THE REVOLUTIONARY GOVERNMENT OF ZANZIBAR

ZANZIBAR

Food-Based Dietary Guidelines

Technical Recommendations

With technical assistance of

Food and Agriculture Organization of the United Nations

Zanzibar Food-Based Dietary Guidelines

Technical Recommendations

By the Revolutionary
Government of Zanzibar
2022

With technical assistance of
the Food and Agriculture Organization
of the United Nations

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LIST OF ACRONYMS

AICR	American Institute for Cancer Research
GBD	Global Burden of Disease Study
FAO	Food and Agricultural Organization of the United Nations
FBDG	Food-Based Dietary Guidelines
Kcal	Kilocalorie
MAINRL	Ministry of Agriculture, Irrigation, Natural Resources and Livestock
MoHSWEGC	Ministry of Health, Social Welfare, Elderly, Gender and Children
MoEVT	Ministry of Education and Vocational Training
MoH	Ministry of Health
NCD	Non-Communicable Diseases
NGO	Non-Governmental Organisation
RAE	Retinol Activity Equivalents
RGoZ	Revolutionary Government of Zanzibar
SFS	Sub-regional Office for Southern Africa
SHMS	School of Health and Medical Sciences
SUA	Sokoine University of Agriculture
SUZA	State University of Zanzibar
TDHS	Tanzania Demographic Health Survey
UCSF	University of California San Francisco
UNICEF	United Nations International Children's Emergency Fund
WCRF	World Cancer Research Fund
WFP	World Food Program
WHO	World Health Organization
WRA	Women of Reproductive Age
ZASWA	Zanzibar Social Work Association
ZFDA	Zanzibar Food and Drug Agency

DEFINITION OF TERMS

Body Mass Index (BMI): is a person's weight in kilograms divided by the square of their height in meters. BMI is a measure that uses the person's height and weight to work out if their weight is underweight or healthy, or if there is overweight and obesity.

Carotenoids: Pigment molecules that produce yellow, red, and orange colors in fruits, vegetables and other plants. Carotenoids are phyto-chemicals (plant chemicals) important to humans for their antioxidant activity protecting cells from damage.

Diet: A range of foodstuffs (including drinks and snacks) habitually consumed by an individual, household or community.

Energy balance: The difference between energy intake and expenditure due to physical activity, the basal metabolic rate and the obligatory energy expenditure associated with digestion and processing of ingested foods. The value can be zero, positive or negative.

Energy expenditure: The amount of energy used by the body equivalent to the heat released by hydrolysis of adenosine tri-phosphate (ATP).

Energy intake: The amount of energy consumed from foods and drinks.

Exercise: Physical activity that is planned, structured and repetitive for the purpose of conditioning any part of the body used to improve health and maintain fitness. Generally, includes working up a sweat, breathing heavily and increasing one's heart rate during physical activity.

Food: Any substance consisting of proteins, carbohydrate, fats, minerals and vitamins that when consumed by an organism sustains growth, maintenance and other vital processes to meet physiological and psychological needs.

Food-based dietary guidelines (FBDGs): Intend to define, through scientific evidence, what a healthy diet means for a country and establish a basis for public food and nutrition, health and agricultural policies and nutrition education programmes to foster healthy eating habits and lifestyles. FBDGs provide advice on foods, food groups and dietary patterns to provide the required nutrients to the general public to promote overall health and prevent chronic diseases.

High Density Lipoprotein (HDL): Or "good" cholesterol, are soluble proteins that absorb cholesterol and carry it back to the liver. The liver then flushes it from the body.

Lifestyle: Someone's way of living; the things that a person or particular group of people usually do which is composed of motivations, needs, and wants and is influenced by factors such as culture, family, reference groups, and social class.

Low Density Lipoprotein (LDL): Sometimes called "bad" cholesterol, they are soluble proteins that transport cholesterol from the liver to the tissues of the body.

Macronutrients: A class of chemical substances found in food, needed by the body in large amounts, and usually measured in grams. These include carbohydrates, protein and fats.

Micronutrients: Chemical substances found in food, needed in small amounts by the body, and often measured in micro or milligrams. These include the different vitamins and minerals. Micronutrients are vital for the body as they orchestrate a range of physiological functions to maintain life and health.

Non-communicable diseases (NCDs): A medical condition or disease that is not caused by infectious agents (non-infectious or non-transmissible). NCDs can refer to chronic diseases which last for long periods of time and progress slowly. They result from a combination of genetic, physiological, environmental, behavioural and dietary factors.

Nutrients: Compounds in foods essential to life and health, providing us with energy, the building blocks for repair, growth, and substances necessary to regulate chemical processes. They are classified as macronutrients and micronutrients.

Overweight and obesity: Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), a person's weight (in kilograms) divided by the square of his or her height (in metres).

- A person over 20 years with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is considered overweight. A BMI between 18.5 to 24.9 is considered normal weight and below 18.5 is considered underweight.

- For children under five years of age: overweight is weight-for-height greater than two standard deviations above the WHO Child Growth Standards median; and obesity is weight-for-height greater than three standard deviations above the WHO Child Growth Standards median.

- Children aged between 5 to 19 years: overweight is BMI-for-age greater than one standard deviation above the WHO Growth Reference median; and obesity is greater than two standard deviations above the WHO Growth Reference median.

Physical activity: Any bodily movement produced by skeletal muscles that requires energy expenditure. Physical inactivity has been identified as the fourth leading risk factor for global mortality causing an estimated 3.2 million deaths globally.

Phytochemicals: Wide varieties of non-nutritive chemical compounds found in plant foods, which may have health effects. A few examples of well-known phytochemicals are flavonoids, phenolic acids, and carotenoids.

Portion size: Amount of food that you actually put on your plate, that you plan to eat in one sitting. Depending on the amount of food a person eats per meal, a portion can be bigger than, smaller than, or similar to a serving size.

Serving size: A set standard amount of food used to quantify recommended amounts of food to eat during the course of the day as per dietary guidelines. A serving size may also represent quantities used on a Nutrition Facts label for food products. The serve size standard measure can be set using food weight or kilo calorie amounts. A serving size is sometimes converted from food weight or kilo calorie amount to household measures like cups, or spoons, etc.

FOREWORD

We are pleased to present the first edition of the Zanzibar Food-Based Dietary Guidelines (FBDGs) for 2022-2027. The dietary guidelines include recommendations for a healthy dietary pattern and have explicitly presented varieties of foods from different food groups that are locally available and can provide sufficient nutrients for one to achieve an optimal nutritional status. This customisation will enable people to make tailored choices that meet their personal preferences and purchasing power.

With the increased global, regional and national focus on improving the nutritional status of the world population, the Revolutionary Government of Zanzibar (RGoZ) has recognized the importance of developing and implementing national food-based dietary guidelines. These guidelines serve as an official document that addresses the principles and recommendations of a healthy diet for the Zanzibar population, and represents a tool to support food and nutrition educational activities in the country.

Looking at the current trends in the nutritional status in Zanzibar, we can appreciate improvements in fighting malnutrition, despite its persistence. However, the progress made is undermined by significantly prevailing under-five malnutrition; micronutrient deficiencies such as vitamin A, iron and iodine; and increases in overweight and diet-related non-communicable diseases. In this context, the FBDGs present an appropriate and effective tool in the country's efforts to cope with the triple burden of malnutrition.

The Zanzibar FBDGs are based on scientific evidence and have been customised to fit the local context. The guidelines are meant for the general healthy population including infants aged less than two years, and include special groups such as pregnant and lactating women and the elderly. With the delivery of this document, the challenge ahead is to ensure the implementation and adoption of the guidelines. For that, testing and behaviour change communication techniques have been adopted to ensure the relevance of the messages to the general public to address all forms of malnutrition. In addition to providing guidelines to the Zanzibar population for a healthy diet, the FBDGs provide a framework for policy advice in planning nutritionally adequate, safe and affordable dietary practices. They are detailed and inclusive and take into account the dietary expectations, gender sensitivity and cultural realities of Zanzibar communities.

We believe the FBDGs will play a key role in improving the eating patterns of people from Zanzibar.

Hon. Shamata Shaame Khamis

Minister for Agriculture, Irrigation, Natural Resources and Livestock

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The FBDGs were drafted by Dr. Mercy Chikoko and Ms Lucie Jouanneau (FAO consultant) in collaboration with the Zanzibar Technical Working Group listed above.

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EXECUTIVE SUMMARY

Zanzibar continues to battle with malnutrition, especially in children under the age of five, women of a reproductive age (WRA), and pregnant and lactating women. All forms of malnutrition, such as undernutrition like stunting and wasting, overnutrition like overweight and obesity as well as micro-nutrient deficiencies like anaemia and Vitamin A deficiencies, are present in Zanzibar and continue to be of public health concern and affect social and economic development. The causes of malnutrition are multifaceted and they operate in complex ways. Malnutrition is linked to poor quality and quantity of food intake and diseases driven by the food system and other structural factors. Stunting, overweight and obesity are linked to non-communicable diseases (NCDs) which are on the rise in Zanzibar. Additionally, lifestyle factors such as physical activity play a vital role in preventing overweight, obesity and NCDs.

The Zanzibar FBDGs define what a healthy diet means and provide evidence-based recommendations on foods groups and recommended amounts and combinations required for optimal nutrition for preventing both under and overnutrition. Extensive global evidence now shows that diversified diets and optimal eating patterns, regular physical activity and food and water safety can help people achieve and maintain good nutrition, increase child and maternal survival, and offer significant health benefits for reducing the risk of NCDs for everyone young and old. The Zanzibar FBDGs reflect and summarize this evidence through their technical recommendations.

These dietary guidelines have been developed in line with the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) guidance manual on developing FBDGs. The ten-step process included extensive participatory consultations in a multi-step decision making process to establish these guidelines between the Ministry of Agriculture and 19 multi-stakeholder FBDGs Taskforce team members representing over 11 institutions from line ministries, non-governmental organizations (NGOs), academia and other partners and stakeholders. Critical steps to developing FBDGs include a situation analysis and evidence review that forms the scientific basis of the FBDGs, and diet modelling using linear programming to optimise food combinations and amounts that meet nutrient requirements, taking into consideration local dietary patterns and local foods. Key to the process of developing FBDGs is the comprehensive field-testing of the FBDGs recommendations in the form of key messages and visual illustrations for the public. This verified that the messages are understood by communities, and are feasible, acceptable and culturally appropriate to ensure that the FBDGs are clear and relevant for the Zanzibar population.

The FBDGs target a healthy general population from 0 to over 65 years who do not have significant medical conditions that may warrant specific diet modifications. In addition, Section 3 is dedicated to populations with special nutrition needs, including pregnant and breastfeeding women, and under five and school going children and the elderly over 65 years of age.

The purpose of this FBDGs Technical Recommendations document is to help professionals working in the health, agriculture and nutrition, governmental and non-governmental sectors to provide coherent and harmonized advice and guidance to help the public in Zanzibar eat nutritionally adequate and safe foods. Furthermore, policy and decision makers

from both the public and private sectors will benefit from the FBDGs when formulating policies and program strategies. Research, academia and students in these institutions as well as individuals with post-secondary education would also benefit from the guidelines.

The Zanzibar FBDGs are a combination of four guidelines with a set of eighteen evidence-based dietary recommendations and four healthy practice recommendations as per Table 1. Each recommendation also has practical examples of how to maintain healthy dietary patterns and healthy habits. The guidelines include scientific evidence underpinning each recommendation. Furthermore, each recommendation is framed as a memorable key message that, after pilot testing with consumers, could be used in developing consumer promotional materials and programmes.

The first guideline provides advice on consuming a combination of foods from the six food groups that are the foundation of healthy eating. The six food groups include (i) cereals, starchy roots, tubers and plantains; (ii) pulses, nuts and seeds; (iii) fruits; (iv) vegetables; (v) sea foods and animal source foods; and (vi) healthy oils.

The second guideline advises on foods to limit due to their high calorie amounts and negative impacts on nutrition and health outcomes if consumed regularly and in large amounts, such as sugars, salt, and saturated and trans fats (TFAs).

The third guideline pertains to healthy practices that include food and home hygiene and water safety, avoiding alcohol consumption, and encouraging physical activity.

These three guidelines apply to the general population.

The fourth guideline is specific to populations with special nutrition needs such as pregnant and breastfeeding women, and under-five and school aged children and the elderly.

As the main objective of the FBDGs is to empower the public to choose diversified diets in right amounts and combinations, their implementation requires practical tools to support the adoption, dissemination and communication of campaigns. The success of implementation requires joint efforts from various governmental and non-governmental sectors, the media, community-based organizations (CBOs), and other concerned parties to ensure that necessary action is taken. Making healthy eating an easier choice for the public requires increased political will, an enabling environment and public investment. Heightened awareness of the critical importance of FBDGs among professionals and community-based workers who promote healthy eating and related behaviour is critical.

Empowering individuals, families and communities for change is paramount. Monitoring and evaluation is an integral part of the FBDGs to track and measure the impact of their implementation.

THE ZANZIBAR FOOD-BASED DIETARY GUIDELINES AT A GLANCE

Table 1: The Zanzibar Food-Based Dietary Guidelines at a glance

Guidelines		A set of recommendations
1	Increase dietary diversity through consumption of six foods focusing on variety within the food groups, nutrient density and correct amounts to meet nutrient adequacy, prevent under and overnutrition, and reduce the risk of NCDs. The six food group are the foundation of a healthy diet.	**Recommendation 1.1:** Everybody, young and old, should enjoy eating a variety of foods from different food groups every day to stay healthy and strong. **Recommendation 1.2:** Eat different coloured vegetables every day to prevent and reduce the risk of diseases. **Recommendation 1. 3:** Eat at least two different fruits a day for better health. **Recommendation 1.4:** Eat animal source foods including seafood, meat, milk or eggs every day to stay strong **Recommendation 1.5:** Eat pulses such as beans, lentils, and nuts or oily seeds every day for good health. **Recommendation 1.6:** Eat staples such as cereals, starchy roots, tubers or plantains every day for a strong and active body. **Recommendation 1.7:** Choose unsaturated fats and oils and eat in small amounts.

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Guidelines		A set of recommendations
2	Limit intake of deep fried and ultra-processed foods and foods that contain high fats, sugar and salt	**Recommendation 2.1**: Limit intake of deep-fried foods to reduce risk of type 2 diabetes and cardiovascular diseases and obesity. **Recommendation 2.2**: Limit intake of ultra-processed foods to reduce cardiovascular diseases, cancer, overweight and obesity and early mortality. **Recommendation 2.3:** Limit intake of saturated fats and avoid intake of trans-fats to reduce the risk of cardiovascular diseases like heart attacks and stroke, increased "bad'' cholesterol and type 2 diabetes **Recommendation 2.4**: Reduce intake of free sugars prevent weight gain and dental caries. **Recommendation 2.5.** Reduce salt intake to reduce the risk of higher risks of incident stroke, fatal stroke, and fatal coronary heart disease
3	Shift to healthier lifestyles that support better nutrition and health outcomes.	**Recommendation 3.1:** Keep your food, home environment, and water safe and clean to prevent diseases. **Recommendation 3.2:** Make clean, safe water your drink of choice every day for good health. **Recommendation 3.3:** Avoid drinking alcohol and tobacco use to prevent and reduce the risk of diseases. **Recommendation 3.4:** Be physically active every day to stay strong and keep a healthy weight.

