67].
- **Symptom management:** High-energy soft foods will assist with many conditions [40]. For further information on feeding children when sick, refer to the section “provide guidance to the mother for feeding her child during illness” of the WHO *HIV and Infant Feeding Counselling Tools Reference Guide* [65].

3.2 Orphans and Other Vulnerable Children

It is estimated that 15.2 million children under 18 have lost one or both parents to AIDS [42]. Most of the children orphaned by HIV live in sub-Saharan Africa (82 percent) [68], but Asia has twice as many orphans (due to all causes) [68]. The number of orphans and other vulnerable children (OVC) is set to increase [68]. Some studies have shown that female teenage OVC (15 to 18 years old) have a higher HIV prevalence than non-OVC female teenagers [69].

OVC are at increased risk of malnutrition and illness [68] due to economic hardship; lack of love, attention, and affection; increased abuse, risk of HIV infection, stigma, discrimination, and isolation; and other factors [68].

Nutrition Issues

Social

- **Complex environment** – Many children have become vulnerable due to HIV, poverty, hunger, armed conflict, and harmful child labor practices, all of which fuel and are fueled by the HIV epidemic [68]. Communities, schools, healthcare systems, and other social support networks are weakened [68].
- **Household poverty and food security** – OVC households are more likely to be poor and food-insecure [70, 71]. Commonly unmet needs in households with OVC are education, food, medical care, and clothing [71, 72]. Other issues include caregivers being unable to attend healthcare appointments, assist with educational support and development needs, or provide adequate care when a child is sick [72].
- **Gender** – Many girls face gender-based discrimination in households and communities, and are therefore less likely to receive basic healthcare, education, and social services [73]. Research has shown that food insecure women, especially young women, are more likely to engage in transactional sex to procure food [74, 144].

Biological

- **Growth** – A recent study found that HIV-exposed but uninfected Zambian infants had poorer early growth than their HIV-unexposed counterparts, but the reason for this was not determined [56].

Recommendations and Interventions

- Improve food security [68] via livelihood strategies, access to credit, and education [70].
- Offer food support if required, especially for the most vulnerable [70]. For example, the World Food Programme (WFP) provides food support via its Food for Education school feeding program. The WFP Junior Farmer Field and Life Schools program, implemented with the Food and Agriculture Organization of the United Nations (FAO), is another example [70].
- Assess support groups and community childcare facilities to provide growth monitoring and nutrition interventions (if required) for OVC [68, 75].
- Include consideration of OVC nutrition in community home-based care (CHBC) [68, 75]. If appropriate, train staff (volunteer and paid) to rapidly assess nutrition and food security and then provide nutrition interventions as appropriate [76].
- If OVC are HIV positive see above recommendations.

3.3 Women Affected by HIV

Women are affected by HIV in almost equal numbers as men globally [77]. Poverty, gender inequality, and HIV combined result in disproportionate harm to women and girls. Women tend to be primary caregivers and providers of food in families and communities. When they are unwell and unable to meet the basic needs of family and community, severe food insecurity may result. In addition to the physical manifestation of HIV, women may also have to combat the discrimination and lack of social support commonly associated with HIV infection [77].

Nutrition Issues

Social

- Poverty
- Gender inequality
- Lack of education
- **Poor access to health services** – Poverty and discrimination may prevent women from accessing health services including sexual and reproductive health services, antenatal care, PMTCT, and ART [77], all of which can potentially improve nutritional outcomes for women.

Biological

- **Malnutrition** – A woman's nutritional status before and during pregnancy will influence the health and survival of both mother and child [60, 78-80]. Malnutrition is associated with increased risk of MTCT [80].
- **Micronutrient deficiencies** – Micronutrient supplementation in pregnant women is known to be beneficial in protecting against adverse pregnancy outcomes among HIV-infected women [81-83]. Anemia (iron deficiency) affects more than half of all pregnant women in resource limited settings and is more common and severe in HIV-infected women [80]. Vitamin A supplementation (10,000 IU) is associated with significantly improved birth weight [60, 80-82, 84, 85].

Recommendations and Interventions

Dietary recommendations and nutrition counseling for women with HIV are similar to those for the general population [80, 83]. (See Box 1 for dietary recommendations, and section 4.5 for nutrition counseling.) However, due to the social and cultural issues that commonly affect women's access to adequate nutrition, gender-specific programs should be considered.

Pregnant/lactating women – Counseling is recommended to meet energy and nutrient requirements for weight gain in pregnancy and to prevent nutritional depletion [80]. Two key aims are to prevent anemia and other micronutrient deficiencies [60, 80].

Gender-specific or gender-sensitive programs – These programs target female-headed households without family support and encourage women's participation in program matters including governance [86, 87].

3.4 PLHIV on Antiretroviral Therapy

Nutrition Issues

Social

- Lack of food is often mentioned as the most likely cause of non-adherence to ART in developing country settings [88].

Biological

- **Malnutrition** – In patients commencing ART, malnutrition has been linked to more side effects, decreased effectiveness of treatment, and reduced length of survival during treatment [89]. However, the initiation of ART can lead to a significant improvement in nutritional status among populations where food insecurity and poverty are not endemic [90-92].
- **Nutrition-related side effects** – Emerging interactions and impacts of ART on nutritional status [93, 94] include the relationship between food intake and ART absorption [93], ART-related symptoms [95, 96], and metabolic complications of HIV [67, 97]. Issues such as nausea and vomiting affect adherence to ART, particularly early in treatment [98]. Anecdotally, PLHIV report fear about taking their HIV medications when they do not have sufficient food because of concern about side effects they have experienced with other drugs, such as tuberculosis (TB) medication.

Short- and long-term side effects of ART can include the following [67, 93, 95-97]:

Please see appendix 1, table A1 for further details.

- Unplanned weight change
- Anorexia
- Nausea and vomiting
- Cachexia
- Diarrhea
- Changes in taste and smell
- Reflux, bloating, and other gastrointestinal changes
- Hyperlipidemia, insulin resistance, and diabetes
- Osteopenia and osteoporosis

Recommendations and Interventions

Recommendations

PLHIV who are on ART or taking other OI medications need to be careful about the foods they eat. Suggested steps to support dietary management of interactions between ART and food and nutrition are described in the Food and Nutrition Technical Assistance program (FANTA) Technical Notes 2004 [14]. See <http://www.fantaproject.org/publications/tn7.shtml>.

The combination of medicine and certain foods can interfere with drug metabolism. For example, Nevirapine and Lamivudine can be taken without consideration of food, whereas others, such as Indinavir and Didanosine, should be taken with plenty of liquid and no food.

Interventions

- **Food assistance** – Provision of food support may increase compliance with treatment in instances where a lack of food is contributing to non-adherence. A study in Zambia found that providing food support to food-insecure patients increased ART adherence by 40 percent and increased weight during the first six months of treatment [99].
- **Food or micronutrient supplementation** – In patients with inadequate dietary intake starting ART, supplementation may improve their response to ART [100].
- **Nutrition counseling** – Advice on simple dietary changes to help manage the common side effects of ART can be beneficial. These changes may improve tolerability and therefore adherence to treatment, increasing its effectiveness and reducing the likelihood that drug resistance will develop. Lifestyle changes may include eating regular meals, taking medication with or without meals as recommended, or eating different types of foods to reduce the side effects of ART [60, 80]. Appendix 1 provides some examples of the nutritional management strategies for common ART side effects.

For longer term side effects of ART, such as raised blood fats (hyperlipidemia), ensuring adequate food to prevent or treat malnutrition takes priority in resource poor settings. In some cases it may be appropriate for PLHIV to receive advice on dietary change or receive modified food packages to reduce the impact of the side effects listed in table A1, appendix 1.

3.5 People Who Inject Drugs

Globally there are an estimated 13 million people who inject drugs (PWID), of whom 4 million are living with HIV [101]. HIV can spread quickly among PWID, through sharing of injection equipment, drug contamination, high risk sexual behaviors, MTCT, and needle stick injuries [102].

Hepatitis C virus and HIV co-infection is an issue for PWID, and is associated with increased morbidity and mortality [102]. PWID are less likely to access care and treatment as discrimination and stigma from healthcare workers is common [102].

Nutritional Issues

Social

- **Food insecurity** – PWID are more likely than the general population to be living in poverty and experiencing food insecurity. Seeking and using drugs may take priority over tasks such as food preparation [103, 104]. PWID are at greater risk of homelessness and mental health problems such as depression, anxiety, and psychosis [105, 106].

Biological

- **Malnutrition** – PLHIV who inject drugs are more likely to be underweight than the general population [104, 107].
- **Poor micronutrient status** is common in PWID, regardless of HIV status. Injection drug use is associated with decreased nutritional quality of diet and increased vulnerability to nutrient deficiencies [103, 107, 108]. This may be attributed to nutritional insufficiency of diet, malabsorption, metabolic abnormalities, or increased nutritional requirements [107].
- **Dry mouth and other oral problems** – Drug use can perpetuate oral health problems associated with HIV infection such as dry mouth, dental cavities, and gum disease. Poor dental health can lead to difficulty chewing and reduced food intake, which further compromise nutritional status [103].