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Guidelines		A set of recommendations
4	Optional nutrition for pregnant and lactating mothers and infants and children promotes thriving, ensures healthy child growth and development and improves child and mother survival.	**Recommendation 4.1:** When pregnant or breastfeeding, enjoy a variety of food including animal source foods, pulses, fruits and vegetables with your meals for your health and the health of your baby. **Recommendation 4.2:** Feed your baby only breast milk for the first 6 months of life and no water, herbs or porridge because mother's milk contains all the food and water your baby needs. **Recommendation 4.3:** From 6 months, feed your baby a variety of foods, including animal source foods, pulses, fruits and vegetables and continue breastfeeding up to 2 years of age and beyond for healthy growth and development of your baby. **Recommendation 4.4:** Give a variety of foods from the six food groups to children 2 to 5 years to help them grow to their full potential. **Recommendation 4.5:** Provide healthy meals and snacks for school aged children through out the day. **Recommendation 4.5(a):** School-aged children should enjoy breakfast before school to enable them to be productive and perform well in school. **Recommendation 4.5(b):** Encourage school-aged children to eat healthy snacks such as fresh fruits, vegetables and nuts. **Recommendation 4.5(c):** Provide school-aged children with a lunch box to take to school. **Recommendation 4.6:** The elderly (over 65 years) should eat a diversified diet, and be physically and socially active for a good quality of life.







SECTION 1

About the Food-Based Dietary Guidelines for Zanzibar

1. INTRODUCTION

1.1 Background Information

Zanzibar is part of the United Republic of Tanzania and consists of an archipelago with two main islands, Unguja and Pemba, and several smaller islets. Its area of 2 643 square kilometres (Unguja 1 658 sq km and Pemba 985 sq km) is divided into five regions, three of which are in Unguja and two in Pemba. Based on the 2012 National Population Census, the projected population of Zanzibar in 2021 is 1 717 608 (837 034 males and 880 574 females), based on a growth rate of 2.8 percent per year. Zanzibar has a high population density of 677 persons per square kilometre, making Zanzibar the most densely populated area in East Africa. Zanzibar's urban and rural population is almost equal; however, 83 percent of Pemba's population resides in rural areas (World Bank, 2017).

1.2 Nutrition situation in Zanzibar

The triple burden of undernutrition, overnutrition and micro-nutrient deficiencies co-exist in Zanzibar. There are several drivers and determinants of malnutrition which include the food system, the health and food environment as well as individual behaviours. Malnutrition is associated with morbidity, mortality and linked to NCDs.

1.2.1 Undernutrition

Despite a net decrease in undernutrition in Zanzibar, indicators remain high in children under five, with a higher prevalence on the island of Pemba. In Zanzibar, underweight affects 13.8 percent of children and stunting, an indicator of long-term effects of malnutrition, affects 24 percent of children under five (30 percent in Pemba, 20 percent in Unguja). Acute malnutrition, indicating in most cases a recent process of weight loss, was 7 percent (9 percent in Pemba, 6 percent in Unguja), classified as medium severity as per WHO standards. The prevalence of severe acute malnutrition among children is twice as high in Pemba (2.2 percent) than in Unguja (1.1 percent). Underweight affects 14 percent of children and 11 percent of women of reproductive age, with higher rates on Pemba island (MoHCDGEC *et al.*, 2016).

1.2.2 Overnutrition

In parallel, overnutrition—the excessive consumption of food—is on the rise. Between 2010 and 2015, the prevalence of overweight people and diet-related NCDs, mainly among urban adults, has significantly increased. In 2015, almost a quarter of the adult population was overweight (23 percent), with a significant difference between urban and rural areas with 21.1 percent against 9.9 percent and a general higher prevalence for women (39 percent). Hypertension affects 33 percent of the population, and diabetes 7.5 percent (Z-NCDA, 2016).

1.2.3 Micronutrient deficiencies

This is defined as not having enough of one, or more, of the micronutrients (vitamin or mineral) required for optimal health. In Zanzibar, micronutrient deficiencies affect all population groups and their status and consequences, as presented in the 2015 Tanzania Demographic Health Survey (TDHS) (MoHCDGEC *et al.,* 2016) and revealed in an in-depth analysis of the 2015 Household Budget Survey, are as follow:

1.2.3.1 Iron deficiency

- Anaemia, a manifestation of iron deficiency which affects more than half of the women of reproductive age, with a higher prevalence in Pemba (66 percent) than in Unguja (58 percent). This was a slight increase from 2010. Children's (6 to 59 months) anaemia is also very high at 66 percent in Zanzibar, 69 percent in Pemba and 63 percent in Unguja, and has improved slightly since 2010 (MoHCDGEC *et al*., 2016).

- Diets consumed in the United Republic of Tanzania (mainland and Zanzibar) lack animal source foods which are micronutrient dense and provide a

rich source of iron. As a result of a low consumption of iron, iron deficiency is prevalent, especially in children and women. Other causes of iron deficiency include malaria and other parasitic diseases (FAO, 2008).

- Anaemia is a serious public health problem in many countries including the United Republic of Tanzania. Pregnant women with anaemia are twice as likely to die during or after childbirth, compared to women without anaemia (Daru *et al*., 2018). Maternal and neonatal deaths are a major cause of deaths worldwide, responsible for 295 000 deaths (Lozano *et al*., 2012; WHO, 2019; Stevens *et al*., 2013). Anaemia in pregnancy is also associated with higher rates of preterm birth, preeclampsia, low birth weight, neonatal mortality, and caesarean delivery (Rahman *et al*., 2016; Kidanto *et al*., 2009; Smith *et al*., 2019). Kavle *et al*. (2008) also established an association between anaemia during pregnancy and blood loss at and after delivery among women in Pemba Island.

- Anaemia affects the cognitive and psychomotor development of children and is associated with poor cognitive functions in adults. Anaemia, irrespective of the aetiology, was found to cause mild to moderate cognitive impairment (Jáuregui-Lobera *et al*., 2014; Pivina, 2019).

If left untreated, iron deficiency anaemia increases a person's risk of developing illness and affects or can lead to complications of the heart and lungs (NHS, 2021).

1.2.3.2 Vitamin A deficiency

- Vitamin A deficiency is of public health concern in Zanzibar. According to the 2010 Tanzania Demographic and Health Survey, the prevalence of vitamin A deficiency in children under five years in Zanzibar is 32.8 percent (26.3 percent in Unguja and 42.5 percent in Pemba). In women aged 15 to 49, 39.8 percent are deficient (35.6 percent in Unguja and 47.4 percent in Pemba). Vitamin A consumption is far below the recommended intake with 258 micrograms (mcg) Retinol Activity Equivalents (RAE) against the recommended intake of 528 mcg RAE/ person/day (FSND, 2017).

- Vitamin A deficiency is one of the top causes of preventable blindness in children. Vitamin A deficiency can also weaken the body's immune system, making it difficult to fight infections. Vitamin A deficiency increases the risk of diarrhoea, while chronic diarrhoea leads to vitamin A loss in young children (WHO, 2019a). Pregnant women are more susceptible to vitamin A deficiency during the third trimester (WHO, 2019a; Radhika *et al*., 2002). Deficiency in pregnant women can lead to night blindness (West, 2003), maternal mortality (Christian *et al*., 2000) and a high risk of infant mortality in the first year of life (Christian *et al*., 2001). In addition, vitamin A deficiency during pregnancy can lead to preterm delivery and maternal anaemia (Radhika *et al*., 2002).

1.2.3.3 Iodine deficiency

Iodine deficiency is endemic, with a prevalence of goitre affecting 21.3 percent of primary school children in Unguja and 32 percent in Pemba (Assey *et al*., 2006). The use of iodized salt in the household was lower in Pemba (1 percent) than in Unguja (63.5 percent) (Assey *et al*., 2006).

1.2.3.4 B vitamins

Vitamin B1, which enables the body to use carbohydrates as energy, and vitamin B12 are also under-consumed, as suggested by the food consumption patterns in Zanzibar (OCGS, 2016). Vitamin B1 consumption is 0.95 mg/person/day which is below the recommended 1.0 mg/person/day (OCGS, 2016) while vitamin B12 intake is 0.90 mg/person/day which is below the recommended of 1.69 mg/person/day (FSND, 2016).

Table 2: Nutrition indicators

	Unguja	Pemba	Zanzibar	Trend Since DHS 2010
Wasting 6-59 months	6%	8.90%	7.10%	↘
Stunting 6-59 months	20%	29.50%	23.50%	↘
Underweight 6-59 months	12.70%	15.70%	13.80%	↘
Underweight (WRA)	12.50%	10.30%	11.40%	↘
Overweight (WRA)	41.60%	31.30%	38.90%	↗
...of which is obesity (WRA)	19.80%	9.70%	17.20%	↗
Overweight (total adult population)	23.60%	18.40%	22.20%	n.d.
...of which is obesity	15.50%	7.40%	14.30%	n.d.
Anaemia (WRA)	57.80%	66.20%	60%	↗
Anaemia 6-59 months	62.70%	69%	65.80%	↘
Urinary iodine concentrations (WRA <100µg/l)	20.10%	38.2%*	25.20%	n.d.
Households with adequately iodized salt	89.50%	60.10%	80%	↗
*low data collected n.d.: no data				
Source: MoHCDGEC *et al.,* 2016				

1.3 Possible determinants of malnutrition in Zanzibar

1.3.1 Food systems

A food system gathers all the elements and activities that relate to the production, processing, distribution, preparation and consumption of food. The national food system of Zanzibar is experiencing many challenges that need to be tackled to improve food security, particularly the availability and accessibility of nutritious foods and improved dietary diversity. Although, the government placed a strong emphasis on policies required to attain food self-sufficiency; since attaining self-sufficiency, the production system, the policies related to it, and the resulting diets have begun to diversify and levels of food insecurity have started to decrease. Nonetheless, undernutrition for children below five years, and micronutrient deficiencies in children and women of reproductive age remain a problem. Dietary diversity still remains a challenge.

Moreover, as the food system has begun to transition from traditional to modern, challenges related to food safety have begun to rise. Further, increased ultra-processed food intakes are potentially associated with rising overweight/obesity and NCDs. Both government interventions and innovations are needed to help shift the national food system to improve nutrient-dense food availability, particularly among the poor, and to limit the increase in ultra-processed food consumption.

1.3.2 Food security

Food security includes four main components: (a) Availability of sufficient quantities of food of appropriate quality, supplied through domestic production or importation (including food aid); (b) Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet; (c) Utilization of food through adequate diet, clean water, sanitation and health care; and (d) Stability where the population, household or individual must have access to adequate food at all times (FAO, 2006).

The Zanzibar food system is not self-sufficient in food production and remains highly dependent on food imports. Zanzibar agriculture is predominantly based on smallholder farming and dependent on rainfall. With the exception of banana, cassava, yams and sweet potato, overall domestic production for most food remains low and below the national demand. Only 7 percent of household food consumption is satisfied by the household's own production in rural areas, with the remainder being purchased in local markets. Both rural and urban households purchase most of their food and are consequently dependent on their purchasing power to obtain sufficient and nutritious food. Concurrently, food prices are increasing with prices of fruits, fish and coconut commodities growing consistently over the past six years. In 2015, around 50 percent of the population spent between 59 percent and 88 percent of their income on food only (FSND, 2017).

The high reliance on purchased food and the price increases contribute to a decrease in the consumption of fruits and vegetable and animal-based products, such as fish. Household consumption preferences go to rice, wheat flour and maize which are mostly imported. Even if the Zanzibari diet varies with the type of household (region, urban, rural, number of members, income, etc.), rice remains the staple food consumed by all throughout the year and on a daily basis.

According to the ADePT analysis results for the 2014/15 HBS data in Zanzibar, 99 percent of total energy intake in the population comes from six of the 19 food sub-categories. Cereals (rice, maize, wheat) and derived products contribute to more than half (70 percent) of energy intake. Fruits, fish, vegetables and animal products are much less consumed and contribute less than 5 percent of the total calorie intake. Over time, the intake of fat, rice, vegetables, sugar, bananas and wheat has increased significantly, while the intake of fish, fruits and cassava has decreased. Micronutrient-rich foods such as fruits and vegetables depend on the household's purchasing power. The Zanzibari diet is mostly made up of

carbohydrates and lacks diversity to meet dietary requirements. This is especially a concern for vulnerable population groups such as pregnant and lactating women and children under five years old (ADePT 2014/15).

1.3.3 Lack of dietary diversity

There is limited dietary diversity – the current diet is high in carbohydrates while most of the micronutrients do not meet the dietary requirements of a healthy individual. Rice is the main food consumed in Zanzibar and contributes to 35 percent of the total caloric intake. Other common foods are coconut (17 percent), wheat (10.8 percent) and sugar (7 percent) (MALE and MOHSW, 2006). The available statistics indicate that the current dietary pattern is characterised by the consumption of energy-dense foods, mostly carbohydrates, and an inadequate intake of micronutrient-rich foods such as fruits and vegetables. There is also inadequate consumption of animal-source foods which provide protein and micro-nutrients. This consumption pattern suggests that this diet is unable to meet the dietary requirements of healthy individuals.

1.3.4 Infant and young child feeding practices

More than two-thirds (67 percent) of mothers started breastfeeding, with 97 percent of them reporting breastfeeding within one hour after delivery. Only half of the children were exclusively breastfed between zero and six months (56 percent), with Unguja having a higher proportion (73 percent) than Pemba (39 percent). Children (50 percent) were reported to have taken three meals in the last 24 hours, with Unguja at 67 percent and Pemba at 35 percent. However, in Pemba Island, 59 percent of children had two or less meals in the last 24 hours. Only 7 percent of the children had more than three meals in the last 24 hours (MOHCDGEC *et al.,* 2019).

1.3.5 Water and sanitation

Approximately 80 percent of Zanzibar households have access to clean and safe water, although access is lower in Pemba and in the rural area of the island (NBS and ICF Macro, 2011). However, the prevalence of diarrhoea in children under five years is 10.5 percent, with North Unguja (13.6 percent) and North Pemba (12.6) having slightly higher prevalence (MoHCDGEC *et al.*, 2016). The use of public tap water as the main source of drinking water was reported in 42 percent of households in Zanzibar. Boiling drinking water was a common practice in 63 percent of households, while the use of water disinfectant was reported in 38 percent of households in Unguja and more than a half of households (53 percent) in Pemba (MoHCDGEC *et al.*, 2019).

Use of unimproved sanitation facilities applies to one third of the population, with 13 percent of households using open pits without a slab, and 20 percent openly defecating into the ocean, with a higher proportion in Pemba (30 percent) than in Unguja (9 percent). In addition, a majority of households (92 percent) reported not having the availability of household waste collection services in their area (MoHCDGEC *et al.*, 2019).