Recommendations

- Empathetic and nonjudgmental attitude from healthcare workers to avoid further isolation of PWID from health services.
- Referral to food security interventions that engage PWID.
- Counseling for a nutritious diet with energy sufficiency, plus micronutrient supplementation if available.
- Dental and oral health education and referral services where possible.

3.6 PLHIV Co-infected with Tuberculosis

Nutrition Issues

TB is an opportunistic infection that affects 30 percent of PLHIV in resource limited settings [14], including children [109, 110]. Co-infection has been reported to be greater than 75 percent in some countries in sub-Saharan Africa [111].

Social

- TB can be highly stigmatized and therefore may reduce PLHIV's access to food.

Biological

- **Risk of infection** – PLHIV's risk of developing TB is increased if their nutritional status is poor [110, 112].
- **Malnutrition** is an important factor in the clinical progression and response to treatment of both TB and HIV [111]. If PLHIV are also infected with TB, weight loss is very rapid [111, 113]. Malnutrition is associated with early death in PLHIV co-infected with TB [114].
- **Clinical effects** – Pulmonary TB can make breathing difficult during acute illness and can lead to fatigue and reduced food intake. Poor appetite and nausea are also common. TB increases a person's energy requirements and leads to weight loss, especially when dietary intake is inadequate.

Recommendations and Interventions

- Nutrition interventions will depend on the outcome of a detailed nutrition assessment. Energy estimates for PLHIV without any symptoms of disease will be (on average) 20 percent higher than those without any infection (HIV or TB [6]).
- TB is correlated as an independent risk factor for wasting among people also living with HIV [38].
- Texture modification and/or supplementary feeding may be required depending on individual symptoms.
- Lower carbohydrate diets are *not* recommended for PLHIV with active pulmonary TB, especially when underweight.
- The diet should be supplemented with high energy foods or supplement drinks when commencing TB treatment. Nutrition interventions using energy and protein supplements initiated at the same time as commencing anti-tuberculosis drugs significantly improved lean body weight and physical function in a study of patients with wasting [115].
- Providing food assistance in resource poor settings as an incentive to complete TB treatment can improve compliance. Nutrition counseling is recommended to accompany food assistance programs for people with TB infection, to improve health outcomes and treatment response [14].

4. Food Support and Nutrition Interventions

Food and nutritional support are important components of comprehensive HIV care, particularly in areas where malnutrition and food insecurity are common. Food and nutritional support are not the same thing, and while nutritional support is always an element of HIV care, support, and treatment, food support may be appropriate only in certain contexts.

Nutrition interventions may or may not include the provision of food. Nutrition support interventions include nutrition assessment, education, counseling on specific eating behaviors, prescription of targeted nutrition supplements (e.g., micronutrient supplementation, therapeutic feeding), and linkages with food-based interventions and programs.

Food support, in contrast, always includes the provision of food. This may be food distributed in times of crisis, as part of a school feeding program, or in exchange for labor. Food support (rations) may be given to HIV-affected households to reduce the risk of OIs or the side effects of antiretroviral medications.

A number of nutrition-based interventions are often integrated into HIV care programs. Some of these, which will be described below, include advocacy, nutrition and HIV policy, nutrition assessment, screening and monitoring, nutrition counseling and education (NCE), and finally nutrition research.

4.1 Advocacy

Despite the growing amount of evidence promoting the role of food and nutrition in HIV care, currently there is limited understanding and awareness about these issues and little integration into HIV care programs. By building awareness about the relationship and interactions between food, nutrition, and HIV, it is possible to highlight the importance of incorporating these interventions as a fundamental component of HIV prevention and care programs. To raise awareness, this advocacy needs to be targeted toward a number of groups at various levels, including government, policymakers, healthcare agencies, nongovernmental organizations (NGOs), and PLHIV groups.

4.2 Nutrition and HIV Policy

The development of comprehensive policies on food and nutrition in HIV prevention and care is an important strategy in addressing dietary issues of PLHIV and can enable a coordinated and systematic approach. The policy or guidelines need to outline the elements (particularly evidence-based elements) crucial for developing or providing high-quality, effective nutritional care and support [8]. The policy can target various levels of intervention, from community-based nutrition care guidelines to the development of national strategies. Suggested components of a nutrition and HIV policy are included in appendix A2.1.

4.3 Nutrition Assessments

Why do nutrition assessments?

- To identify the type of nutrition intervention required
- To determine eligibility for food assistance for malnourished adults and children infected or affected by HIV
- To develop an individualized nutrition care plan to support the clinical management of PLHIV before and during antiretroviral therapy
- To complete nutrition research or a nutrition survey in a population

Where are nutrition assessments conducted and by whom?

Nutrition assessment occurs at the **facility level**, integrated with clinical management of PLHIV, and at the **community level** through home-based care programs. Physicians, nurses, nutritionists, and other trained staff can conduct nutrition assessments.

When should a nutrition assessment be conducted?

1. If risk factors or indicators are identified during nutrition screening
PLUS
2. Soon after an HIV diagnosis for assessment of baseline nutritional status
3. Periodically, depending on the stage of a person's HIV infection:
 - Asymptomatic PLHIV – one or two times per year
 - Symptomatic PLHIV – two to six times per year
4. When initiating or changing antiretroviral therapy
5. As part of clinical nutrition research or evaluation of populations receiving nutrition interventions

What should be included in a comprehensive nutrition assessment?

A comprehensive assessment includes a psychosocial and physiological assessment; evaluation of current nutritional status, including baseline weight and body mass measures (anthropometric parameters) and blood tests (biochemical parameters); symptoms/illness affecting nutritional state (clinical); and eating patterns and average daily energy and micronutrient intake (dietary parameters). However, inclusion of all these components will be dependent on the availability of resources and the skills of the healthcare workers.

Results of the nutrition assessment, including goals and plans, can be recorded using a standard form or as a medical record notation. In a medical record notation, Subjective, Objective, Assessment, Plan (SOAP) is recommended. SOAP is described in appendix A2.2.

What equipment is required for a comprehensive nutritional assessment?

Where available, required equipment includes weighing scales (including baby); height and length measures; tape measure; paper/ruler/string; skin-fold calipers; bioelectrical impedance analysis (BIA) machine; laboratory equipment; and testing agents for biochemical data.

What tools can assist clinicians in measuring nutritional status?

Depending on the target group and the purpose of the assessment, it may be useful to develop standard forms for collection of data. A variety of tools for use in the community and clinical settings are shown in appendix A2.2. These tools can be modified to be appropriate for specific services.

Additional considerations in nutrition assessment for children

Nutrition assessment assists in the monitoring of disease progression in children [116].

When to conduct assessments – HIV guidelines state that all infants should have their weight monitored monthly in the first year of life and at least every three months in the second and third years of life; this is especially important for non-breastfed children [65, 116]. After this time, growth should continue to be monitored until adulthood [117].

What to assess – The same assessment should be conducted as for adults, with the addition of growth monitoring. Growth monitoring is a universal practice, but more than half of all countries use only weight for age as a measure, and many countries do not provide monitoring over the age of 6 years [117]. At a *minimum*, weight for age and length/height for age should be measured [117]. There are widespread problems with the interpretation of growth by healthcare workers [117]. The z-score system is preferred [117]. An important element in the context of HIV is that low birth weight infants will display significant catch-up growth in good conditions, but may have lower weights than others for some time [118].

Please refer to the World Health Organization pediatric growth charts at www.who.int/childgrowth/en, as well as the *Training Course on Child Growth Assessment* at <http://www.who.int/childgrowth/training/en/>, and see appendix A2.2 for further information.

Additional considerations for adolescent nutrition assessment

Nutritional status assessment using anthropometry is indicated, along with physical examination if in a clinical setting. A rapid dietary assessment is also indicated whenever a nutritional problem is suspected, and as a basis for nutrition counseling [59].

Anthropometry is complicated in adolescents, especially the assessment of undernutrition [59, 119, 120], and there are no defined tools [120]. For further information see appendix A2.2.

For children over 5 years old, WHO recommends the use of locally available growth charts or, if these are not available, the NCHS/WHO growth charts [59], which can be found at http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm.

4.4 Nutrition Screening

Nutrition screening identifies HIV-infected persons in need of nutrition therapy, based upon specific criteria. A screen is a broad assessment, while a nutrition assessment is a detailed investigation by a nutritionist/dietitian, medical officer, nurse, or other trained staff [121, 122].

A well-designed screening tool is a quick, reliable, cost-effective way of identifying nutritionally at-risk people [123]. If people at risk of malnutrition can be identified, and an early intervention implemented, then the screen will help prevent the onset of malnutrition [121]. Nutrition screening can occur at the patient/individual level or on the household and community level [86].

Nutrition screening at the household level is used to identify groups of people with a collective risk of food insecurity [86]. For example, WFP broadly screens households within a community or area that has been identified as food insecure with a high prevalence of HIV for the purpose of identifying households that qualify for food aid [124]. WFP uses a number of tools, including anthropometric surveys, household surveys, rapid assessment procedures, and direct observation [86].