2. ABOUT THE ZANZIBAR FBDGS

2.1 Rationale and purpose of the Zanzibar Food-Based Dietary Guidelines

Malnutrition in the form of under and overnutrition is prevailing in Zanzibar despite the downward trend registered in the 2015 Tanzania Demographic Health Survey (TDHS). Undernutrition, as manifested by stunting, wasting, underweight, and micronutrient deficiencies, is an important underlying cause of illness and death in Zanzibar especially among women of reproductive age and children under five years old, and therefore remains an issue of national concern. Overweight and obesity are emerging issues of public health concern in Zanzibar. The 2015/16 TDHS found that a significant proportion of the adult population between 40 to 59 years had high instances of overweight and obesity, indicating that sizeable parts of the population are at risk of diet-related chronic diseases. The TDHS studies also revealed that Zanzibar has limited dietary diversity; the diet is high in carbohydrates accounting for about 66.7 percent of total dietary energy consumed, while most of micronutrients do not meet the dietary requirements of a healthy individual. Nutrient intake data from the analysis of food consumption data from the Household Budget Survey of 2009/10 and 2014/15 indicated that vitamin A, vitamin B1, vitamin B12, calcium, and animal-source iron were under-consumed relative to average requirements. These findings stress the need to emphasise the consumption of a variety of nutrient-dense foods at recommended intake levels for nutrients of public health concern.

Non-communicable diseases such as hypertension and diabetes are prevalent and continue to rise in Zanzibar just like in many other places in the world. Most of these NCDs are diet-related and can be prevented if people change their lifestyle as well as their dietary intake. Generally, malnutrition problems have dietary implications and available scientific evidence shows that nutrition plays a major role in preventing and managing diet-related NCDs of public health importance (Global Panel, 2016).

Globalization, urbanization, and changes in food supply and lifestyles have resulted in a shift in dietary habits and a loss of traditional food cultures. These changes highlight the need for consistent, simple and practical dietary guidance to enable populations to select healthy diets, prevent disease and to guide countries in food, health and agriculture policy development. It is widely acknowledged that diet is one of the single most important contributors to health, but also to diseases. The existence of both undernutrition and overnutrition and the associated co-morbidities call for a need to inform the Zanzibar population on healthy eating and healthy lifestyles.

For this reason, the Food-Based Dietary Guidelines are designed to address the country's nutritional challenges. The FBDGs aim to be a guide towards the recommended food consumption for the provision of required nutrients to promote the health of the general population. The guidelines take into consideration country-specific food consumption, dietary habits, nutrition and health-related problems. Importantly, the FBDGs:

- are designed to support and encourage healthy eating by promoting the consumption of a variety of nutrient-dense foods across all food groups, that are locally available, to attain adequate diversity (quality) and meet the recommended nutrient requirements (quantity).

- provide science-based advice on what to eat and drink to promote health, help reduce risk of chronic disease and meet nutrient needs.

- support policies, programmes, and actions whose purpose is to encourage, protect, and promote the good health and the food and nutrition security of the whole Zanzibar population. For example, the FBDGs:
  - ◇ provide the basis for designing nutrition programs for implementation in various settings including schools, the food industry, other businesses, community groups, and the media.
  - ◇ are instrumental for nutrition education of school children on healthy eating patterns and will influence curriculum development for healthy eating and are critical to informing the general population on the need to consume diverse, nutrient-rich foods for an improved nutritional status.
  - ◇ are used to be used to produce communication materials for the general public.

Good nutrition is the basis for optimal human health and wellbeing, and is a key factor for African societies to reach their full socio-economic and developmental potentials. What we eat impacts our health, growth and well-being and most countries, if not all, experience nutrition challenges.

The National Nutrition Strategy (2013-2018) of the RGoZ aims to improve the nutritional status of the general population of Zanzibar with a focus on women and children. Its main objective is to scale up nutrition interventions and services to improve their nutritional status. The FBDGs are one of the tools to help achieve this goal.

2.2 Who is the intended user of this FBDGs Technical Recommendations document?

- **Practitioners who provide advice and guidance to others** on eating well and healthy lifestyles including nutritionists, dieticians, health workers, agriculture extension workers, educationalists and all other technical professionals in related fields. These guidelines can inform the content of their advice on the consumption of diversified diets.

- **Researchers, academics and students** in academia or research institutions conducting studies in the fields of nutrition, health, agriculture, development, etc.

- **Policy and decision-makers** in ministries related to agriculture, food security, health, social welfare, protection and development; education; finance and planning; public works; and non-governmental organizations. These guidelines are useful for those who formulate and implement policy and programmes to improve the nutritional status of the public as well as provide an enabling environment that facilitates the general public to follow the recommendations towards healthier diets and lifestyles.

- **Individuals with post-secondary education** with the ability to understand technical language can also read and use these guidelines and recommendations.

This FBDGs Technical Recommendations document is accompanied by the FBDGs for Healthy Eating and Lifestyle Guide for the public. The FBDGs for the general public use simplified terms that are easy to understand even for those with low literacy levels. Other derivative products and tailored communication and educational materials are needed that convey the FBDGs to specific end-users based on each target audience's needs.

2.3 Who is the target population for the FBDGs?

The FBDGs are developed for the healthy general public between the ages of 0 and over 65 years, who do not have significant medical conditions that may warrant specific diet modifications. In addition to the guidelines for the general population provided in Section 2, Section 3 provides

added guidance for children under five years of age, school-aged children, and pregnant and lactating women and the elderly, given their special nutrition requirements. The guidelines have taken into consideration cultural values, food diversity and food consumption patterns prevailing in Zanzibar, hence making them very practical and applicable to everyone in Zanzibar.

2.4 Objectives of the Zanzibar FBDGs

The development of FBDGs in Zanzibar aims to improve the nutritional status of the population by disseminating positive messages on healthy eating and lifestyles and prevent all forms of malnutrition. The recommendations are based on scientific evidence and take into account food availability, dietary patterns and food preferences, as well as the current nutrition situation and trend in Zanzibar. The FBDGs provide up-to-date recommendations about the amounts and kinds of foods needed by the Zanzibari population for health and wellbeing. The Zanzibari FBDGs not only provide the general public with key guidelines, they can also be used as an advocacy tool to influence national policies and programmes.

2.5 Guiding principles

The Zanzibar FBDGs are based on the following guiding principles:

Science-based: The recommendations contained in the FBDGs are based on latest scientific knowledge and evidence related to food and nutrition as well as the relationships between diet and health.

Nutritional and health status: These dietary guidelines are guided by the current nutritional situation of people from Zanzibar using up-to-date nutritional indicators, such as stunting, wasting, underweight, micronutrient deficiencies, overweight and diet-related NCDs.

Consumption patterns: The guidelines are guided by the prevailing Zanzibar food consumption habits.

Practicality: The food guide has been designed to be practical for use by the general public. The foods recommended in the dietary guidelines are locally available and accessible to most households but are equally designed to address nutritional needs for different household members within Zanzibar households.

Cultural acceptability: The FBDGs take into consideration the Zanzibar cultural context based on the prevailing patterns of food intake and food habits to ensure the guidelines are acceptable for the population. Furthermore, the FBDG have been tested during focus group discussions (FGDs) to ensure the respect of this principle.

User friendly: The information contained in the FBDGs is user friendly. The dietary guidelines have been written in simple language and the use of scientific nutrition and dietetic terms have been limited to a minimum and when used, the terms have been explained. The wording of the main messages and illustrations were tested for understanding during FGDs in Zanzibar.

Food-based: The FBDGs are grounded in food-based requirements rather than nutrient-specific considerations. The messages contain a variety of nutrient-dense food from each group to allow for flexibility in the selection of food to consume based on personal preferences.

Nutrition-sensitive messaging: All the FBDGs messages are designed to meet the recommended dietary allowances and adequate intakes for essential nutrients.

3. PROCESS OF DEVELOPING THE FOOD-BASED DIETARY GUIDELINES

The FBDGs were developed by the Zanzibar FBDG Taskforce led by the Department of Food Security and Nutrition of the Ministry of Agriculture, Irrigation, Natural Resources and Livestock in Zanzibar. The Taskforce received technical guidance and support from the FAO Country Office in Tanzania, FAO Sub-regional Office for Southern Africa (SFS), the Nutrition and Food Systems Division in FAO Headquarters, and from Sokoine University of Agriculture, Department of Food Technology, Nutrition and Consumer Science in Tanzania. The development of the FBDGs followed the steps laid out in the FAO and WHO guidance manual for FBDG development (WHO, 1996).

3.1 Formation of the FBDGs Taskforce

The formation of the FBDGs Taskforce was led by the Ministry of Agriculture, Irrigation, Natural Resources and Livestock in Zanzibar with the guidance of FAO. The Taskforce consisted of 19 experts in the field of food science, nutrition, agriculture, Food security and health from different sectors. The formation of the FBDGs technical Taskforce was an effective mechanism for obtaining a comprehensive and systematic review of the evidence, which contributed to the successful development of the dietary guidelines. Members of the Taskforce were from various organisations including Ministry of Health (MoH) – Nutrition Unit and Department of Non-Communicable Diseases (NCDs); Ministry of Agriculture, Irrigation, Natural Resources and Livestock – Department of Food Security and Nutrition (MAINRL); State University of Zanzibar (SUZA); Ministry of Labour, Empowerment, Elderly, Youth, Women, and Children; Zanzibar Food and Drug Agency (ZFDA); Zanzibar NCDs Alliance; Ministry of Education – Department of Health Promotion; Save the Children; Zanzibar Social Work Association (ZASWA); and the Milele Zanzibar Foundation. The process used for the development of FBDGs in Zanzibar comprised many steps, as follows.

3.1.1 Situation analysis/review of scientific evidence

The processes involved evidence gathering, assessment, evaluation, synthesis and the development of an Evidence Report. The FBDGs Taskforce used a systematic approach to answer a set of science-based questions in seven thematic areas. The sources of information included existing systematic reviews, meta-analyses, other peer reviewed studies (cross sectional, cohort, case control), official reports from government departments, UN agencies, NGOs and other organisations guided by inclusion and exclusion criteria. This step led to the accumulation of scientific evidence on the nutrition, diet and health situation, within the policy, program and food systems context, as well as the diet and nutrition and health relationships. This information was organised into an Evidence Report which formed the scientific basis that informed the development of the FBDGs for Zanzibar.

Validation of the Evidence Report: A workshop was conducted from the 17th to 20th October, 2018 in Zanzibar to validate the findings and evidence review process. Nineteen participants (six males and 13 females) from academia, government ministries (agriculture, health, education), and non-governmental organisations attended. The evidence was consolidated into the following chapters: 1) Risk factors

and problems associated with diets in Zanzibar; 2) Food consumption, dietary patterns, nutrient intake: current status and trends; 3) Food availability, access and affordability in Zanzibar; 4) Nutrition-related policies and programmes; 5) Food consumption behaviour and food-related habits; 6) Other behaviours related to nutrition and health; and 7) Dietary, lifestyle patterns and health outcomes.

During the workshop, participants endorsed the presented evidence and drafted technical recommendations based on priority problems that were identified. Generally, key issues to be addressed by the Zanzibar FBDGs, as well as the relevant technical recommendations including suggested future research based on the gaps and limitations identified in the evidence, were discussed during the workshop.

3.1.2 Development of dietary recommendations, messages and visual illustrations

Based on the situation analysis and evidence review document, the FBDGs Taskforce met and discussed priority problems that the Zanzibar FBDGs would address. These priority problems included malnutrition in all its forms, lack of dietary diversity, sub-optimal infant and young child feeding practices, poor hygiene and home environments, high alcohol consumption, and physical inactivity.

Ranking priority problems guided the selection of the top 14 technical recommendations for the FBDGs. Each recommendation was framed as a message. The TWG from Tanzania mainland and Zanzibar developed the messages during two workshops held in June 2019 and July 2019 in Zanzibar, where the 26 participants included the Zanzibar Taskforce members, journalists and other stakeholders.

The Taskforce considered the following attributes when developing each message:

- The message had to be clear, short and concise so that it can be understood and remembered easily. It had to show the benefits, be action-oriented and easy to implement, positive, culturally acceptable and promote self-efficacy.

The key messages have supporting messages, including tips to demonstrate the ease of implementation and to show the general population how to do the specific action(s) or behavioural change(s) the messages want the target audience to adopt.

3.1.3 Diet modelling and food group graphics design

The diet modelling and food group graphics design step involved the development of a food group guide which is a graphic representation of a desirable eating pattern that encourages the optimal consumption of a variety of the Zanzibar local foods for different food groups in proportions or amounts that would meet the nutrient requirements. Based on the previous steps and the recommendations provided by the technical Taskforce, a recommended diet was modelled through linear programming for the people in Zanzibar. During diet modelling, the following considerations were made:

- The specific dietary pattern included the amounts recommended for each food group, in line with the 2 200 kcal energy level per day set for the general population that would ensure nutrient adequacy.

- The diet modelling was based on the six Zanzibar food groups taking into consideration the nutrient profiles of each food within the food group, based on the food composition tables. The model also took into account discretional calories from sugar and sugar-sweetened beverages, etc.

- The diet model ensured that the proposed meal patterns meet key micronutrients of public health concerns such as vitamin A, iron, calcium and zinc.

- The food group guide was adapted from the Zanzibar existing eating habits and culture to make sure food preferences are respected.

- The diet model also ensured that the serving size (Kcal/grams) outputs would be as close as possible to the usual portion sizes and would be easy to estimate using common household measures.

After these decisions were made, most commonly consumed foods and their nutrient profiles were entered into the linear program. Each food was weighted appropriately using the country's food consumption data and through TWG expert opinions where data was not available.

Recommended intake for each food group was calculated by a mathematical program using minimum and maximum food quantities that are compatible with current eating habits, while striving to optimize the pattern to meet nutrient requirements, especially those that are of interest to the target population. The mathematical model then determined the best possible recommended amounts of each food. Where food consumption data was available, the existing diet was also considered, and attempts were made to deviate as little as possible from the current diet, when the optimal diet was calculated.

After the dietary pattern was optimized, a graphic representation of the model was created to depict the food groups and their proper proportions to be consumed (suggesting each food group's recommended proportion of total diet). The visual representations will go along with key messages to ensure the delivery of the message to the targeted group.

For Zanzibar, diet modelling was completed with assistance from FAO-HQ and FAO Sub-Regional Office of Southern Africa, utilizing existing food consumption data, expert opinions, and the West African Food Composition Table for nutrient analysis. Data was processed through an Excel program written by MS-Nutrition (Marseille, France) for FAO-HQ.

3.1.4 Message, food group graphic and image field testing and revision

The FBDGs' key messages and visual materials were tested on the target population through FGDs to make sure the draft materials were understandable, appealing, persuasive and culturally appropriate. The pre-testing team was trained on how to test the messages and images by Stellenbosch University. Eight FGDs were conducted in four locations within one region of Zanzibar from 29th October, 2019 until the 3rd November, 2019. A total of 64 women participated in the FGDs conducted in the Kiswahili language. The results of the testing were analysed and interpreted, and the guidelines, messages and visual materials were adjusted accordingly.

3.1.5 Final editorial and review

The entire document underwent several reviews by the FBDG Taskforce members, the Technical Officer and Nutrition Officer at the FAO Tanzania Office, the FAO Sub-Regional Office for Southern Africa, and the Nutrition and Food Systems Division (ESN) at FAO-HQ. All corrections were incorporated into the final document prior to being validated, accepted, printed and launched on a national forum as an official document.

SECTION 2

The Food-Based Dietary Guidelines for the general population in Zanzibar

THE FOOD-BASED DIETARY GUIDELINES FOR THE GENERAL POPULATION IN ZANZIBAR

This section details the guidelines for the general population that are applicable to everyone both young and old. It includes dietary guidance on eating diversified diets with seven recommendations, five recommendations on limiting calorie intake, as well as four recommendations on healthy practices. Each recommendation has a dedicated section describing what the recommendation is about, its importance – specifically the importance of consuming the food group in the right amount – and the expected health outcomes, including the scientific reasoning for the recommendation. The section also details the current consumption patterns and the gaps identified as the basis for why the guidelines were developed. Recommended amounts of consumption, including the visuals of the correct amounts, proportions and serving sizes required per day are provided. Each recommendation also includes tips for small changes individuals can make in order to follow the recommendation.

4. ZANZIBAR FOOD GROUPS AND FOOD GUIDE

4.1 The Zanzibar six food groups

The Zanzibar FBDGs group foods together that share similar nutrients, play related essential roles in the body as well as their effects on nutrition and health. Based on scientific evidence, global food grouping practices and local context; the TWG agreed on six food groups that, when consumed in optimal amounts daily, promote good health and nutrition.

There are some key differences in the names and number of food groups used in guidelines and education materials such as nutrition guidelines for people living with HIV. These changes are based on emerging evidence as well as current problems observed in dietary habits. Table 3 highlights these differences.

Table 3: Key differences in names and numbers of food groups

FBDGs food groups		Groups and names previously used in dietary guidance	
1	Cereals, roots, tubers and plantains	**1**	Cereals, green bananas, roots and tubers
2	Vegetables	**2**	Vegetables
3	Fruits	**3**	Fruits
4	Healthy oils and fats	**4**	Sugar, honey, fats and oil
5	Seafood and animal source foods	**5**	Pulses, nuts and animal source food
6	Pulses, nuts and seeds	**-**	

4.2 Changes to the Zanzibar/ Tanzania food groups and the rationale

In the current food groups, pulses, nuts and animal source foods are separated to emphasize the importance of animal source foods as a source of wholesome and more bio-available protein and micronutrients. Given the importance of seafood in the Zanzibar diet, seafood is added to the name of the animal source food.

Pulses, nuts, and seeds have their own food group given the important role of plant-based foods in reducing the risk of NCDs. Pulses nuts and seeds are good sources of proteins, micronutrients and fibre and are low in fat.

Sugars in the sugar, honey, fats and oil group is removed from this group. Emerging evidence is linking a high intake of added sugar to the rise in obesity and associated complications like NCDs. High intake is defined as consumption of over 50 g or around 12 level teaspoons of added sugar from all sources including beverages and snacks. The recent EAT-Lancet Commission paper also indicated that because sugar has no nutritional value and has adverse metabolic effects, a limited intake of less than 5 percent (about 25 g) of total energy per day is recommended (Johnson *et al.*, 2009). The recommendation on sugar consumption is described in more detail in *Recommendation 2.1 (Limit your intake of deep fried and ultra-processed foods that contain saturated and trans fats, sugar and salt).*

Given the various effects of different types of fats, the sugar, honey, fats and oil group is re-named healthy oils and fats. This is because a small amount of fats, particularly unsaturated fats, provide necessary essential fatty acids important for vital functions in the body. Other types of fats like trans fats are not included in this group and are discussed in Recommendation 1.7.

4.3 Zanzibar Food Group Guide

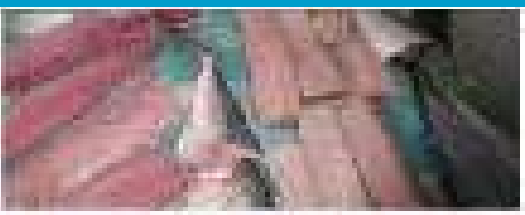
The Zanzibar Food Group Guide (Figure 1) provides a visual representation of a sample of foods to select from each of the six food groups daily. The size of the food group represents the proportion contribution of the food group to the recommended 2 200 Kcal and nutrients per day. Select larger amounts of food from the bigger size and less amounts of food from the smaller size. The proportional contribution of each of the six food group to a daily diet was derived from diet optimisation modelling. Tables 5 provides the kilo calorie, food weight and nutrient contribution of each food group.

Figure 1: The Zanzibar Food Group Graphic depicting the amount of each food group's contribution to a healthy diet

Dietary Guideline 1

Increase dietary diversity through the consumption of six foods focusing on variety within the food groups, nutrient density and correct amounts to meet nutrient adequacy, prevent under and overnutrition, and reduce the risk of non-communicable diseases.

The six food group are the foundation of a healthy diet.







5. RECOMMENDATION 1.1: Everybody, young and old, should enjoy eating a variety of foods from different food groups every day to stay healthy and strong.

5.1 What does eating a variety of foods mean?

Eating a variety of foods means eating different healthy and nutritious foods from all six food groups daily and in right amounts. Eating a variety of foods also includes choosing different varieties of food within each group. An eating pattern consisting of a variety of foods from all the food groups is also referred to as a diversified diet.

5.2 Importance of dietary diversity

A diversified diet contains energy, macro- and micronutrients and water to meet the daily requirements for a healthy individual. The human body needs more than 50 different essential nutrients to stay nourished and function properly. Apart from breastmilk during the first six months of life, none of the food groups can provide all the nutritional requirements required by the body. Therefore, it is important to eat foods from each group since each food group has an important and unique function in the human body. For example:

- Vegetables are good sources of micro-nutrients (vitamins and minerals), fibre and anti-oxidants and other phytochemicals that support the body's functions and protects it from diseases (Lampe, 1999; Slavin and Lloyd, 2012).

- Beans, pulses, legume, and nuts are good and affordable sources of protein, vitamins, minerals and fibre. Nuts are also good source of healthy oils.

- Sea foods and animal products are rich sources of protein, vitamins and minerals such as iron, zinc and calcium.

- Cereals and starchy roots and tubers provide carbohydrates which are a primary source of energy for the body. Whole grain cereals are also a rich source of fibre and supply vitamins and minerals and small amounts of proteins.

Therefore, eating a diversified diet (variety of food from different food groups) leads to taking in macronutrients, micronutrients, and phytochemicals.

It is also important to choose a variety of foods from each food group since different foods provide varying amounts of nutrients from that food group. For example, although vegetables are a great source of vitamin C, only dark green leaf and orange-colored vegetables contain significantly more vitamin A than others (Slavin and Lloyd, 2012). In the seafoods and animal source products group, while all fish, milk, and meat provide the body with protein, milk and small fish like sardines contain a lot of calcium when eaten with bones, while liver is the richest source of iron in this food group.

Therefore, choosing a different variety of foods across and within the food groups daily is important in ensuring that adequate energy and nutrients are supplied for maintaining healthy bodily functions. People who eat a variety of foods are more likely to meet their nutrient requirements compared with those who have limited dietary diversity. In addition, a meal containing a variety of foods is also more appealing and enjoyable. The FBDGs have thus emphasized the consumption of diverse foods.

5.3 Nutrient density

One easy way to get all the nutrients the body needs is to eat nutrient dense foods. A nutrient dense food has a lot of nutrients with few calories per gram. Nutrient dense foods are rich in vitamins, minerals, complex carbohydrates, lean protein and phytochemicals. Examples of nutrient dense foods include fruits and vegetables, peas, beans, nuts, whole grains, fish, eggs, etc. Fortified foods and bio-fortified foods are also nutrient dense foods. Less nutrient dense foods include oils, fats, sugars, salt and refined grains.

In addition, within each food group, there are foods that are more nutrient dense than others. Nutrient dense foods are also called superfoods. For example: Moringa leaves, amaranth, sweet potato leaves and okra are more nutrient dense vegetables compared to cabbage while whole grain products are more nutrient dense than refined grain products.

Thus, consuming nutrient dense foods is one of the healthiest ways to eat, as it provides individuals with concentrated amounts of valuable nutrients such as vitamins, minerals, fibre, essential fatty acids, phytonutrients and lean protein for less calories.

5.3.1 What is bio-fortification?

Bio-fortification is improving the nutritional quality of the food during plant growth through plant breeding or modern biotechnology. It is different to conventional fortification, which adds nutrients to the food after the harvest or during processing of the crops.

In Zanzibar, bio-fortified crops include orange-fleshed sweet potatoes, provitamin A maize, iron and zinc-rich beans.

5.3.2 Importance of eating bio-fortified and fortified foods

Bio-fortified crops contain more nutrients than regular crops. For example, the bio-fortified orange-fleshed sweet potato contains more provitamin A than the regular sweet potato. The same goes for the iron and zinc-rich beans and the provitamin A maize.

Eating bio-fortified crops can improve nutrient intake and can be helpful in preventing nutrient deficiencies. Choosing bio-fortified crops whenever possible is recommended.

Fortification of foods during processing with nutrients like vitamin A also helps to increase the amount of nutrients that may generally be lacking in the food or in small amounts.

Food groups and recommended quantity per day

Figure 1 of the food group guide and Table 4 on food groups and recommended quantities are for the general population and are discussed in detail in Section 2 of this FBDGs document. Based on these food groups, a recommended diet has been modelled, in line with Zanzibar food habits and nutrient requirements for the general population. This is based on 2 200 Kcal population energy goals per day. This diet model ensures that women of reproductive age (18 to 49 years old) meet their nutrient needs specifically for iron, folate, and calcium which are nutrients of public health importance for women in this age group.

However, given that nutrition needs differ due to age and physiological needs among other factors, Section 3 provides specific dietary recommendations for population groups with special nutrients requirements such as pregnant women, lactating mothers, school-age children and adolescents, under-five children and the elderly.

Table 4: Food groups and recommended quantity per day

Food groups for Zanzibar	Foods	Pictures	Quantity (g/day)*
Cereal, roots, tubers, plantain	**Cereals:** Rice, wheat, maize, bread, millet, etc.		580 g
	Roots and tubers: Potato, cassava, yam, cocoyam, sweet potato, etc.		
	Plantains: Green cooking banana, yellow cooking plantain, breadfruit, etc.		
Sea food and animal products	**Fish and seafood:** Sardine, octopus, shellfish, anchovies, mackerel, etc.		145 g
	Meat: Beef, goat, duck, chicken, rabbit, veal, lamb, liver, etc.		
	Eggs		
	Dairy: Milk, yoghurt, cheese, etc.		

Continued on page 29

Food groups for Zanzibar	Foods	Pictures	Quantity (g/day)*
Pulses, nuts and seeds	**Pulses and legumes:** Cowpea, bean, lentil, green gram, dry peas, soybean, chickpea, etc. **Nuts:** Groundnut, cashew, and coconut milk, etc. **Seeds:** pumpkin, sesame, sunflower, flax seeds, etc.		195 g
Vegetables	Okra, cassava leaf, amaranth, lettuce, cabbage, carrot, onion, tomato, egg plant, pumpkin, courgette, spinach, etc.		280 g
Fruits	Mango, papaya, orange, ripe banana, pineapple, rubber vine fruit (mabungo), watermelon, guava, tamarind, apple, etc.		280 g
Fats and oil	Oils: Sunflower oil, sesame oil, olive oil, etc.		28 g
* Food weight (grams) per day			

Table 5: Diet-model-calculated recommended food group amounts, serving sizes and the nutrients the eating pattern will provide

Food group	Recommended amounts per day		Energy and nutrient values per serving*								
	Food weight	Energy	Protein	Fat	Carbohy-drates	Calcium	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
TOTAL INTAKES	**1508**	**2211**	**77**	**48**	**351**	**1109**	**24**	**11**	**2040**	**451**	**32**
Cereals, roots, tubers and plantain	580	869	16	2	192	99	3.4	2.1	236	78.9	9
Vegetables	280	168	14	1	21	741	10.1	1.5	693.2	148	7.5
Fruits	280	247	3	1	54	120	2.6	1.3	206.4	56.7	6.4
Pulses, nuts and seeds	195	302	16	10	32	44	4	2.5	5.6	109.8	8.7
Sea food and animal products	145	176	28	6	3	100	3.6	3.2	898.4	54.1	0
Fats and oils	28	252	0	28	0	0	0	0	0	0	0
Note: 197 Kcal will come from the discretionary calories from foods that are not part of the six food groups, such as beverages, sugars and other snacks.											
*Based on the diet model food combinations											

5.4 What is a serving size and what does it look like?

For each food group, the total amount of food to eat per day is divided into small amounts called serving sizes.

A serving size is a standardized recommended amount of food to be eaten daily from each of the food groups.

Dividing the total amount into serving sizes makes it easy to spread the required daily amount of food required throughout the day, based on the number of meals or snacks the person has per day. This also make it easier to select and combine different foods from the same food groups based on food availability and eating patterns, and to eat a variety of foods from each food group.

For example, the recommended total amount from the food group cereals, roots, tubers, and plantains is 580 grams providing a total of 869 Kcal per day is divided into four servings. The average food weight is about 145 grams per serving. With this division of a serving, a person can chose to eat one serving of plantain in the morning, two servings of rice in the afternoon and one serving of ugali in the evening, making a total of the required four servings per day. This can also be done for the other food groups as shown in Tables 6a and 6b.