Nutrition screening at an individual level often occurs in a clinic or health service. In a resource limited setting a screen is likely to identify individuals at risk of malnutrition. In high resource settings, high risk patients are those considered to have greater than 10 percent unintentional weight loss over four to six months, or poor growth in children [121]. For example, see the *Nutrition Screening Criteria in Adults* tool [125].

A variety of screening or risk assessment tools are available. Most involve questionnaires, checklists, or scaled instruments. It is important to validate a tool in the population that it will be assessing [122]. It is most practical if the tool can be administered by a volunteer or clinic receptionist without the need for specific nutrition training. This is dependent on the simplicity of the tool. If the tool is a questionnaire that the individual fills out, literacy rates must be considered.

The outcome of the screen will be influenced by the validity and reliability of the screening tool [122]. Thus, the tool is best designed in consultation with those who will be implementing it, to ensure it is appropriate and simple to administer. There are few validated HIV screening tools appropriate for resource limited settings. Examples of screening tools and criteria can be found in appendix A2.3. We encourage the development of site specific tools and validation in the target population.

An important additional consideration is that there must be a suitable protocol in place to refer people to appropriate services if they have been identified in the screen as nutritionally at risk.

4.5 Nutrition Counseling and Education (NCE)

NCE is essential to provide comprehensive nutritional care and support to PLHIV at any stage of the disease [4]. Culturally and economically viable dietary NCE can be low in cost and effective in treating PLHIV with limited access to ART [126], and has been shown to be effective, particularly when provided early, in improving body weight in PLHIV [127, 128]. NCE can take place in various settings, including hospital inpatient and outpatient departments, community health centers, other community settings, or at home.

Box 2. Integrating NCE into Treatment and Palliative Care Services

It is necessary to identify resource availability (e.g., equipment IEC, staff) and then initiate capacity building activities for services as required (e.g. nutrition training, IEC development). Implementation of NCE may vary depending on the type of service.

CHBC for PLHIV

Home assessments should include nutrition screening and NCE in individual care plans (and/or other nutrition or food interventions). “Cooking clubs” can be initiated to promote practices that save fuel, improve nutrition, and address common nutrition-related issues in the community. Texture modification cooking groups may be useful especially for families caring for PLHIV who are acutely ill or receiving palliative care.

Outpatient HIV clinics in hospitals or community health centers

Regular nutrition screening of PLHIV attending clinics should be conducted, followed by nutrition assessment and NCE as required. NCE can be delivered individually or in groups. Nutrition education can be provided by peer educators trained in nutrition or by other staff where available. Flip charts, posters, and leaflets should be used to support the education provided. Practical cooking groups addressing nutrition, cost, or other dietary issues are recommended.

PLHIV support groups

Community or hospital nutrition staff can provide outreach group nutrition education (incorporating cooking programs) at support group premises.

Prevention projects

Nutrition IEC can be provided as part of safer sex and condom promotions and harm reduction programs (e.g., in needle and syringe programs). Nutrition screening, assessment, and NCE should be incorporated into PMTCT clinics.

Note: Food support interventions (table 1) can be added to all of the above services. Section 5 describes some case examples. Nutrition counseling and education are described in more detail in this section.

Individual nutrition counseling incorporates nutrition assessment and bases development of strategies on its findings. For recommendations for specific groups, please see previous sections.

Practical considerations for nutrition counseling [40, 60, 80, 121, 129, 130]:

- Conduct counseling in a nonjudgmental manner in which the client is respected. Develop a trusting relationship. This is crucial in the face of stigma and discrimination.
- Individualize nutritional counseling and involve PLHIV in the decision-making process.
- To achieve sustained behavior change, base interventions on the “stages of change” model to enhance motivation and achieve outcomes. See appendix A2.4.
- Work with PLHIV to identify potential barriers due to cultural traditions, linguistic preference, distrust, cognitive dysfunction, or limited literary skills, and discuss possible solutions.
- Provide practical suggestions and recommendations. Dietary strategies should be adapted to the local context, taking into consideration a client’s medical history, available foods and other household conditions, culture, finances, and individual beliefs about food and diet.
- Organize follow-up visits or establish links to the multidisciplinary team for PLHIV facing special challenges.

Asymptomatic phase of HIV infections: nutrition counseling and education for positive living. Focus nutrition efforts on the following [121, 129, 131-133]:

- Emphasizing healthy eating, meal planning, and nutritious diet to maintain weight, lean body mass, and normal growth in children.
- Educating PLHA on water and food safety with regard to purchasing, handling, preparing, and storing foods.
- Promoting physical activity and exercise.
- Educating PLHA about food budgeting and cooking.
- Identifying and addressing misinformation or lifestyle issues such as smoking, drinking alcohol, and using recreational drugs, and explaining how these behaviors affect food intake, absorption, and use.

Symptomatic phase of HIV infections: nutrition management of HIV-related symptoms and medications. Focus nutrition efforts on:

- Providing symptom management counseling. Addressing nutrition-related complications such as diarrhea, weight loss, loss of appetite, problems in chewing and swallowing, nausea, and vomiting.
- Preventing weight loss and potential wasting.
- Advising on achieving increased energy intake (20 to 30 percent) over the level of energy intake recommended for HIV-negative adults and achieving protein and micronutrient recommended intakes.
- Providing nutrition counseling on simple dietary changes to increase the effectiveness of ART and to help manage the common side effects of ART.

Food-based recommendations for PLHIV

The following recommendations for asymptomatic PLHIV are collated from a number of sources:

http://www.fantaproject.org/downloads/pdfs/HIVAIDS_Guide02.pdf

<http://www.fao.org/DOCREP/005/Y4168E/Y4168E00.HTM>

<http://www.fantaproject.org/focus/preservice.shtml>

<http://www.unsystem.org/scn/Publications/NPP/npp20.pdf>

- Be aware of the importance of eating [4, 121, 133].
- Eat a diverse range of foods from each food group.
- Eat staple foods with every meal.
- Eat legumes every day, if possible.
- Eat animal and milk products regularly.
- Eat vegetables and fruit every day.
- Use fats and oils as well as sugar and sugary foods.
- Drink plenty of clean and safe water.

Other Recommendations

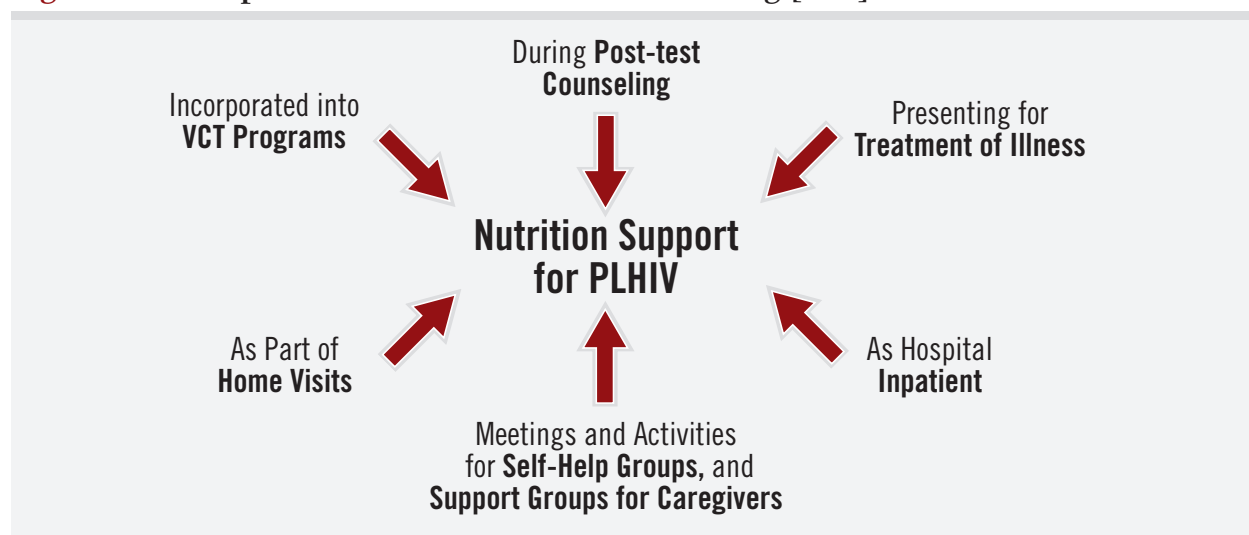
- An adequate micronutrient intake should be achieved for HIV-infected adults and children through consuming a diverse range of foods rich in micronutrients, such as fruit and vegetables and fortified foods, where available and affordable. However, PLHIV should also consider taking a daily broad-spectrum multivitamin and mineral supplement [133]. Based on current evidence, consumption of diverse foods, particularly fruit and vegetables, fortified foods, and micronutrient supplements as needed, is required to meet daily requirements [41].
- Dental and oral health are particularly important for PLHIV as minor problems can rapidly develop into serious infections. Maintaining good oral health is an important recommendation for PLHIV [133].