Table 6a: One serving size with a standard measure per serving for cereals, roots, tubers, and plantains; and vegetables and fruit

	Celerals, roots, tubers and plantains	Vegetables	Fruits
Total number of servings per day	4 servings per day	2 servings per day	2 servings per day
Food amounts per servings in grams	145 g	140 g	140 g
Kcal amount per serving	200 Kcal	70 Kcal	80 Kcal
One serving size equivalent using common household measures	- About 1 cup of rice, Pasta, diced, sweet potato, cassava, plantain, or green banana **OR** - ¾ cup cooked ugali **OR** - About 145g of cereal, roots, tubers, plantain	-1 cup cooked vegetables **OR** - 2 cups raw leafy or salad vegetables **OR** - About 140 grams of vegetables	-One medium banana or apple; or one large orange, peaches; or two small tangerines, or peaches, **OR** - One cup cut fruit like papaya, mango or small fruit like berries, grapes, rubber vine (ma)bungo) (no sugar added), golden apple (embe sakua) **OR** - quarter cup baobab pulp (with no sugar added) **OR** - About 140 grams of fruit
Example on how to spread the total servings per day throughout the day**	-1 cup cooked sweet potato in morning, **AND** -2 cups rice in the afternoon, and - 1 plantain in the evening *(this makes a total of 4 servings per day)*	-1 cup cooked amaranths leaves for lunch **AND** - 1 cup cooked okra for dinner *(this makes a total of 2 servings per day)*	- One orange for breakfast, **AND** - One mango or a cup of cut papaya or (ma) bungo) as a snack in the afternoon or evening *(this makes a total of 2 servings per day)*
Recommended total amounts per day in food weight	580 g per day	280 g per day	280 g per day
** These servings per meal combined add up to make total servings per day			

Table 6b: One serving size with a standard measure per serving for pulses, nuts and seeds; seafood and ASFs; and fats and oils

	Pulses, nuts and seeds	Sea food and animal products	Fats and oils
Total number of servings per day	2 servings per day	1 serving per day	2 servings per day
Food amounts per servings in grams	97 g	60 to 145 g**	14 g
Kcal amount per serving	130 Kcal	130 Kcal	126 Kcal
One serving size equivalent using common household measures	- ½ cup cooked beans, bambara nuts, soya beans or cowpeas **OR** - 3 tablespoons peanuts, or seeds like flax, chia, sunflower; pumpkin seeds **OR** - 1½ teaspoon peanut butter or flour **OR** - 1/3 cup coconut milk **OR** - About 97 grams of pulses **or** 30 g of nuts and seeds*	-2 eggs (95 g each) **OR** - 2 match box size or ~60 g red meat (beef, goat, sheet); or beef liver, **OR** - 3 match boxes size or ~90 g fish, or poultry like chicken, quails, duck, or rabbit **OR** - 1 cup milk or sour milk (245 g), **OR** - ¾ cup or 1 small tin yoghurt (200g) or 4 dice-size pieces of cheese (30 g)	One 15 millilitres tablespoon
Example on how to spread the total servings per day throughout the day	- 1/2 cup of cooked beans for lunch, **AND** - 3 tablespoons groundnuts as a snack	-Pick any one of the foods in the given amounts for dinner For example: 2 eggs or 3 matchbox-sized pieces of fish	This is added to meals when cooking
Recommended total amounts per day in food weight	195 grams	145 grams per day	28 grams per day
*nuts are energy dense per gram hence the lower amounts per serving **food weights for seafood and animal products that provide 130 Kcal vary a lot given the different energy densities of foods from this food group			
Note: Each food group recommendation has a detailed food exchange list for one serving size with Kcal, food weight and household measure for common food items.			

5.5 The science and explanation of how the Zanzibar serving sizes for each food group were determined

Although a serving size is a standardised recommended amount of food to be eaten daily from each of the food groups, there are no global harmonised standards for what constitutes a serving size or recommended numbers of servings per day for most food groups (FAO and FHI, 2016).

Given this, the serving sizes for the Zanzibar FBDGs are based on the standard serving definition form other countries like the United States of America and Australia for similar foods. The serving sizes for Zanzibar were further adapted to accommodate commonly consumed local foods particular to Zanzibar.

For Zanzibar, the standardized measure is based on set value Kcal for each food group. That is each food item in the food group should provide approximately that Kcal amount. For example, a serving of vegetable provides 70 Kcal, while a serving of fruit is 80 Kcal and cereals, roots and tubers is 200 Kcal. Depending on the energy density of foods, food weights per serving may vary within the same food groups particularly for fruits and animal source foods.

Through diet modelling, the linear program optimised various combinations of food items, their food weights and nutrient and energy density within the six foods groups to come up with a proportion contribution of each food group to the total Kcal a day (2 200 Kcal for the general population).

The diet optimisation process determined the number of serving sizes for each of the six food groups. The diet modelling also considered energy and nutrient intake recommendations for the population groups, commonly consumed foods and dietary pattern. Determining the serving sizes also took into account the ease of converting these serving sizes into everyday household measures and the prevailing portion sizes (the amount of food people usually consume) in Zanzibar.

Based on the Kcal serving definition, the diet model also provided the food weights equivalents of a serving in grams. The serving sizes will also be communicated to the public in everyday household measures such as cups or spoons to help with estimating the amount to be eaten per day as seen in Tables 6a and 6b.

For example, you could have three meals a day with:

Morning/breakfast	A sweet banana (fruit) **and** A glass (250 ml) of milk (animal-based food) **and** Sweet potatoes or cassava (roots and tubers)	**This means that during this day you would have eaten from six food groups:** **1. Cereal, roots, tubers, plantain** **2. Pulses, nuts and seeds** **3. Sea food and animal products** **4. Vegetables** **5. Fruits** **6. Healthy fats and oil (from oil added to dishes during cooking)**
Afternoon/lunch	Salad (vegetables) **and** Beans (legumes) **and** Rice (cereals)	
Snack	Golden apple [embe sakua] (fruit)	
Evening/dinner	Whole grain ugali (cereal) **and** Sardines (animal based food) **and** Cassava leaves (vegetables)	

5.6 MESSAGES FOR EATING DIFFERENT FOODS

1. Everybody, young and old, should enjoy eating a variety of foods from different food groups every day to stay healthy and strong.
2. Eat pulses such as beans, lentils, peas or nuts with your meals every day for good health.
3. Eat animal-source foods, including seafood, meat, milk or eggs every day to stay strong.
4. Eat different coloured vegetables every day to prevent and reduce risk of diseases.
5. Eat at least two different fruits every day for better health.
6. Eat staples such as cereals, starchy roots, tubers or plantains every day for a strong and active body.
7. Limit your intake of deep-fried and ultra-processed foods that contain fat, sugar and salt to prevent disease such as high blood pressure, diabetes and heart diseases.

5.7 Helpful Tips to eat a diversified meal

1. Make your plate colourful. Combine different coloured vegetables, roots, tubers, and pulses in your meals.
2. Eat mixed food. Adding different food groups to stews is a great way to eat many food groups in one meal.
3. Share a variety of meals with the whole family including young children.
4. Plan ahead. Planning your meals ahead can help you eat more variety of foods.
5. Choose different types of staples in a week including non-refined cereals, plantains, starchy roots and tubers.
6. Grow different types of food in a backyard garden for a continued supply of a variety of foods.
7. Keep livestock such as chickens, goats and rabbits to increase access to animal-source foods.
8. Preserve and store food safely to ensure a sustainable supply of various types of food.

6. RECOMMENDATION 1.2: Eat different coloured vegetables every day to prevent and reduce risk of diseases.

6.1 What is the Vegetables Group?

Vegetables are part of a plant such as leaves, flowers, stems and roots in different colours. Vegetables could be fresh, dried, frozen or canned. Vegetables are an important part of healthy eating because they are nutrient dense. Different vegetables provide different amounts of nutrients. Different colours in vegetables also indicate different concentrations of various nutrients hence it is important to eat a variety of vegetables every day.

Commonly available vegetables in Zanzibar are leafy vegetables, tomatoes, sweet pepper, okra, eggplants, radishes, beetroot, onions, seaweed, etc.

Roots and tubers such as potato, cassava, sweet potato and yam are not part of this group because they contain a lot of starch and are included in the grains, roots and tubers food group.

6.2 Importance of vegetables in a diet

Vegetables contain micronutrients, dietary fibre and phytochemicals and therefore confer many benefits to the body.

- **Vegetables are a rich source of vitamins A, iron, other vitamins and minerals.** Vitamin A and iron deficiency anaemia are of public health importance in Zanzibar, since over one-third of children under five years of age and women aged 15 to 49 have vitamin A deficiency, while 66 percent of children and over half of women have iron deficiency (NBS and ICF Macro, 2011). One of the factors could be a low intake of vitamin A-rich foods such as vegetables and fruits and orange vegetables and roots rich in carotene (a precursor for vitamin A). Examples include carrots, pumpkins, and red peppers, as well as dark leafy vegetables like amaranth leaves, pumpkin leaves, cowpea leaves and cassava leaves. Dark leafy vegetables are also rich in iron.

Vegetables are also rich in other vitamins such as C and B9 (folate); B6, B1 (thiamine), and B3 (niacin). Vegetables are also important sources of other minerals such as potassium, dietary fibre, phytochemicals, and plant proteins (Willet *et al.*, 2019; Slavin and Lloyd, 2012; WHO and FAO, 2002).

- **Eating a lot of vegetables boosts the body's immune functions** and helps to protect it from diseases and infections like colds and the flu. This is because the micronutrients, antioxidants and phytochemicals found in vegetables provide this protection. The amounts of each of these components vary depending on their type, colour and maturity, whether eaten raw or cooked and the method of preparation. Eating raw vegetables has many more health benefits than when they are cooked (Leenders *et al*., 2013). Furthermore, the consumption of a variety of vegetables within the same meal results in many more benefits than when individually consumed (Liu, 2000; Van Duyn *et al*., 2000).

- **Vegetables are protective against non-communicable diseases.** Consuming more than 400 g or more of fruits and vegetables every day reduces blood pressure and decreases the risks of heart diseases and stroke (WHO and FAO, 2002; Willett *et al*., 2019; WCRF/AICR). It is also associated with lowered risks of obesity, type 2 diabetes, cholesterol and lower blood pressure (WCRF/AICR, 2018; GBD, 2017a; UCSF Health, 2021a; Boeing *et al*., 2012). Eating a diet rich in whole grains, vegetables, fruits and pulses can also help one stay at a healthy weight, which is linked with a reduced risk of 11 cancers, making it one of the most important ways to reduce cancer risk (WCRF and AICR, 2018).

  According to the Global Burden of Disease Study (GBD), exposure to a diet low in vegetables is defined as the average daily consumption of less than 360 g per day of vegetables (fresh, frozen, cooked, canned or dried vegetables) (GBD, 2017b). The "Healthy Reference Diet" proposed by the EAT-Lancet Commission recommends consuming 300 g/day of vegetables (range 200 to 600 g), consisting of 100 g each of dark green vegetables; red and orange vegetables; and other vegetables (Willett *et al*., 2019). The WHO and FAO recommend a daily intake of 400 g of fruits and vegetables (WHO and FAO, 2002). GBD EAT-Lancet, WHO and FAO exclude legumes and salted or pickled vegetables, juices, nuts and seeds, and starchy vegetables such as potatoes, cassava and fresh corn from this vegetable group.

- **High consumption of vegetables is associated with longevity.** Low consumption of vegetables and of fruits is associated with mortality. WHO estimated that 3.9 million deaths worldwide were attributable to inadequate fruit and vegetable consumption in 2017. The majority of these deaths occur in low-income countries. Eating vegetables is associated with a reduced likelihood of developing several diet-related NCDs as well as reducing risk of mortality (Liu, 2003; Oyebode *et al*., 2014; WHO and FAO, 2003). The benefits of consuming vegetables are dose dependent: an increasing amount and variety is associated with stronger beneficial effects.

- **Vegetables are nutrient dense,** meaning they provide a lot of vitamins and minerals in relation to their weights. They have much lower calories than other food groups but pack much higher contents of health-promoting nutrients, thus nourishing the body without excess calories. They are also low in sodium which is also important for good health. Most vegetables are naturally low in fat and none have cholesterol (UCSF Health, 2021a).

- **Vegetables support weight loss and a healthy weight.** Vegetables contain no cholesterol and have a lot of fibre, hence a person feels full quickly and stays full longer, thereby reducing the calories consumed. Due to their low-

calorie content and their filling effect, vegetables are healthy and nutritious and can play a role in maintaining a good body weight and preventing obesity in Zanzibar (Swinburn *et al*., 2004).

6.3 People in Zanzibar do not eat enough vegetables and eat them less often

In Zanzibar, the overall intake of fruits and vegetables is low. More than a quarter (28.7 percent) of the population do not have a daily intake of fruits or vegetables, and only 2.1 percent have an intake at the recommended 400 g or more a day (MoH, 2015).

With the mean daily intake of vegetables at 56 g, combined with the 72 g mean daily intake of fruits for Zanzibaris, the total consumption of 128 g of fruits and vegetables is below globally recommended intakes. Further, vegetables in Zanzibar are consumed 2.8 days a week instead of daily, indicating a lack in the recommended quantity and frequency (WHO and FAO, 2002).

According to the Food Security and Nutrition Department, in 2016 there was low consumption of fruits, fish, vegetables and animal products in Zanzibar, which contributed less than 5 percent of the total daily calorie intake (FSND, 2016). A diet low in vegetables may not supply sufficient amounts of provitamin A carotenoids and iron for the Zanzibari population.

6.4 The scientific basis of the health and nutritional benefits of eating plenty of vegetables

The most commonly cited mechanisms and pathways for the protective action of vegetables in the medical literature include the contribution of phytochemicals, dietary fibre, low energy density, and a wide range of micronutrients (Boeing *et al*., 2012; Slavin *et al*., 2012).

Phytochemicals in particular are singled out for their effects on the modulation of detoxification enzymes, antioxidant activities (removing dangerous free radicals in the body), boosting of the immune system and antibacterial and antiviral effects as well as blood pressure lowering effects (Lampe *et al*., 1999).

The different types of dietary fibre, including insoluble and soluble fibre, found in varying amounts in different vegetables is essential for the prevention of diseases including cancer and heart diseases. The dietary fibre adds bulk to stools, making them soft and easy to expel from the body thereby reducing intestinal problems like constipation, and keeps the gastrointestinal system healthy overall. Some fibre fractions are prebiotics and favour the growth of beneficial bacteria or probiotics in the colon. These bacteria ferment fibre, producing short-chain fatty acids, which are a useful energy source for the cells of the colon (FAO and WHO, 1997).

It should be emphasized that vegetables should form part of a varied diet that includes consumption of other foods like fruits, whole grains, pulses, nuts and seeds which are also rich sources of fibre and key micronutrients. The varied diet should be complemented by seafoods and small amounts of animal-source foods.

6.5 Recommended amount of vegetables to eat per person per day

Eat at least 280 g or about two servings of leafy vegetables and non-leafy vegetables referred to as "spices" in Zanzibar, such as carrots, onions and tomatoes every day. One serving of vegetables is based on 70 Kcal with an average food weight of 140 g per serving.

One serving is the equivalent of one cup of cooked vegetables or two cups of uncooked vegetables. To make a total of two servings per day, combine the options given in Figure 2 and Table 7.

6.6 Prepare vegetables properly to avoid losing nutrients

Healthy eating involves healthy cooking. Although vegetables are nutrients dense, they can lose their nutrient values depending on the preparation and cooking

methods. Heat can destroy vitamins during the cooking process and similarly, boiling can leach minerals from the vegetables into the water. Up to more than 50 percent of vitamin C may be lost during cooking due to heat. Vitamins may be lost when cooking water is discarded which is a common practice in Tanzania. This is because some vitamins like vitamin C are a water-soluble and temperature-sensitive, so the vitamins easily degrade during cooking. Elevated temperatures and long cooking times have been found to cause particularly severe losses of vitamin C (Tian *et al*., 2016).

To preserve all the nutrients, vegetables should be washed before chopping and cooked while covered at a low temperature and for a minimum time. Do not discard the water used for cooking, but use it to make soup. Add small amounts of oil to dark green and yellow vegetables to improve vitamin A absorption.