Nutrition Education

Individuals respond differently to various methods of education. In most cases adults learn best when they are actively involved in nutrition education. Tailored nutrition education messages can be delivered via an individualized approach, such as one-on-one counseling, small-group education sessions, peer education, or written nutrition information, also known as information, education, and communication (IEC) material (please see an example in appendix A2.4) [134].

Indirect nutrition counseling can be incorporated into existing services or facilities to support promotion of nutrition for PLHIV. Figure 3 highlights a number of activities that can be adapted to include a nutrition component.

Figure 3. Examples of Indirect Nutrition Counseling [133]



4.6 Nutrition Research

Nutrition research is an important strategy in planning and implementing food and nutrition interventions. Currently there is limited evidence about the efficacy of these interventions as part of HIV prevention and care. Research through either clinically based trials or operational or participatory action research should be a priority. Results from these interventions have important applications in terms of awareness raising and advocacy, attracting donor funding, and guiding policy to address food and nutrition support.

4.7 Food Support Interventions

These interventions can play a valuable role in HIV prevention, particularly when food is used as an incentive to promote more secure livelihoods. In terms of HIV care, food support can play an important role in improving nutritional status, enhancing tolerance of treatments, or as an incentive to continue with treatment.

There is no established standard for providing food support to people living with and families affected by HIV. The rationale for providing food support must be considered in the context of the aim of providing it. Aims may include food security, nutrition, or another purpose, such as promoting adherence to treatment. Often the provision of food support is determined by resource constraints of the donor, such as funding and logistics of transporting and storing food commodities.

Other important considerations need to be taken into account when designing food rations for individuals and families, including:

- Composition of the food support – What foods does the ration contain? Are they culturally acceptable? Are they locally available staple foods? Do they require special preparation?

- Food security situation of the family – Although nutrition support (e.g., assessment of nutritional status, counseling) is an important component in comprehensive care of PLHIV, food support may not be required by all. To allocate resources effectively, consider assessment of criteria for providing food support.
- Number of family members – This is important as food is often shared among family members.
- Food distribution – How will the food support be distributed and how often? Can the food be transported by the family?
- Other support – What other interventions will be provided with the food support? Does the food require instruction on preparation? Is there an opportunity to disseminate other information on such topics as food handling and hygiene?

Table 1 provides a number of examples of food support interventions that may be incorporated as part of HIV prevention and care.

Table 1. Summary of Food Support Interventions Available in HIV Prevention and Care

Food Support Intervention	Description
Food as incentive	
Emergency food aid	Food is distributed during times of natural or manmade disaster without commitment to involvement in any activities.
Food for work (FFW)	Food rations are provided in exchange for manual labor on activities such as land clearing, planting, community infrastructure development, and appropriate agricultural practices (aquaculture, forestry).
Food for assets (FFA)	Food is provided in exchange for labor, but emphasizing the creation of assets that are owned, managed, and used by targeted households or communities.
Food for training/food for education (FFT/FFE)	Food rations are linked to home-based workers, income generating activities (IGA), and micro-credit programs.
Food for treatment programs (HIV/TB)	Food rations are used as an incentive to promote adherence to medical treatment, such as treatment for TB and during the early phase of initiating ART.
Food safety nets	Often government-supported initiatives, these may be either cash or food-based transfers or a subsidy available to those most vulnerable to food insecurity. Examples include provision of food stamps to food insecure families.
Supplementary Feeding	
Food rations	Food rations are provided to specific groups that may be particularly vulnerable to malnutrition (such as pregnant women or OVC). Sometimes rations are also used as an incentive to encourage patients to return for follow-up care (e.g., PMTCT).
School feeding	Food is provided to schoolchildren in the form of breakfast and/or lunch. Intervention may also include a take-home ration, de-worming, vocational training, and HIV prevention programs after school.
Program-based feeding	Food is provided in the form of a regular meal for recipients attending a health or support service. Recipients may also receive nutrition education and skills building training in such areas as food preparation and hygiene.
Home-based care	Food support is usually provided in the form of individual foods (such as rice, oil, or salt) to people requiring home-based care. Interventions may also include nutrition screening, basic medical care, counseling, and welfare support.
Therapeutic Feeding	
Micronutrient supplements	Single- or multi-compound micronutrient supplements may be provided to either correct or prevent a specific micronutrient deficiency.
Therapeutic foods	Specialized foods are provided to rehabilitate those with malnutrition. These foods are often energy- and nutrient-dense and need minimal preparation. These interventions are often expensive.

5. Case Studies

Nutrition interventions can improve health outcomes and are an integral part of HIV care at any stage of disease and throughout the life cycle [4]. Examples of how FHI's program is incorporating nutrition activities as part of HIV care, treatment, and support activities are presented below in three brief case studies.

Malawi: FHI is integrating a nutrition component into its home-based care services that addresses some of the challenges in nutrition care and support for home-based care/orphans and other vulnerable children (HBC/OVC) households. Nutrition activities include:

- Nutrition education training of eight implementing partners, HBC/OVC households, and community volunteers, including training in nutritional practices, malnutrition, nutrition counseling, and ways of addressing nutrition security using cost-saving horticultural methods.
- Household and community gardens and/or orchard to provide consistent food supplies, food banks, and income generation to support other community needs.
- Cooking clubs for HBC households to demonstrate to community members how to use locally available food, how to enhance their cooking skills, how to cook in ways that save energy, fuel, and time, and how to address issues such as HIV/AIDS, nutrition for pregnancy, and breast-feeding.

Nairobi: With funding from the Elton John AIDS Foundation, FHI initiated a nutrition program to boost the immune systems of PLHIV. The nutrition program was run by the Redeemed Gospel Church in Huruma and Modu Health Management Centre (MHMC). To improve PLHIV health status, this nutrition program used a three-pronged approach:

- Educating clients on the role of good nutrition and proper hygiene in fighting HIV/AIDS.
- Teaching group members how to grow vegetables cheaply.
- Developing free immune booster kits with Nutri-fit flour (made with local ingredients) and supplement capsules (total kit cost was \$22/person).

Clients who joined the nutrition program had their CD4 counts monitored each month. Positive outcomes were shown as clients gained weight, had higher CD4 counts, and reduced hospital visits.

Nepal: FHI has implemented initial programs with four main partners in Nepal. Preliminary work includes nutrition training to emphasize the importance of nutrition as part of comprehensive care of PLHIV, and resource development for PLHIV in symptom management, food hygiene, and basic food security.

Appendix 1 – Specific Groups

PLHIV on Antiretroviral Therapy

Table A1. Nutrition recommendations for short-term and long-term side effects of ART [13]

ART Side Effect	Recommended Nutritional Management
Anorexia	Eat small and frequent meals. Eat preferred and high- energy foods when hungry. Avoid strong-smelling foods.
Change or loss of taste	Use flavor enhancers such as salt, spices, or lemon. Chew food well and move around in mouth to stimulate taste receptors.
Diarrhea	Drink plenty of fluids, e.g., boiled water, rice water, oral rehydration solution. Limit coffee, soft drinks, alcohol, and fruit juice. Continue eating during and after illness. Eat food high in soluble fiber, e.g., psyllium husk, oats, rice, banana, and peeled apples. Avoid fatty or spicy food.
Fever	Drink plenty of fluids. Eat energy- and nutrient-dense foods. Eat small amounts frequently.
Nausea or vomiting	Take medication with food (except Indinavir and DDI). Eat small quantities of food at frequent intervals. Drink after meals and limit intake of fluid with meals. Avoid having an empty stomach. Avoid lying down immediately after eating. Eat slightly salty and dry foods to calm the stomach. Rest between meals.
High blood fats, e.g., cholesterol and triglycerides	Change the type of fat in the diet, e.g., eating more oily fish, seeds, and nuts. Eat unsaturated fat from soybean, canola, or other oils instead of palm oil or butter. Eat more fiber from such sources as legumes and oats. Eat fruit and vegetables daily. Limit alcohol.
Weakening of bones (note: in resource poor settings, testing for osteoporosis is unlikely)	To prevent or slow damage to bones, PLHA may benefit from: Regular exposure to sunlight (at least 10 minutes per day) Eating calcium-rich foods daily (e.g., milk, milk powder, soy products, yogurt). Daily weight-bearing exercise, such as walking.
Insulin resistance or diabetes (management for PLHA not on diabetes medication)	Eat foods containing carbohydrates (e.g., maize, sweet potato, rice, fruit) in similar amounts at each meal, such as 1 cup of rice and 1 medium piece of fruit. Avoid soft drinks. Limit sweets. Small amount of sugar added to foods/meals is acceptable. Protein foods (e.g., legumes, eggs, meat), unsaturated fats, and green vegetables do not affect blood sugar and can be eaten as required.

Appendix 2 – Interventions

A2.1 Nutrition Policy

Generally the components of a nutrition and HIV policy should include:

- **Statement of policy position:** Articulate the key principles and positions that govern nutritional components in the package of care and support for PLHIV.
- **System elements:** Detail the roles, relationships, and responsibilities of key stakeholders who will govern nutritional care and support. Also address such issues as in- or pre-service training of service providers, materials production, supplies provision, and quality assurance.
- **Nutrition service delivery and service design:** Outline the key elements of the nutrition service.
- **Guides to inform caregivers and PLHIV:** Such guides help to ensure consistency of nutrition information and messages. The written information is often composed of key dietary messages (which may include recipes) for healthy eating and management of HIV-related complications.

At a local level, nutrition policies provide direction to care providers about multiple issues ranging from service type and delivery to standards of best practice. At a national level the nutrition policy outlines what program/service providers need to do to care for and support PLHIV at various contact points such as VCT, antenatal care, and agriculture extension. The policy documents may also target specific groups including pregnant and lactating women, young children, severely malnourished children, and people living in food insecure areas. It is important that national guidelines reflect the diversity of contexts and situations within each individual country [8].

A2.2 Nutrition Assessment

This appendix provides further information on conducting and recording a comprehensive nutrition assessment of a client. Results can be recorded using a standard form or as a medical record notation such as SOAP (Subjective, Objective, Assessment, Plan), but locally adapted formats may be more appropriate, especially if your organization can conduct only limited assessments.

SOAP: Subjective, Objective, Assessment, Plan

S: Subjective Data

This includes self-reported data on medical and socioeconomic factors that may contribute to poor nutrition status. Examples include:

- **Medical and physiological:** diarrhea, nausea, heartburn; oral/dental problems; appetite; fatigue; medications; current/previous medical status and co-morbid conditions; and use of alternative therapies.
- **Psychosocial:** smoking; depression; substance use (e.g., illicit drugs, alcohol); and dementia and other psychiatric problems that may impede appetite or the ability to prepare meals.

- Educational: a patient’s basic understanding of their bodily functions and key nutritional principles.
- Living environment: homelessness and access to a stove (cooking equipment) or refrigerator; maternal time for childcare and the availability of alternative care; and a male- or female-headed household.
- Financial: poverty and access to food; availability of income and resources to women.
- Functional status: the ability to shop for and prepare food.
- Cultural: dietary restrictions and habits.
- Dietary intake: a diet history should include evaluation of usual intake (quantity and quality of food eaten), current intake, and any perceived changes; food intolerances; and use of macronutrient and micronutrient supplements. Various tools are available to assist in dietary assessments, including the Quick Nutrition Guide, the Food Intake Record, and the Nutrition Assessment Tool (see table A9). For assessment of groups already receiving food assistance, it is important to determine whether there are micronutrients lacking in the ration and what supplementary foods are available in the local community.

O: Objective data

This includes measured and verifiable data.

Anthropometric data

Nutritional evaluations should include an assessment of physical appearance and functional status and should involve anthropometric (body composition) measurements, including height, weight (current and past), and hip, waist, and mid-upper arm circumferences (MUAC).

A good resource for in-depth information on child, adolescent, and adult anthropometrics is the *FANTA Anthropometric Indicators Measurement Guide* [119].

Box A1. Measurement of Weight and Height

Weight should be measured with the patient wearing no shoes and only light clothing. Scales should be placed on a flat surface (e.g., place a wooden board under the scales). Height should be measured with the patient standing on a flat surface looking straight ahead. Special height measures or a tape can be used to measure height.

Measurement of height and weight allows calculation of the body mass index (BMI) as follows:

$$\text{Weight (kg)}/\text{Height (m)}^2$$

Example: for a man with a weight of 55 kg and height of 1.65 m, BMI is calculated as follows:

$$55 \text{ kg}/1.65 \text{ m}^2 = 20.2 \text{ kg/m}^2 \text{ (normal weight range)}$$

Refer to table A7 for interpretation of BMI.

Note: BMI is the most commonly used measure of adult malnutrition in HIV care and treatment programs in developing country contexts. However, it does not account for body composition changes that can occur with the use of some antiretroviral medications. Measuring weight alone also does not indicate the amount of muscle loss, which can occur at a more rapid rate than total weight loss in PLHIV with progressive or late stage HIV infection. A higher rate of muscle loss in PLHIV is linked to increased risk of morbidity and mortality.

In pregnant women or adults with edema, BMI is not accurate as weight gain is not related to nutritional status.

Although involuntary weight loss remains a critical measure for evaluating nutritional status, other nutritional parameters are more accurate indicators of nutritional problems. When developing appropriate nutritional management strategies for people on antiretroviral therapy, it is best practice to assess a variety of measures, including changes in body composition of fat and lean body mass. This may be difficult in resource poor settings. However, such measures may include:

- **Skin-fold measurements:** a measure of subcutaneous fat.
- **Bioelectric impedance analysis:** a simple, painless, and accurate procedure in which a handheld device sends a small electrical current through the body and measures the ease with which it travels. Cost of this technique may be an impediment.
- **Waist to hip ratio (WHR) and waist circumference:** WHR can identify abdominal obesity. WHR is determined by dividing the waist measurement by the hip measurement [135]. A WHR greater than 0.9 for men and 0.8 for women indicates abdominal obesity, as does a waist circumference greater than 102 cm (40 in.) for men and 88 cm (35 in.) for women [135].
- **Mid-upper arm circumference:** see Box A2.

Box A2. To Measure Mid-Upper Arm Circumference:

1. Ask patient to keep their arm in a relaxed position by the side of their body (preferably while standing).
2. Find the halfway point of the upper arm — this is the midpoint from the ridge across the top corner of the shoulder to the elbow joint.
3. Using a tape measure, piece of string, or narrow strip of paper, measure around the upper arm at this halfway point.
4. Record the measurement in centimeters. You can use a ruler to determine the circumference using string or paper. If no ruler is available, you can record the paper length by drawing in the patient's notes. This can be used to compare future measurements.



Considerations for children

An excellent resource to use in this area is the *WHO Child Growth Standards Training Course on Child Growth Assessment*, which can be found at <http://www.who.int/childgrowth/training/en/> [136].

Key steps in the assessment of children's growth are [136]:

1. Establish the exact age (using a child age calculator or computer program if available).
2. Observe the child and note clinical signs of marasmus and kwashiorkor. This includes edema of both feet – if this is present the child is considered to be severely underweight.
3. Measure weight using good quality scales (not bathroom or hanging if possible). If there are no baby scales, weigh the child using tared weighing – i.e., have a family member or caregiver hold the child.
4. Measure length (if child is under 2 years old) or height, and consider head circumference if resources allow.

5. Calculate BMI (as outlined previously) and plot on growth charts: length/height for age, weight for age, weight for length/height, and BMI for age.
6. Interpret plotted points and growth trends – z-score charts are preferred.

Considerations for older children and adolescents

Measure the weight and height of older children and adolescents as you would adults. Plot calculated BMI, weight, and height on regionally constructed growth charts or, if not available, use the NCHS/WHO growth charts [59]. As stated above, WHO recommends the use of the NCHS/WHO growth charts for children over 5 years old. These charts can be found at http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm.

Please note that WHO recommends the use of the 5th to 95th percentile charts for BMI-for-age and the 3rd to 97th percentile charts for weight and height [59].

Biochemical data

Biochemical measures focus on blood chemistry, including levels of hemoglobin (Hb), glucose, albumin, prealbumin, liver enzymes, iron, lipids, insulin vitamins, trace elements, free testosterone, and renal function. Anemia has been found to be a predictor of mortality in PLHIV. Refer to table A6 for normal values.

Note: For blood or urine collection, trained staff (e.g., nurses, phlebotomists, or laboratory technicians) are required to collect samples where necessary and where resources allow. When only finger-prick samples are needed, any clinical staff can be trained.

Clinical data

This should include current medications, current medical status, opportunistic infections, and any other diagnosis.

A: Assessment

This is an evaluation of the patient's current nutritional status and may include the adequacy of dietary intake (micronutrient and energy intake; see tables below); level of malnutrition (for mild, moderate, and severe levels using BMI cutoff points, see table A7); nutritional problems (e.g., malabsorption and dehydration due to diarrhea); amount of weight loss (e.g., 10 percent unintentional weight loss); and evaluation of anthropometry (e.g., MUAC: see box A2).

Adequacy of Dietary Intake – Energy

Table A2. Mean population energy requirements and recommended increments of energy (kcal per day) needed, taking into account levels of activity and environmental temperature [86]

Mean energy requirement in developing countries (kcal)	2070
Adjustment to requirement for activity level of adults 18+ years (kcal)	+360
Moderate: Males	+100
Moderate: Females	+140
Whole population (adults and children)	
Heavy: Males	+850
Heavy: Females	+330
Whole population	+350
Adjustment to requirement for mean daily temperature (degrees Celsius)	
20	+0
15	+100
10	+200
5	+300
0	+400

Table A3. Daily Energy Requirements

	Male	Female	Average
Age groups (yrs.)	Daily energy requirement (kcal)	Daily energy requirement (kcal)	Daily energy requirement (kcal)
0-4	1,320	1,250	1,286
5-9	1,980	1,730	1,858
10-14	2,370	2,040	2,207
15-19	2,700	2,120	2,415
20-59	2,460	1,990	2,229
60+	2,010	1,780	1,889
Pregnant		+285 (additional)	
Lactating		+500 (extra)	
HIV infection asymptomatic			+10%
HIV infection symptomatic			+20 to 30% (or more for children)

Source: WHO. The management of nutrition in major emergencies. Geneva, 2000.