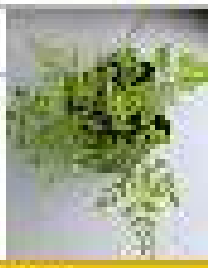
6.7 Types of vegetables to limit

Pumpkins contain a lot of carbohydrates compared to other vegetables. Although they are rich in vitamin A and other nutrients, they should be limited to one serving of vegetables. More than one serving of pumpkin can be eaten per day by counting those extra servings as a staple, and eating them instead of rice, potatoes or cassava.

DID YOU KNOW?

Moringa is more nutrient dense that other foods.

Moringa contains 18 of the 20 amino acids including all the essential amino acids as well as Omega 3, 6 and 9



Gram per gram Moringa contains more than these foods multiple times			Moringa	
			Dry leaves	Fresh leaves
Vitamin A	Carrots		10 x	4 x
Iron	spinach		25 x	6 x
Calcium	Milk		17 x	4 x
Potassium	Banana		15 x	3 x
Protein	Yogurt		9 x	2x
Vitamin C	Oranges		0.6 x	7x

Figure 2: One serving equivalent of vegetable exchange list

Add or combine any of the vegetable measures below to make two servings per day for vegetables. Each measure is listed as a one/single serving equivalent

One cup raw (uncooked) or cooked hard vegetables	 Carrots, beet root, green peas, green beans, radishes, cabbage, broccoli, celery, etc.
Two cups raw leafy, or soft vegetables and salads	 Leafy: cowpeas, bean, pumpkin, sweet potato, cassava, moringa, okra, baobab and amaranths leaves, Chinese cabbage, mustard greens, soft mushrooms, egg plants, etc.
One cup cooked leafy and soft vegetables	 Leafy: cowpeas, bean, pumpkin, sweet potato, cassava, moringa, and okra, and amaranths leaves, Chinese cabbage, and mustard greens, soft; mushrooms, egg plants, etc.

Table 7: One serving equivalent of vegetables exchange list

Food description	Food serving measure*			Nutrient values per serving**							
	Cups (250ml)	Grams (g)**	Table-spoons	Energy	Vit C	Vit A	Iron	Folate	Calcium	Zinc	Fibre
				(Kcal)	(mg)	(mcg)	(mg)	(mg)	(mg)	(mg)	(g)
Amaranth leaves (boiled)	1	132	8	57	25	301	6.4	55.4	501.6	0.8	2
Baobab leaves (boiled)†	1	160	10	118.8	32	626	5	78.4	501.4	1.2	12.2
Carrot (raw, chopped)†	2	256	18	104	15.2	2137.6	0.8	48.6	84	0.6	7.2
Cassava leaves (boiled)	1	160	10	162.4	26.2	432.8	7	99.2	441.8	0.8	6
Chinese cabbage (cooked)†	1	170	12	22.2	76.6	379.2	1.4	112.2	178.6	0.4	1.8
Cowpea leaves (boiled)	1	160	10	69.8	38.4	227.2	6.4	108.6	424.6	0.6	6
Cucumber (raw)	2	208	14	32	5.8	10.4	0.6	14.6	33.2	0.4	1
Eggplant (cooked)	2	200	14	64	8.2	5	1.6	30.6	26.4	0.2	5.6
Green beans (boiled)	1	125	8	54	14.6	30.8	1.2	45.8	60	0.4	3.4
Green mustard (boiled)†	1	140	10	36	35.4	865.2	1.2	12.6	165.2	0.2	2.8

Continued on page 43

Food description	Food serving measure*			Nutrient values per serving**							
	Cups (250ml)	Grams (g)**	Table-spoons	Energy (Kcal)	Vit C (mg)	Vit A (mcg)	Iron (mg)	Folate (mg)	Calcium (mg)	Zinc (mg)	Fibre (g)
Green pea (cooked)	1	160	10	68	76.6	83.2	3.2	46.4	68	0.6	4.4
Kale/rape (cooked)†	1	130	8	46	23.2	189.8	1	84.6	195	0.4	5.2
Moringa powder (raw)*	-	20	2	76	4.25	4725	24	-	500	-	5
Moringa/ drumstick leaves (cooked)	1	136	10	81.6	42.2	4106	3.2	31.2	784	1	2.8
Okra [lady's fingers] (cooked)	1	160	10	36	26	22.4	0.4	73.6	124	0.6	4
Okra leaves (boiled)	1	160	10	68.2	24.2	85	0.8	99.2	475.2	1.2	8.2
Onion (boiled)	1	160	10	72	6.8	0	0.4	16	46.4	0.4	3.6
Onion (raw)	1	160	10	60	16.4	0	0.4	25.6	40.2	0.4	2.8
Pumpkin (cooked, mashed)*	1	244	16	48.8	12	264	1.4	-	36.8	-	2.6
Pumpkin leaves (boiled)	2	142	10	42	6.6	258.4	2.6	27	504	0.2	3.6

Continued on page 44

Food description	Food serving measure*			Nutrient values per serving**							
	Cups (250ml)	Grams (g)**	Table-spoons	Energy	Vit C	Vit A	Iron	Folate	Calcium	Zinc	Fibre
				(Kcal)	(mg)	(mcg)	(mg)	(mg)	(mg)	(mg)	(g)
Sea weed (cooked in oil)†	1	96	6	58	28.8	216	1.6	94	61.4	1	0.2
Sea weed (dried)†	-	28	2	102	24.2	-	3.6	-	101.2	-	10.2

6.8 MESSAGES FOR EATING MORE VEGETABLES

1. Eat two servings (280 g) of seasonally available vegetables every day.
2. Select from a wide variety of vegetables with different colours throughout the week to increase the variety of nutrients consumed:
   - ◇ Green leafy vegetables e.g. amaranth leaves, moringa leaves, pumpkin leaves, cowpea leaves, cassava leaves, sweet potato leaves, spinach, lettuce, cabbage, baobab leaves and tamarind leaves
   - ◇ Orange vegetables e.g. carrots, pumpkin fruit and flowers
   - ◇ Red vegetables e.g. tomatoes, red peppers and beetroot
   - ◇ White vegetables such as onions, cauliflower and cabbages
   - ◇ Other vegetables e.g. eggplant, tomatoes, cucumber, green pepper.
3. Eat green leafy vegetables and orange vegetables to increase your intake of vitamin A.
4. Choose fresh or frozen vegetables rather than canned vegetables or vegetable juices.
5. Add one to two teaspoons of vegetable oil when cooking leafy green or yellow vegetables. Oil helps with the absorption of vitamin A.

6.9 Helpful Tips to increase and enjoy the consumption of vegetables

1. Start your own garden. A very small space can yield plenty of vegetables. Some vegetables can make beautiful flower beds.
2. Exchange and barter different varieties with your neighbours.
3. Buy fresh vegetables in season – for better value, cheaper and fresher.
4. Make your pot or plate colourful with different types of vegetables.
5. Preserve vegetables by drying so that you can enjoy them when they are out of season.
6. Do not overcook vegetables because heat destroys certain vitamins.
7. Do not add soda or ash to vegetables as it destroys certain vitamins.
8. Add one to two teaspoons of vegetable oil when cooking leafy green or yellow vegetables. Oil helps with vitamin A absorption.
9. Vegetables such as carrots and cucumbers make quick and easy grab-and-go snacks that can be enjoyed at home, at work or at school.
10. Apart from a side dish to meals, make vegetables part of other dishes.
11. Add vegetables to soups, stews, staples and other dishes. Carrots, extra onions, and green peas make dishes colourful, tasty and nutritious.
12. Add grated carrots and sliced tomatoes to breakfasts or omelettes.
13. Add vegetables to smoothies and/or homemade juices. Carrots, beetroot, cucumbers or leafy vegetables are perfect ingredients for a smoothie.
14. Cook different vegetables together and add herbs to make fresh vegetable stews or homemade vegetable soups.
15. Try something new – try new recipes and buy new vegetables as part of shopping each month. There are many ways to prepare, cook and eat vegetables, including stir-frying, steaming, boiling, grilling or baking them.

6.10 Helpful Tips to preserve nutrients in vegetables and fruits

1. Stir-fry, steam, boil, grill or bake your food to better preserve the nutritional value of vegetables and fruits.
2. Cut vegetables after washing, not before.
3. Peel fruits and vegetables as thinly as possible, as some fruits and vegetable carry nutrients right under the skin.
4. Use a sharp blade to cut green leafy vegetables, because a dull blade will bruise the vegetables, which will cause a rapid loss of vitamin C.
5. Use the least amount of water possible when cooking as some vitamins are lost when cooking liquid is thrown out.
6. Use the cooking water or liquid to make soup.
7. Choose steaming over boiling when possible.
8. Don’t cook vegetables for a long time as some vitamins are destroyed by heat.
9. Add small amounts of oil when cooking dark green leafy or yellow vegetables to improve vitamin A absorption,
10. Do not add soda or ash to vegetables as it destroys certain vitamins.
11. Cook fruits and vegetables just in time for eating as a long waiting time causes a loss in nutritive value.

7. RECOMMENDATION 1.3: Eat at least two different fruits a day for better health.

7.1 What is the Fruits Group?

Fruits include mango, papaya, banana, pineapples, guava, watermelon, avocado, citrus fruits like oranges and lemons, and wild fruits like rubber vine ([ma] bungo/*saba comorensis*), golden apple (embe sakua/*spondias cytheera*) baobab, shoki-shoki, etc. The fruits can be fresh, dried, frozen or canned. Fruit juices are not included in this group because they are highly concentrated in sugars which cause tooth decay, and the juicing strips the dietary fibre from the fruits.

7.2 Importance of eating fruits

Fruits are a great source of dietary fibre, phytochemicals, vitamins and minerals. Phytochemicals give fruits their different colours, flavours and tastes which come with different health benefits. Fruits are good for everyone – men, women, the young, and the aging.

1. Orange-coloured fruits like papaya and mango are also an excellent source of vitamin A which helps to strengthen the immune system, prevent vitamin A deficiencies and also prevent night blindness (Willett *et al*., 2019). They provide the same benefits as vitamin A-rich vegetables.

2. Vitamins such as folate and vitamin C, and minerals like potassium, promote good health, a quick healing process and prevent diseases (Slavin and Lloyd, 2012). Folate helps the body to form red blood cells and prevents neural tube birth defects (FAO and WHO, 2004).

3. Adequate fruit intakes decrease the risk of high blood pressure, heart diseases, and some cancers (Patra AK, 2012).

   WHO and FAO recommend 400 g or more of fruit and vegetables per day, and similarly, the World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) also recommend at least 400 g of a variety of non-starchy vegetables and fruit every day. The GBD Study defines exposure to a diet low in fruits

as an average daily consumption of less than 250 g per day of fruits (GBD 2017b). The EAT-Lancet Commission proposed an average daily fruit intake of 200 g per day of fruits (range 100 to 300 g) (Willett *et al*., 2019).

4. The dietary fibre that fruits provide adds bulk to stools, making them soft and easy to expel from the body. In addition, dietary fibre makes a person get full quickly and for longer periods, thereby reducing the calorie intake and preventing weight gain (Maćkowiak *et al*., 2016).

7.3 Zanzibaris do not eat enough fruits daily

Consumption of fruits in Zanzibar is low in frequency and quantity. Fruits are consumed 3.9 days a week instead of daily as per the global recommendation. Almost one third (28.7 percent) of the population do not eat fruits or vegetables daily, and only 2.1 percent eat the recommended servings a day of fruits and vegetables (MoH, 2012).

Mean daily intake of fruits for Zanzibaris is 72 g (Keller, *et al*., 2012) which is below the recommended global reference intakes or the 280g set for Zanzibar as per the diet modelling.

A low intake of fruits is associated with an increased risk of developing NCDs, especially cardiovascular diseases, diabetes mellitus, chronic obstructive pulmonary disease and cancers. Low intake of fruits contributes to micronutrient deficiencies like vitamin A and iron deficiency anaemia which are a public health problem in Zanzibar (MoH, 2012).

7.4 The recommended amount of fruits per person per day for Zanzibar

The recommended intake for Zanzibar is two servings a day which is about 280 g per day. Based on diet modelling, a serving of fruit provides 80 Kcal with an average weight of 140 g per serving. Examples of one fruit serving equivalent are as shown in Table 8. Chose two from these options or other options available including wild fruits.

7.5 What would a serving of fruits look like?

- **1 cup of cut fruit or small fruit OR**
- **1 medium banana or apple; OR**
- **1 large orange, peaches similar size fruits OR**
- **2 small tangerines, or peaches, guavas or similar size fruits as per Table 8.**

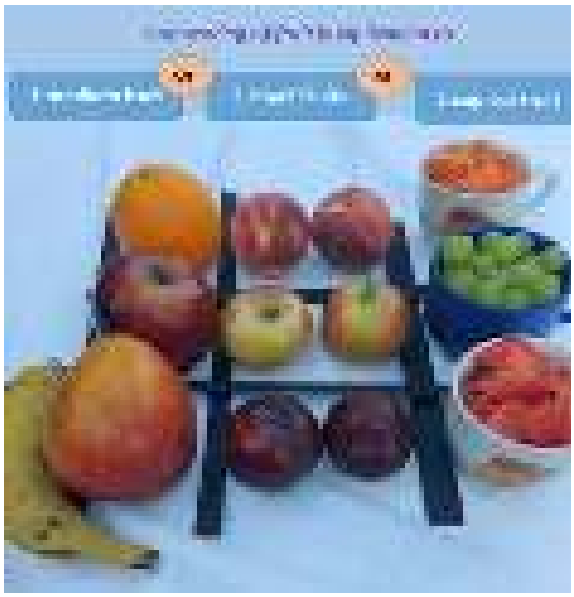


Table 8: One fruit serving equivalent

Food description	Food serving measure*			Nutrient values per serving**							
	Cups	Grams (g)**	Quantity & size	Energy	Vit C	Vit A	Iron	Folate	Calcium	Zinc	Fibre
				(Kcal)	(mg)	(mcg)	(mg)	(mg)	(mg)	(mg)	(g)
Banana, white flesh	-	120	1 medium; 17-19cm long	120	13	5	<1	23	8.4	0.2	2.4
African locust bean fruit, pulp (raw)	-	30	-	86	67	58	1	-	34	0.28	3.6
Apple, with skin (raw)	-	140	1 medium; 7cm diameter	75	6	4	<1	4	8.4	<1	3.4
Baobab pulp†^	-	45	-	136	111	2.6	2.5	-	124.1	<1	3.1
Diced fruit - e.g. papaya and other cut fruit (raw, ripe)	1	145	-	51.9	84	116	1	36.3	29.6	<1	2.8
Custard apple/ Sweet apple, raw	-	87.5	-	80	31.5	0.2	0.6	-	-	20.6	-
Granadilla/ passion fruit (raw, without refuse)†	-	90	5	87	27	58	1.4	13	10.8	0.1	9