Adequacy of dietary intake – micronutrients (assessment of micronutrient deficiencies)

Micronutrient deficiencies are more common in resource poor settings and should be assessed particularly when food consumption is known to be inadequate.

Vitamin A deficiency

Night blindness is the most common vision problem resulting from severe vitamin A deficiency. Therefore assessment of night blindness can be used to determine severe Vitamin A deficiency. WHO-recommended interview questions are:

1. Does your child have any problems seeing in the daytime?
2. Does your child have any problems seeing at nighttime?
3. If answer to question 2 is yes, is your child's problem different from that of other children in your community?
4. Does your child have night blindness? (Use local term that describes the symptom.)

Detection of lower levels of vitamin A deficiency (levels that are not leading to vision problems but may lower immune response) can be measured by serum retinol concentrations. Table A4 details retinol concentrations that should be used if available [137].

Table A4. Retinol Concentrations and Vitamin A Deficiency

Serum retinol (micrograms/dL)	Serum retinol (micromols/L)	WHO definition of deficiency
<10	0.35	Severe
10-19.9	0.35-0.69	Moderate
20 or above	0.7 or above	None

Iodine

This can be measured by urinary iodine (UI) concentration. See table A5 below for the reference ranges. Iodine deficiency can cause a goiter – swelling of the thyroid gland in the neck. Iodine deficiency is associated with mental disabilities and permanent brain damage in infants.

Table A5. Epidemiological criteria for assessing iodine nutrition based on median urinary iodine concentrations in school-age children [137]

Median urinary iodine (9g/L)	Iodine intake	Iodine nutrition
<20	Insufficient	Severe iodine deficiency
20-49	Insufficient	Moderate iodine deficiency
50-99	Insufficient	Mild iodine deficiency
100-199	Adequate	Optimal
200-299	More than adequate	Risk of iodine-induced hyperthyroidism within 5 or 10 years following introduction of iodized salt in susceptible groups
>300	Excessive	Risk of adverse health consequences (iodine-induced hyperthyroidism, autoimmune thyroid disease)

Anemia

Anemia is defined by low hemoglobin levels and can be caused by: nutritional deficiencies of iron, vitamin B12, vitamin A, and folic acid; infections; blood loss; inherited abnormalities; and medication side effects.

Iron deficiency is the most common nutritional disorder in the world. Children under 24 months are especially at risk for anemia, which slows their mental and psychomotor development. Please see table A6 below for hemoglobin cutoffs.

Table A6. Hemoglobin cutoffs to define anemia in nonsmoking individuals living at an altitude <1000 m [137]

Age/sex	Hemoglobin cutoff (g/dL)
0.5 < age in years < 5.0	11.0
5.0 < age in years < 12.0	11.5
12.0 < age in years < 15.0	12.0
Non-pregnant females >15 years	12.0
Men >15 years	13.0

Zinc deficiency

Mild to moderate zinc deficiency is quite common throughout the world. However, assessment is difficult in most resource poor settings due to the procedures required for assessment.

Level of malnutrition

Malnutrition can be assessed using many different approaches, but the most common is using BMI (outlined previously).

Adults

Table A7. WHO International Classification of adult underweight, overweight, and obesity using BMI [119, 137]

Cutoff points using BMI	
Normal weight range	18.5–24.99
Overweight	≥ 25.00
Pre-obese	25.00–29.99
Obese	≥ 30
Malnutrition classification	
Mild	$17 \leq \text{BMI} < 18.5$
Moderate	$16 \leq \text{BMI} < 17$
Severe	$\text{BMI} < 16$

MUAC cutoffs are challenging as there is a lack of understanding of the functional significance of different levels. FANTA suggests using the following [119]:

- Moderate undernutrition <18.5 cm
- Severe undernutrition <16.0 cm

Pregnant and lactating women

Weight gains of 1.5 kg/month during the last two trimesters are consistent with positive pregnancy outcomes in resource poor settings [119]. Short maternal stature, low pregnant BMI, and poor weight gain during pregnancy are all indicators of risk for low birth weight. MUAC is independent of pregnancy or lactation status and therefore can be used as an effective indicator of women's nutritional status [119]. Cutoffs are ill-defined, and therefore changes over time are a more appropriate indicator [119]. This is also the recommendation for adolescent pregnancy, but it is important to note that increases in height can still occur during adolescent pregnancy. Therefore weight gain should be slightly greater in many adolescent pregnancies [59].

Nutritional requirements are higher during lactation than in pregnancy. BMI monitoring is advised, and as suggested by WHO, a cutoff point of 20.3 could be used at one month postpartum, with a progressive return to standard adult cutoffs at six months [59].

Children

Internationally the cutoff point for classifying a child as malnourished is a z-score below -2 SD. A severely malnourished child has a z-score below -3 SD for weight and height, based on WHO growth standards [6, 42, 66, 67]. For children age 6 months up to 5 years an arm circumference less than 110 mm is considered an indicator of severe malnutrition [42]. Other measures are taken by using biochemical markers and physical examination [6, 42].

The following table provides an overview of the interpretation of z-scores [136]

Table A8. Growth Problems in Children: Interpretation of Z-Scores

Z-score	Length/height for age	Weight for age	Weight for length/height	BMI for age
Above 3	Very tall – rarely a problem	May have growth problem but this is better assessed from weight for length/height or BMI for age	Obese	Obese
Above 2			Overweight	Overweight
Above 1			Possible risk of overweight	Possible risk of overweight
0 (median)				
Below -1				
Below -2	Stunted	Underweight	Wasted	Wasted
Below -3	Severely stunted	Severely underweight	Severely wasted	Severely wasted

Adolescent guidelines

WHO recommends that BMI should be one of the key indicators for any age group, and the two tails (ends of the normal distribution curve) of the distribution should be looked at. The WHO definitions of malnutrition are provided below [59].

FANTA suggests that for targeting interventions and assessing the situation, thinness measures are the most appropriate. These measures include weight for height and BMI for age. The use of MUAC is limited as there are no agreed-upon cutoffs for determining adolescent undernutrition for admission to feeding centers [119]. FANTA also suggests a system commonly used by international development agencies: weight-for-height reference tables. This system uses existing reference tables for weight for age and height for age to calculate the median weight and 70 percent of median weight for adolescents of each sex and height category. This method has been found to be effective in screening adolescents for admission to therapeutic feeding programs in emergency situations [120]. Growth charts should be interpreted in the same way as child growth charts.

In terms of defining undernutrition, following are specific WHO recommendations for adolescent anthropometry [59]:

- Stunting is the 3rd percentile (or z-score of 2 below the median) of height for age, using the NCHS/WHO data as reference population.

- The appropriate thinness indicator is the 5th percentile cutoff of BMI for age, using the NCHS/WHO data as reference population.
- Maturational indicators are needed in addition to anthropometry, as there are differences in timing of growth spurts. Bone age is a measure of skeletal maturation, but it is not easily assessed in field settings. More practical indicators are, in girls, median age of menarche, and in boys, median age of attainment of adult voice, which both occur roughly one year after peak height growth velocity. When population estimates of maturational status are available, age-specific means or medians for anthropometry may be adjusted for different rates of maturation from the reference population.

P: Plan

Goals of nutrition intervention may include detailed strategies for management described below in the strategies section, or, for specific groups, see above.

Assessment tools

Assessment tools are important in streamlining the assessment process. Below is an example of an assessment tool used in an Indonesian hospital.

Table A9. Nutrition Assessment Tool Used in Waldin, Indonesia

INPATIENT BASIC DATA COLLECTION FORM

**Dr. WAHIDIN SUDIROHUSODO HOSPITAL
UJUNG PANDANG**

Date					Code					
Height					Registration number					
Current weight					Name					
Previous weight (before illness)					Age					
Diagnosis					Religion					
Therapy					Sex					
Past medical history					Activity level					
Blood pressure					Address					
Occupation										
ANTHROPOMETRY										
WEIGHT					MID-UPPER ARM CIRCUMFERENCE					
Kg	Standard %	Nutritional status			cm	Standard %	Nutritional status			
BIOCHEMISTRY										
Blood glucose (fasting/random)					100 and 150					
Albumin					3.5-5.5 gr					
Globulin					1.5-3 mg/100 ml					
Protein total					6-8 gr/100 ml					
Sodium					90-200 mg/l					
Potassium					1.1-1.7 mg/dl					
Phosphate					3.2-4 gr/100 ml					
Calcium					8.5-10.5 mg/dl					
Urea					20-40 mg/dl					
Creatinine					1.2-1.7 mg/dl					
Creatinine Clearance Test										
Hemoglobin					14-16 mg/100 ml					
Uric acid					3.4 - 7.0 ml/dl					
SGOT					< 37 U/L					
SGPT					< 42 U/L					
Triglyceride					40 – 155 mg/dl					
Cholesterol					< 200 mg/dl					
LDL					< 130 mg/dl					
DIET HISTORY		Energy kcal	Prot gr	Fat gr	Cho gr	Sodium gr	Potassium mg	Phosphate mg	Calcium mg	Iron mg
Recommended intake										
Current intake										
% Recommended intake										
Summary										
Note										

Appetite:
Intake:
Eating patterns:
Habits:
Food Avoidance:

Table A9. (cont.)