Continued on page 51

Food description	Food serving measure*			Nutrient values per serving**							
	Cups	Grams (g)**	Quantity & size	Energy	Vit C	Vit A	Iron	Folate	Calcium	Zinc	Fibre
				(Kcal)	(mg)	(mcg)	(mg)	(mg)	(mg)	(mg)	(g)
Grapes†	1	90	-	60.3	4	4.5	0.3	3.6	12.6	0	0.8
Guava (raw, without refuse)	-	110	2	65	287	39	<1	8	25.3	<1	6.2
Jack fruit †		84.2	-	80	11.5	4.2	0.2	24.0	20.2	0.1	1.3
Java plums †	-	133.3	-	80	19.1	0.0	0.3	-	-	25.3	-
Mango, orange flesh (raw)	1	165	-	106.2	60	276	1.1	41.7	28.5	<1	3.5
Orange	-	185	1 large; 7.5-8cm diameter	80	87	14	<1	62	57	<1	3.1
Pear†	-	150	1 small	85	7	1.5	<1	11	13.5	<1	-
Jujube raw	-	87.2	-	80	5 4.8	1.5	0.7	-	-	27.9	0.1

Continued on page 46

Food description	Food serving measure*			Nutrient values per serving**							
	Cups	Grams (g)**	Quantity & size	Energy	Vit C	Vit A	Iron	Folate	Calcium	Zinc	Fibre
				(Kcal)	(mg)	(mcg)	(mg)	(mcg)	(mg)	(mg)	(g)
Tamarind (raw, ripe)	-	30	-	75	-	0.3	<1	5	45.3	<1	5,5
Tangerines	-	150	2 small; 5-6cm diameter	84	40	51	<1	24	55.5	<1	-
Watermelon, (raw)	1.5	230	-	67.2	17	96	<1	8.8	16.1	<1	0.8
African Black plum/Java plum (wild), ripe raw* **		71.4		80	7.1	trace	0.8	-	-	17.9	0.0
Soursop, raw * **		103.9		80	62.3	0.0	0.4	6.0	6.2	20.8	0.2
Pomegranate raw **		102.3		80	15.4	2.0	0.7	24.0	24.6	12.3	0.4
Avocado, pulp, raw**		51.9		80	7.3	3.1	0.4	35.3	18.3	7.8	0.3
Dates **		53.6		80	7.5	1.1	0.2	25.0	13.4	12.9	0.1
Blackberries, raw$_{+}$		186.0		80	39.1	20.5	1.1	25.0	46.5	54.0	0.9

Continued on page 46

Food description	Food serving measure*			Nutrient values per serving**							
	Cups	Grams (g)**	Quantity & size	Energy	Vit C	Vit A	Iron	Folate	Calcium	Zinc	Fibre
				(Kcal)	(mg)	(mcg)	(mg)	(mcg)	(mg)	(mg)	(g)
Star fruit, raw**		60.6		80	77.0	0.0	0.9	-	-	14.5	0.6
Rose apple/ wax apple/Java apple, raw+		320.0		80	71.4	54.4	0.3	-	-	92.8	0.3
Peaches (yellow)*	1 large	175		70	12	28	0.4	7	10.5	<1	2.6
Peaches 1 cup (sliced)*	1 cup	154		60	10	25		9.5	9.2	<1	2.3
Other fruits like Shoki-shoki, Bilimbi, Rambutan, Durian, Rubber vine (wild), Fracassis, Mobola plum, Jelly palm, Pomelo also provide you with plenty of vitamins and minerals											
Consume two daily fruit servings by choosing any of the foods above. Each food amount listed is the equivalent of one serving.											
*USDA; rounded values **Based on the Zanzibar Diet Model FCT unless otherwise stated; rounded values *** Based on West Africa FCT 2019 †Values based on the USDA FCT ^FCT only has values for baobab pulp (without seeds). Please eat baobab with little or no sugar to get the health benefits ^^Eat rubber vine with little or no sugar to get the health benefits.											
Note: Where fields are blank, no value was available in the food composition table.											

7.6 MESSAGES FOR EATING MORE FRUITS

1. Eat two servings of fruits every day.
2. Eat fruits as snacks between meals.
3. Choose different coloured fruits every day as each colour represents different nutrients and compounds that are beneficial to your health.
4. Enjoy fruits in season; they are fresher and low cost.
5. Eat wild fruits because they are packed with nutrients for example baobab and tamarind are rich in calcium and vitamin C.
6. Eat whole fresh fruits with their skins instead of fruit juices.
7. If you need to drink fruit, blend the whole fruit and drink it with the fruit pulp.
8. Limit fruit juices because they contain high amounts of added sugars and lack dietary fibre compared to fresh fruits or blended whole fruit.
9. Limit dried fruits because they are concentrated in sugars and can cause tooth decay when they get stuck in between teeth.

7.7 Helpful Tips to enjoy the consumption of more fruits

1. Choose fruits as a snack instead of sweet treats or doughnuts.
2. Leave fruits in an open and easily accessible area for convenient snacking.
3. Grow your own fruit trees.
4. Add a serving of fruit to your breakfast or other meals.
5. Choose fruits that are in season as they are cheaper.

8. RECOMMENDATION 1.4: Eat animal-source foods including seafood, meat, milk or eggs every day to stay strong.

8.1 What is the Seafood and Animal Products Group?

These refer to red and white meat; seafood like fish, sardines, octopus, and squid; eggs; and milk. White meat includes chicken, quail, duck, guinea fowl, and rabbit etc. Red meat includes beef, goat, lamb, mutton and veal. Milk and milk products are part of this group.

Animal products such as butter and ghee are excluded from this food group and classified as oils and fats. Processed meats are not included in this group because they are risk factors for developing chronic diseases.

8.2 Importance of eating from the Seafood and Animal Products Group

Seafood and animal-source foods are rich in protein and are a good source of iron, zinc, and vitamins A and B, which are especially important for growth and development. Vitamin B12 is found in animal-source foods and lacks in plant-based diets. Animal proteins have a complete profile of amino acids and thus are more easily used by the body than the plant-based proteins found in pulses, nuts, and seeds. Liver meat is the richest source of iron. Iron deficiency anaemia is a public health problem in Zanzibar affecting women and children. Milk is a rich source of calcium which is essential in building and maintaining strong bones and teeth. Seafood, meat, milk, and eggs should be a part of a healthy diet for all household members, including women and children.

The consumption of animal-source foods prevents iron-deficiency anaemia, therefore, it is important that children and women, especially those who are pregnant and lactating, eat more of this food group. Eating more seafood and animal-source foods like meat, eggs, and milk can also help improve growth and development in children. These foods can help children learn better, be more active, and stay healthy.

When eating from this food group, select seafoods as much as you can; take milk and milk products daily and white meat like poultry regularly. Limit the intake of red meat and avoid eating processed meats. Among animal-source foods, fish and poultry are the healthiest options due to their healthy fatty acids/oils and are associated with a reduced risk of cardiovascular diseases and stroke.

8.3 What is the difference between red and white meat?

As the name suggests, red meats like beef, goat and mutton are red in colour due to the presence of myoglobin, a muscle pigment that causes meat to be red. White meats like chicken, poultry and birds are white in colour, because they have less myoglobin content.

The biggest difference between white and red meats is fat content. White meat is a leaner source of protein, with a lower fat content in general. White meats contain high amounts of polyunsaturated and mono-unsaturated fatty acids like omega-3 and omega-6 fatty acids, which help to reduce the 'bad cholesterol' like the LDL and increase the 'good cholesterol' the HDL (Bowen, Harris and Kris-Etherton, 2016; Farrell, 2012). In addition, white meat, such as fish and poultry (without skin), are lower in saturated fats when compared to red meat. Further, chicken meat does not contain trans fats unlike red meat like beef and lamb (Abete *et al*., 2014). One of the conclusions from a meta-analysis of prospective cohort studies (13 studies involving 1 674 272 individuals) was that "white meat consumption might be the 'healthy' alternative to red and processed meat consumption". This is because even with the same number of servings of red meat, the consumption of fish, poultry, dairy products, and especially nuts were associated with a lower risk of diseases such as heart diseases like strokes, type 2 diabetes, certain types of cancers, weight gain and mortality (IARC, 2015).

8.4 Why limit the intake of red meat and avoid processed meats?

Red meat contains higher amounts of saturated fats which can increase the bad cholesterol (LDL), increasing the risk of heart disease and stroke. Saturated fats, found in the white marbling of red meat, are also found in poultry skin, cream from milk, and cheese. Red meats also contain trans fats which increase the risk of coronary heart disease (CHD). Red meat contains higher levels of B vitamins, iron and zinc compared to white meat. Although red meat contains more vitamins and minerals, limit the consumption of red meat since a high consumption has been correlated with an increased risk of NCDs. A high intake of red meat increases the risk of heart diseases like stroke, type 2 diabetes, certain types of cancer, weight gain and mortality (WHO, Cancer 2015; IARC, 2015; Song *et al*., 2016; Bernstein *et al*., 2010; Abete *et al*., 2014;WCRF and AICR, 2018). Select white meats and seafood as options of animal-source foods.

Processed meats such as luncheon meats, corned beef, sausages, hot dogs and burgers, smoked/cured products, beef salami, and smoked fish are linked to cancer. WHO placed the risk of eating processed meat in the same category as smoking (WHO, 2015a). This could be attributable to the high levels of sodium and nitrates in processed meats that can increase risks of developing cancer (Bouvard *et al.,* 2015; IARC and WHO, 2015).

According to the World Cancer Research Fund (WCRF), "processed meat" refers to meat that has been transformed through salting, curing, fermentation, smoking or other processes to enhance flavour or improve preservation. Nitrite is used to preserve processed meat (WCRF and AICR, 2018). In the Global Burden of Disease Study, exposure to a diet high in processed meat is defined as the average daily consumption greater than 2 g of meat (GBD, 2017b).

Therefore, adopting a diet containing a reduced amount of meat, especially red meat, and avoiding processed meat products is ideal. Fish and white meat are good options for animal-source food intake.

8.5 Recommended amounts of animal-source foods

Eat one serving of seafood and animal products every day. One serving is based on 130 Kcal per day. Each food amount listed in Table 9 is one serving equivalent. Make one daily serving by selecting and combining these foods. Where possible, include milk as a daily serving as part of the animal-source food. Eat fish as often as possible, and at least one to two servings of animal-source foods per week should come from oily fish, such as mackerel. Eating small fish with bones, like anchovies, whitebait and sardines, has the additional benefit of providing calcium. If red meat such as beef, goat and lamb is eaten, cut down to less than 160 g equivalent a week to help protect against heath diseases and some cancers.

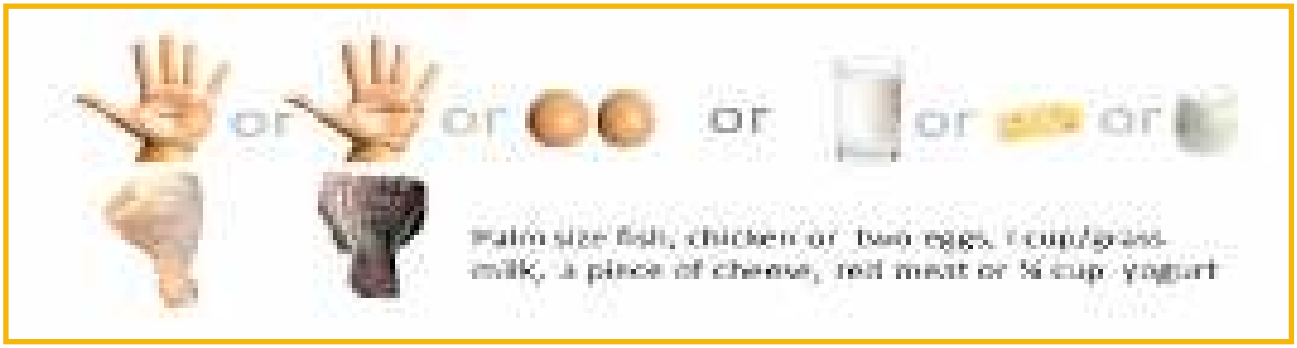
Table 9: Seafood and animal products one serving equivalent

Food description	Food serving measure*	Nutrient values per serving*						
	Grams (g)	Energy	Protein	Iron	Folate	Zinc	B12	Calcium
		(Kcal)	(g)	(mg)	(mg)	(mg)	(mg)	(g)
Anchovy (steamed)	85	135	23.5	3.2	6	2.2	0.7	109.7
Beef meat, lean (boiled, without salt)*	65	137	23	2.3	5.2	4	0.9	4.6
Chicken liver (braised, without salt)**	80	135	22	9.6	596.8	3.5	19.2	12
Chicken meat, light flesh (boiled, without salt)**	95	135	29.5	0.6	5.7	1	0.2	9.5
Eels								
Eggs [2 large] (hard-boiled)	100	135	12.6	1.7	38	1.2	0.7	53
Goat meat (boiled, without salt)**	65	135	17	2.3	2.9	3.3	0.7	8.3

Continued on page 57

Food description	Food serving measure*	Nutrient values per serving*						
	Grams (g)	Energy	Protein	Iron	Folate	Zinc	B12	Calcium
		(Kcal)	(g)	(mg)	(mg)	(mg)	(mg)	(g)
Sardine, steamed* (without salt)	101.3	130	24.3	1.8	3.2	2.0	11.1	89.7
Mackerel, boiled* (without salt)	106.7	130	20.7	0.7	0.7	0.5	2.0	29.1
Tuna, boiled* (without salt)	82.2	130	24.0	0.9	10.7	0.5	4.2	14.8
Sword fish, cooked, dry heat	78.8	130	18.5	0.4	1.6	0.6	1.3	4.7
Barracuda, steamed* (without salt)	133.1	130	29.8	1.1	9.3	0.8	2.7	41.2
Rabbit meat (stewed or grilled)	70	135	22	1.2	3	1.7	7	13.3
Tilapia (steamed, without salt)**	115	135	25.4	1.4	23	1.1	1.7	23
Consume one daily serving of seafood and animal products by choosing any of the foods above. Each food amount listed is the equivalent of one serving.								
*Based on the Zanzibar Diet Model FCT; rounded values **To match and reach adequate intake of the key nutrients, the quantity gives a higher than targeted energy								
Note 1: Where fields are blank, no value was available in the food composition table. **Note 2:** Other fish to choose from are white bait, travellys and king fish.								

Figure 3: Seafood and animal products one serving estimate

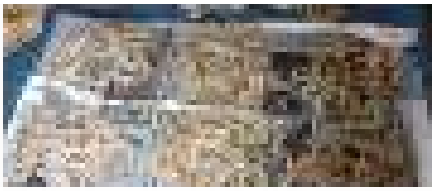
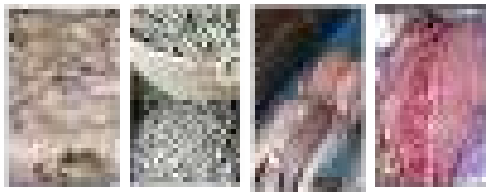


8.6 MESSAGES FOR EATING ANIMAL SOURCE FOODS

1. Eat one serving of fish, poultry (e.g. chicken), milk, or eggs every day.
2. Eat seafood as often as possible weekly, with one to two servings of fatty fish, such as mackerel, sardines, travellys, yellowfin tuna, sword fish, king fish, and barracuda. Also choose small fish eaten with bones, like fresh whitebait and anchovies, to get the benefits of calcium.
3. Eat more white meat like chicken or other poultry and insects and eggs instead of red meat.
4. Limit the intake of red meat to less than 160 g (the size of two plams) per week.
5. Avoid eating processed meat such as sausages, luncheon meats and polony.
6. Cook meat thoroughly to prevent food-born illnesses.
7. Eat unsweetened yoghurt to reduce sugar intake.
8. Avoid eating cheese with a lot of salt.
9. Limit intake of ice-cream, butter and cream which are high in fat, sugar and salt.
10. Share fish, chicken, milk, eggs and meat with everyone in your family. Pregnant and lactating women should include poultry and meats in their diet.