NUTRITION DEPARTMENT		INPATIENT		CLINIC		RS. Dr. WAHIDIN SUDIROHUSODO	
Reg. No.						Date	
Name		Sex		Age y.o.		Height cm	Weight kg IBW kg
Religion		Education (Nil/primary/secondary/tertiary school /university)		Occupation		Activity	Area of origin
Referral doctor				Diagnosis			
Important lab. result/clinical findings				Important treatment			
NUTRITION INFORMATION							
Previous diet							
Food allergy/food avoidance/likes/dislikes							
Other information							
FOOD FREQUENCY Please give a tick ✓ in the appropriate column.							
	>1x/day	1x/day	3-5x/week	1-2x/week	<1x/week	Never	
Rice							Tomato/carrot
Com							Other vegetables
Noodle							Banana
Bread							Papaya
Biscuit/cake							Orange
Potato							Other fresh fruit
Cassava							Dried/canned fruit
Sweet potato							Fresh milk
Tempeh							Sweet condensed milk
Tofu							Nonsweetened condensed milk
Oncom							Full cream milk powder
Peanut							Skim milk powder
Chicken							Cheese
Meat							Oil/fried foods
Canned meat							Coconut/coconut cream
Liver/spleen/brain /intestines/lung							Sweetened tea
Chicken/duck eggs							Sweetened coffee
Fish							Syrup
Dried fish							Soft drinks
Prawn							Alcoholic beverages
Green leafy vegetables							
Legumes							

Table A9. (cont.)

DIET HISTORY												
Breakfast		Amount		Mid-morning snack							Amount	
		g	quantity								g	quantity
Lunch		g	quantity	Mid-afternoon snack							g	quantity
Dinner		g	quantity	After-dinner snack							g	quantity
	Cal	Prot g	Fat g	Cho g	Ca g	Fe g	Vit A IU	Vit B1 mg	Vit C mg			
Daily average												
RDA												
Patient's attitude toward diet												
Recommendation to improve diet												
Date		Nutritionist/Dietitian					Sign					

A2.3 Nutrition Screening

Below are some examples of nutrition screening tools.

Malnutrition screening tool (MST) [123]

This tool is validated for use in Australia, to detect malnutrition in general populations, but you may also find it useful in resource limited settings due to its simplicity [123].

Table A10. Malnutrition Screening Tool

Question	Answer	Score
Have you recently lost weight without trying?	No	0
	Unsure	2
If yes, how much weight (kg) have you lost?	1-5.9	1
	6-10.9	2
	11-15	3
	>15	4
	unsure	2
Have you been eating poorly because of a reduced appetite?	No	0
	Yes	1
Total Score		

Score of 2 or greater = patient at risk of malnutrition.

Specific, simple nutrition screening tools

These tools are a suggested starting point to develop and validate a local nutrition screening tool, adapted from [124, 125, 138, 139] and the September 2006 US President's Emergency Plan for AIDS Relief policy guidance on the use of emergency plan funds to address food and nutrition needs [140]. They are designed with a clinical setting in mind, and also for use in resource limited settings.

It is suggested that all PLHIV and OVC be offered nutritional assessment and NCE [140]. However, in busy settings prioritization may be required. A suggested first line nutrition screening tool for prioritization could be an adapted MST [123], with some additional questions. For an example, see Appendix A2.3, Table A11.

Table A11. Template for FHI-supported HIV care and treatment services for first line nutrition screening

Instruction: These questions are to be asked of HIV-positive people, children under 2 years old of HIV-positive mothers, or people with AIDS-defining illnesses (if testing not available).

Question	Answer	Score
Have you recently lost weight without trying?	No	0
	Unsure	2
If yes, how much weight (kg) have you lost?	1-5.9	1
	6-10.9	2
	11-15	3
	>15	4
	unsure	2
Have you been eating poorly because of a reduced appetite or lack of access to food?	No	0
	Yes	1
Are you visibly underweight?	No	0
	Yes	2
Are you HIV positive and under 17 years old?	No	0
	Yes	2
Are you under 17 years old and orphaned or vulnerable because of HIV/AIDS?	No	0
	Yes	2
Are you HIV positive and pregnant or lactating?	No	0
	Yes	2
Total score		

Score of 2 or greater = patient referred for a nutrition assessment and action determined based on this assessment.

In highly food-insecure settings, all people accessing your services might qualify for a referral, based on the results of a screening tool similar to table A11. If this is the case and your resources are limited, the above screening tool may not be useful.

A more targeted screening tool is provided in table A12. This tool is developed to provide an initial screen for therapeutic/supplementary feeding. It should be adapted to local circumstances and validated.

Table A12. Template for FHI-supported HIV care and treatment services to determine eligibility for therapeutic or supplementary feeding assistance

Question	Yes	No
1. Is the person: a. A child under 2 years old born to an HIV-positive mother? b. An HIV-positive infant (up to 12 months) or young child (1-4 years old)? c. An HIV OVC (up to 17 years old), defined as a child either orphaned or vulnerable because of HIV/AIDS?	Go to question 5.	Go to question 2.
2. Is the person an HIV-positive pregnant and/or lactating woman?	Go to question 6.	Go to question 3.
3. Is the person an HIV-positive adult?	Go to question 4.	Cannot gain feeding assistance.
4. Is the person severely malnourished (BMI less than 16)? If suspected, take weight and height measurements, and calculate BMI.	Consider for feeding assistance.	Cannot gain feeding assistance.
5. Is the child showing signs of poor growth or weight loss? Is dietary intake poor? (Measure weight and height and plot on growth charts; assess dietary intake.)	Consider for feeding assistance.	Cannot gain feeding assistance.
6. Is the HIV-positive pregnant and/or lactating woman malnourished? Pregnant: Is MUAC low? Is BMI low? Is there poor weight gain (less than 1.5 kg/month during the last two trimesters)? Is dietary intake poor? Lactating: Is MUAC low? Is BMI low (20.3 cutoff to be used at one month postpartum, with progressive return to standard adult cutoffs at six months)? Is dietary intake poor?	Consider for feeding assistance.	Cannot gain feeding assistance.

Note: If HIV VCT is not available but the area in which you work is suspected to have high HIV prevalence, or if you suspect a person to be HIV positive, use WHO definitions in the absence of testing [102].

A2.4 Nutrition Counseling and Education

Table A13. Stages of Change: A Model for Nutrition Counseling [132, 141, 142]

Stage	Description	Goal	Strategies
Pre-contemplation	Is unaware of problem and hasn't thought about change. Has no intention of changing behavior in near future.	Increase awareness of need for change. Personalize information on risks and benefit.	Assess knowledge, attitudes, and beliefs. Build on existing knowledge. Discuss personal aspects and health consequences of poor diet.
Contemplation	Recognizes a need to change but is in a state of ambivalence. Is sometimes concerned about diet.	Increase motivation and confidence to perform recommended behavior.	Explore ambivalence. Identify problematic behaviors and prioritize behaviors to change. Discuss motivation. Identify perceived barriers and possible solutions. Encourage support network. Suggest small, achievable steps to make changes.
Preparation	Wants to improve diet. Has some confidence they can change their diet. Intends to take action in near future (within the next 30 days) and may have taken some behavioral steps in this direction.	Initiate change by eliciting a firm commitment, developing a specific action plan.	Negotiate SMART (specific, measurable, achievable, realistic, time-bound) goals. Assist in developing a concrete action plan. Praise small changes that client may have already attempted. Explore practical steps to succeed.
Action	Has changed behavior and has been engaging in the new behavior for less than six months.	Commit to change.	Reinforce decision, self-confidence. Assist with self-management, feedback, problem solving, and social support. Discuss relapse and coping strategies. Provide information or skills to support change.
Maintenance	Has been engaging in the new behavior for more than six months. Is continuing to make effort in managing dietary intake in line with nutrition plan.	Reinforce commitment and continue changes or new behaviors.	Reinforce positive benefits of nutrition plans. Help prevent relapse. Plan follow-up to support changes. Assist in coping, avoiding relapses, and finding alternatives.
Termination	The ultimate goal.		Self-efficacy. Self-management.

Example of IEC Material

Food Safety and Hygiene

The most important rule in food selection is safety. It doesn't matter how nutritious the food is, if it causes food poisoning when eaten, the body will not absorb many of the nutrients.

Meat: When buying meat from the market, make sure that the meat has not been exposed to too much sun, dust, or air, particularly cooked meat. These meats may be contaminated with bacteria, which can cause food poisoning. Color of buffalo, goat, and pork meat should be red, and the tissue should be tight and compact. Meat should have a fresh smell.

Fruits and Vegetables: Check for freshness and any insects or fungus.

Milk and Milk Products: Packages or containers must be in good condition. Make sure the seal is intact. Check the expiration date to ensure the product is in good condition (e.g., fresh milk must not go sour or have a strong smell). Milk powder should be stored in an airtight container with no moisture.

Dry Food: Rice, dry chili, garlic, beans, pulses, and other dry food should be free from insects and fungus.

Guidelines for Preparing Food

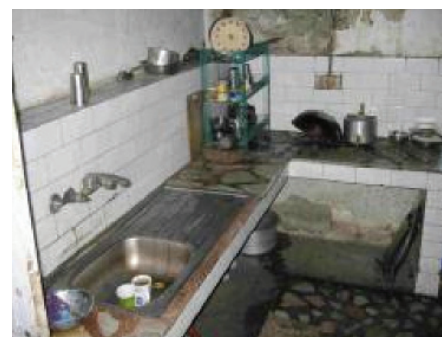
- The preparation area and utensils should be clean.
- Wash hands with soap and water prior to touching food.
- Place food on clean plates or containers and cover with a clean covering after preparation to prevent dust, germs, and flies from contaminating the food.
- Separate pets from food preparation and dining areas.
- After chopping raw meats and seafood, ensure that the utensils and chopping board are washed well in hot, soapy water before preparing any other foods. Alternatively, use separate chopping boards for raw meats, raw vegetables, and cooked foods.
- Keep uncooked foods and cooked foods separate.
- Any food left over from a previous meal should be refrigerated immediately and reheated only once.
- If there is any doubt about the quality of the food, throw it away rather than risking food poisoning.
- Eat clean and freshly cooked food. Make sure food that has been prepared previously (e.g., food bought from markets or food that has been refrigerated) has been well heated (all the way through) before eating.
- Foods that are meant to be kept cold should be stored in the refrigerator or at least in a cool place if a refrigerator is not available.
- Before you prepare any fruit or vegetable make sure it is well washed in clean water.

Strategies for Preparing Clean Water

- To prepare water for washing food, fill a saucepan with water and bring to a rolling boil for 10 minutes. Let this water cool and store in a clean bottle.
- Place water in a clear plastic or glass container (not bigger than 2 liters). Store in direct sunlight for at least 7 hours.



When preparing raw foods make sure meat and vegetables are prepared separately.



Hygiene in food preparation areas is important in preventing food-borne illness.

Glossary

Acceptable, feasible, affordable, sustainable, and safe (AFASS):

These terms should be adapted in light of local conditions and formative research.

Acceptable: The mother perceives no barrier to replacement feeding. (Barriers may have cultural or social reasons, or be due to fear of stigma or discrimination.) The mother is under no social or cultural pressure not to use replacement feeding; she is supported by family and community in opting for replacement feeding, or she will be able to cope with pressure from family and friends to breastfeed; and she can deal with possible stigma attached to being seen with replacement food.

Feasible: The mother (or family) has adequate time, knowledge, skills, and other resources to prepare the replacement food and feed the infant up to 12 times in 24 hours. The mother can understand and follow the instructions for preparing infant formula, and with support from the family can prepare enough replacement feeds correctly every day, and at night, despite disruptions to prepare family food or complete other work.

Affordable: The mother and family, with community or health-system support if necessary, can pay the cost of purchasing/producing, preparing, and using replacement feeding, including all ingredients, fuel, clean water, soap, and equipment, without compromising the health and nutrition of the family. The mother and family have access to medical care if necessary for diarrhea, and can meet the cost of such care.

Sustainable: An uninterrupted supply and dependable system of distribution for all ingredients and products needed for safe replacement feeding is available, for as long as the infant needs it, up to 1 year of age or longer. There is little risk that formula will ever be unavailable or inaccessible, and another person is available to feed the child in the mother's absence, and can prepare and give replacement feeds.

Safe: Replacement foods are correctly and hygienically prepared and stored, and fed in nutritionally adequate quantities, with clean hands and using clean utensils, preferably by cup. The mother or caregiver:

- has access to a reliable supply of safe water (from a piped or protected-well source)
- prepares replacement feeds that are nutritionally sound and free of pathogens
- is able to wash hands and utensils thoroughly with soap, and to regularly boil the utensils to sterilize them
- can boil water for preparing each of the baby's feeds
- can store unprepared feeds in clean, covered containers and protect them from rodents, insects, and other animals [44].

Anorexia: loss of appetite.

Anthropometry: body measurements used as a measure of an individual's growth and nutritional (anthropometric) status [86].

Breast-milk substitute: a food marketed or otherwise represented as a partial or total replacement for breast milk, whether or not suitable for that purpose [44].

Body mass index (BMI): a number that indicates a person's weight in proportion to height/length, calculated as kg/m^2 [136].

Cachexia: general ill health and malnutrition.

Cessation of breastfeeding: completely stopping breastfeeding, including suckling [44].

Digestion: breaking down of food.

Energy and nutrient dense: containing a high level of energy and other nutrients per gram of food.

Exclusive breastfeeding: an infant receives only breast milk and no other liquids or solids, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines [44].

Home-modified animal milk for replacement feeding: animal milk (including cow, goat, camel, buffalo, and sheep milk) that has been boiled, diluted, and had sugar and, if possible, a vitamin and mineral supplement added [64].

Hyperlipidemia: high blood cholesterol and triglycerides, which is a risk for heart disease.

Infant: a person from birth to 12 months of age [44].

Kwashiorkor: a form of severe undernutrition in which the muscles are wasted, but the wasting may not be apparent due to generalized edema (swelling from excess fluid in the tissues). People with this condition are normally underweight but the edema may mask the true weight [136].

Malnutrition: generally, undernutrition and overnutrition, but for the purposes of this document the term will be used to describe only undernutrition.

Marasmus: a form of severe undernutrition in which the person is severely wasted and has the appearance of "skin and bones" due to loss of muscle and fatty issue. For children in this condition, weight for age and weight for length/height are likely to be very low [136].

Metabolic rate: the rate at which the body burns energy at rest [26].

Mixed feeding: feeding both breast milk and other foods or liquids [44].

Mother-to-child transmission (MTCT): transmission of HIV to a child from an HIV-infected woman during pregnancy, delivery, or breastfeeding. Use of this term implies no blame, regardless of whether a woman is aware of her own infection status [44].

Nutrition education: a set of communication activities aimed at increasing knowledge of food and food-related behaviors, influencing attitudes and beliefs, and developing personal skills and motivation to improve the nutritional status of a population. Nutrition education involves educating people about basic nutritional concepts in a simple and practical manner, providing educational materials that reinforce messages, and providing information on how to sustain behavior change [133].

Orphan: a child under age 18 whose mother, father, or both have died [143].

Osteopenia and osteoporosis: weakening of bones.

Ready-to-use therapeutic food (RUTF): soft or crushable food that can be consumed easily by children from the age of six months without adding water. RUTF has a similar nutrient composition to F100 but unlike F100 is not water-based, so bacteria cannot grow in it. RUTF can be produced locally for about US\$3 per kilogram; the average child will consume 10 to 15 kg over six to eight weeks [42].

Replacement feeding: feeding infants who are receiving no breast milk with a diet that provides them with the nutrients they need until the age at which they can be fully fed on family foods. During the first six months of life, replacement feeding should be with a suitable breast-milk substitute. After six months the breast-milk substitute should be complemented by other foods.[44]

Resting metabolic rate (RMR): RMR accounts for 67 to 75 percent of daily energy expenditure and represents the minimum energy needed to maintain all physiological cell functions in the resting state. The principal determinant of RMR is lean body mass.

Stages of Change: a model that can be used to help understand a client's readiness to make dietary changes. This model describes behavior change as a process of passing through a sequence of six motivational stages: pre-contemplation, contemplation, preparation, action, maintenance, and termination [133].

Stunted: short for one's age; length/height for age below the -2 z-score line. Severely stunted is below the -3 z-score line [136]. Stunting indicates past growth failure and is associated with long-term chronic insufficient protein and energy intake, frequent infections, sustained inappropriate feeding practices, and poverty. In children over 2 years of age the effect may not be reversible [119].

Therapeutic feeding: provision of specialized foods to treat persons with severe malnutrition. Therapeutic feeding generally involves two phases: a *stabilization phase* and a *rehabilitation phase*, which may require different therapeutic foods for treatment. The stabilization phase usually requires facility-based treatment, whereas the rehabilitation phase may be done all or in part on an outpatient basis at the community level [140].

Vulnerable children: children whose survival, well-being, or development is threatened by HIV/AIDS [143].

Wasting: weight for length/height or BMI for age below the -2 z-score line. Severely wasted is below the -3 z-score line [136]. Wasting indicates current or acute malnutrition resulting from failure to gain weight or actual weight loss. Causes include inadequate food intake, incorrect feeding practices, diseases, and infection, or more frequently a combination of these factors [119].

Z-score: the number of standard deviations below or above the reference mean or median value [42], also known as the standard deviation score [136]. Z-score is a preferred expression for anthropometric indicators for individuals and for use in surveys [137].

$$z\text{-score} = \frac{\text{measured value} - \text{median of reference population}}{\text{standard deviation of reference population}}$$

There is no need to calculate this score if you are using growth charts.

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