8.7 Helpful Tips to enjoy the consumption of seafood and animal products

1. Raise small animals like rabbits and chickens at home for consumption.
2. Enjoy small fish with bones regularly. The bones are rich in calcium.
3. Drink milk as a beverage during meal times or between meals instead of fizzy drinks.
4. Eat breakfast cereals with milk or yoghurt.
5. Add milk to teas, coffees and smoothies.
6. Add chicken/poultry and fish to your mixed meals.
7. Add an egg to children's porridge or meals to support growth.
8. Offer poultry and meats to infants and young children aged six months to 24 months to increase iron intake.
9. Trim fats off the meats and discard poultry skin before cooking.



9. RECOMMENDATION 1.5: Eat pulses such as beans, lentils and nuts or oily seeds every day for good health.

9.1 What is the Pulses, Nuts, and Seeds Group?

Legumes are plants that belong to the Leguminosae family that includes the seed, pod, leaves and all edible parts.

Pulses are the dry edible seed from a legume plant, usually with seed pods that have two halves (FAO, 1994; FAO 2016). Pulses include foods like beans, peas, chickpeas, cowpeas, bambara beans, dried peas and lentils. Nuts include groundnuts and cashew.

Oily seeds include sunflower, sesame, pumpkin and melon seeds. Coconut milk is also part of this food group.

9.2 Importance of eating from the Pulses, Nuts and Oily Seeds Group

1. **They are cheaper sources of protein than animal source foods.** Pulses, nuts, and seeds are affordable sources of proteins and are cheaper than animal-source foods. When combined with other complementary plant proteins, they provide the body with all the essential amino acids. Proteins are important for building muscles, bones, cartilage and skin, as well as making hormones and blood cells.

Plant-based proteins from this food group should be eaten together with grains to ensure that the body gets all the essential amino acid in a day. This is because, except soya and quinoa, pulses, nuts and seeds do not contain all essential amino acids and hence need to be combined with complementary plant proteins like grains (FAO and WHO,1989). The different amino acids and contents founds in pulses, grains, nut and seeds complement each other and this mixture provides the body with all the essential amino acids it needs.

For example, many beans contain no or insufficient amounts of methionine and cysteine, amino acids found in larger quantities in grains, and conversely, grains like rice are too low in lysine while pulses are higher in lysine. Thus, it is possible to get enough of each essential amino acid throughout the day by eating a varied diet and combining complementary plant proteins.

2. **They are packed with micronutrients and are key in preventing micronutrient deficiencies.** Pulses are also great sources of iron, zinc, phosphorus, magnesium, selenium, calcium, copper, manganese, B vitamins, phytochemicals and dietary fibre.

   Iron from beans, lentils, and peas is best absorbed by the body when taken with foods that contain vitamin C, like green leafy vegetables and citrus fruits.

   Nuts and seeds also provide proteins, minerals such as iron, zinc, magnesium, folate, B vitamins, vitamin E and copper that help to improve the body's immune function. They are also a great source of unsaturated fats including both polyunsaturated and monounsaturated fatty acids. Unsaturated fats are healthy fats that play vital roles in the body.

   The phytochemicals or antioxidants present in legumes could play a role in repairing damaged cells and hence help to prevent certain cancers (FAO, 2016).

3. **Pulses are a healthier alternative to animal-source foods and are NCD protective.** Studies have found that replacing red meat with plant-based proteins like pulses reduces the risk of mortality and helps to prevent non-communicable diseases including diabetes, coronary heart disease and cancers (Kim *et al*., 2017).

   a. *They reduce the risk factors for cardiovascular diseases.*
   A meta-analysis of 36 randomised controlled trials found that replacing red meat with plant-based proteins reduced risk factors for cardiovascular disease (blood cholesterol, triglycerides, blood pressure) (Guasch-Ferré M *et al*., 2019). Similarly, eating legumes is protective against developing cardiovascular disease (Kaliwile, 2019; Liu, 2003; Van and Pivonka, 2000). Studies have found a 22 percent lower risk of cardiovascular diseases when legumes are eaten at least four or more times a week (Flight, 2006; Hutchins, 2012).

   The mono and polyunsaturated fatty acids in nuts and seeds help in lowering the risk of coronary heart diseases. This is because they reduce the amount of low-density lipoproteins cholesterol in the blood (Mukuddem-Petersen *et al.,* 2005; Kim *et al*., 2017).

   b. *Pulses help to control diabetes.*
   Pulses help to control diabetes because of the complex carbohydrates and dietary fibre which slows down the digestion of carbohydrates into sugar glucose. The slow release of sugar helps to maintain the body's blood glucose at desired levels, thereby regulating insulin in the blood and preventing and controlling diabetes (WHO and FAO, 2002; Mann, 2007).

   c. *They protect against cancers.*
   Eating pulses, fruits and vegetables, and whole grains which have a high dietary fibre content, protects against colorectal cancer (WCRF and AICR, 2018). Nuts and seeds lower the risks of some cancers such as breast cancer. The prebiotics in pulses, nuts and seeds also play a role in maintaining gut health due to their function as the body's natural digestive regulators.

   In addition, soy is linked to reducing the risk of 11 types of cancers

(WCRF and AICR, 2018). Soy foods are especially important in reducing the risk of breast cancer and other hormone-related cancers, because they contain high concentrations of phytoestrogens and have weak oestrogenic effects, which might block actions of endogenous oestrogens. Consumption of soy foods during childhood and early adult life reduces the risk of premenopausal breast cancer. This relationship has been found to be significant in the Shanghai Women's Health Study (WCRF and AICR, 2018).

4. **They help with maintaining a healthy weight.** Pulses help in maintaining an ideal body weight (FAO, 2016). Pulses are a good source of dietary fibre including insoluble fibre which is digested slowly by the body. The slow digestion makes a person feel full longer, thereby reducing their appetite and hence protecting against weight gain (FAO, 2021).

5. **They lower the risk of mortality.** Eating plant proteins like pulses, nuts and seeds instead of animal-source proteins, especially red meat and processed meats, is associated with reduced all-cause mortality and cardiovascular mortality (Song *et al*., 2016). Replacing dairy foods with nuts and other plant-source proteins is likely to decrease overall and cardiovascular related mortality (Johnsons *et al*., 2009).

9.3 Importance of soaking pulses and cooking beans thoroughly

Pulses contain several compounds classified as anti-nutrients. These compounds bind to certain proteins and minerals such as iron, zinc, and calcium. The binding of these compounds to nutrients reduces the nutrients' ability to be absorbed in our body, hence they interfere with the utilisation of nutrients. These compounds include phytates (phytic acids), tannins, and polyphenols protease inhibitors. Beans also contain lectins and oxalates (Marathe *et al*., 2011).

Soaking pulses for at least five hours or overnight and throwing away the water used for soaking before cooking has the following benefits:

- Reduces phytic acids hence improves the absorption of protein, iron, zinc and calcium.
- Reduces tannins and polyphenols.
- Reduces anti-nutritional enzyme inhibitors.
- Removes gas-causing compounds.
- Improves texture and decreases cooking time.

Beans contain lectin, a natural protein that is found in many plants, animals and humans. Raw and/or undercooked beans have high levels of lectins which can be harmful and make a person sick. However, lectins are completely destroyed through boiling at 100 °C for 10 minutes. Since it can be difficult to measure cooking temperatures, it is safest to boil beans for at least 30 minutes.

9.4 Coconut milk

Coconut milk is a high-calorie food. Most of its calories come from fat, including saturated fats. Unlike cooking oils which are 100 percent fat, coconut milk also contains proteins, several vitamins, and minerals such as folate, iron, calcium, zinc, vitamin C, selenium, copper, magnesium and manganese, as well as carbohydrates and fibre. Based on the nutrient composition of coconut milk in Table 10, coconut milk is classified in the nut family hence it belongs to the pulses nuts and oily seeds group.

Findings from a systematic review and meta-analysis from 16 research results show that coconut oil consumption results in significantly higher LDL-cholesterol and also higher HDL-cholesterol compared with non-tropical vegetable oils. The findings also revealed that coconut oil consumption

did not significantly affect markers of glycemia, inflammation, and adiposity as compared with non-tropical vegetable oils (Neelakantan N *et al*., 2020).

Given that coconut milk has saturated fats known as medium-chain triglycerides (MCTs), use coconut milk in moderation. WHO recommends that less than 10 percent of total energy should come from saturated fats, since saturated fats increase the risk of cardiovascular heart diseases. Ten percent of total energy is equivalent to 220 Kcal for a 2 200 Kcal diet. Based on the FCT used for the Zanzibar diet model and the USDA FCT, one cup (226 g) of coconut milk provides 445 kcal in total, of which 384 Kcal is saturated fats, thus exceeding the total recommended maximum intake of saturated fats from all sources by 175 percent.

intake of coconut milk to a third of a cup or less per day. A third cup (about 85 ml) is equivalent to one serving from the pulses, nuts and seeds group.

9.5 Recommended amounts of pulses, nuts and oily seeds

Eat two servings of pulses, nuts and oily seeds every day. One serving of this food group is about 130 Kcal. Given the different energy densities between pulses and nuts and seeds, 130 Kcal of pulses is about 90 g food weight, while 130 Kcal of nuts and oily seeds is about 25 to 30 g. Thus, one serving for cooked pulses is about half a cup, while one serving for nuts and seeds is about three tablespoons. A third of a cup of coconut milk is one serving for an individual. There are plenty of options to choose from in this food group to make two servings, as per some examples on Table 10.

9.6 What would one serving of pulses, nuts and oily seeds look like?

Table 10: One serving equivalent of pulses, nuts and oily seeds exchange list

Food description	Food serving measure*			Nutrient values per serving**						
	Cups (c)*	Grams (g)**	Table-spoons (TB)	Ener-gy	Pro-tein	Iron	Fo-late	Cal-cium	Zinc	Fibre
				(Kcal)	(g)	(mg)	(mg)	(mg)	(mg)	(g)
Bambara nuts (boiled)	0.5	90	-	125	6.7	0.9	-	18.5	1	1.3
Cowpeas	0.5	80	-	94	6.3	1.8	61.8	20.6	1.2	4.5
Red kidney beans (boiled)†	0.5	90	-	111	8.6	2.5	66.6	39.6	0.81	8.4
Soya beans	0.5	85	-	151	11.8	2.4	69.7	72.7	1.6	3.4
White beans	0.5	90		111	7.4	1.6	65.7	20.7	1.1	3.4
Coconut milk* **	0.3	75	-	148	1.6	2	11.3	-	0.5	1.7
Peanuts (dry roasted)†	-	27	3	159	6.5	0.4	26.2	15.7	0.756	2.3
Peanuts (raw)†	-	27	3	153	7	1.3	64.8	24.8	0.9	2.3
Peanut butter†	-	24	1.5	134	5.3	0.5	8.4	13	0.6	1.4
Pumpkin and squash seeds (shelled, dried)†	-	30	3	145†	9	2.6	17.4	13.8	2.3	1.8
Seeds, flax , chia sunflower (roasted)†	-	25-30	3	145-175	4.8-5.7	1-1.14	59-71	18-21	13-1.6	2.8-3.3
Sesame seeds	-	25	1.5	144	4.6	3	24	245.8	1.9	3

Consume two daily servings of pulses, nuts and seeds by choosing any of the foods above. Each food amount listed is the equivalent of one serving.

Note: Where fields are blank, no value was available in the food composition table.

*USDA; rounded values for cup size (250 ml)
**Based on the Zanzibar Diet Model FCT unless otherwise stated; rounded values
***Given the high amounts of fat and especially saturated fats, and lesser amounts of other nutrients, limit intake of coconut milk to only one serving per day and chose other pulses, nuts and seeds options to make a second serving from this food group.
†Values based on the USDA FCT

9.7 MESSAGES FOR EATING PULSES, NUTS AND SEEDS

1. Eat two servings of cooked beans, lentils, peas, nuts or seeds every day.
2. Eat a handful of unsalted nuts or seeds every day as a snack.
3. Use coconut milk in moderation; not more than 1/3 cup per person per day.
4. Eat pulses (legumes), nuts and seeds together with fruits or vegetables. Vitamin C in fruits and vegetables helps the body absorb iron.
5. Avoid drinking tea or coffee whilst eating beans and lentils or within two hours after eating. Tea and coffee contain substances that hinder the absorption of iron and zinc in the body.
6. Boil beans for at least 30 minutes and never eat raw beans.
7. Offer cooked beans, lentils, and peas often to young children.

9.8 Helpful Tips for increasing the intake of pulses, nuts and seeds

1. Mix pulses with whole grains, nuts or seeds to make powerful combinations of plant-based proteins.
2. Powders made from nuts and seeds can be added to foods as condiments.
3. Use pulses, nuts and seed in baked goods – either whole or as a flour.
4. Soak beans and lentils overnight and rinse with fresh water before cooking. This reduces cooking times.
5. Soak pulses before cooking to reduce stomach gas after eating and to make iron more available for absorption.
6. Avoid drinking coffee or tea up to two hours after eating beans and lentils. Coffee and tea can reduce the amount of iron and zinc absorbed by the body.
7. If possible, grow beans, nuts and seeds for easy access.

10. RECOMMENDATION 1.6: Eat staples such as cereals, starchy roots, tubers or plantains every day for a strong and active body.

10.1 What is the Cereals, Starchy Roots and Tubers, and Plantains Group?

Cereals, starchy roots and tubers, and plantains are starchy staples that make up the main part of a meal. Cereals include grains like maize, sorghum, rice, wheat, and millet, while roots include cassava, yam, and sweet potato.

Non-starchy roots like carrot, raddish, ginger, and beetroot are excluded from this group and are classified as vegetables.

10.2 Why eat more whole grain and less refined grain?

When the cereals retain all three parts of the grain (germ, endosperm, and bran), they are considered whole grain. When flours or meals are made from all parts of the grains, without any part being removed, they are also considered whole grain products.

Refined grains refer to hulled grains such as white rice and products made from hulled cereals, such as white maize flour, white bread, white bleached wheat four, and white pasta. The process of hulling removes the bran and seed germ thereby reducing the fibre and micronutrients content. The endosperm, which contains mostly carbohydrates, remains after processing thus making refined grain products less nutritious than whole grains (WCRF and AICR, 2018; Elia and Cummings, 2007).

10.3 Importance of eating from the Wholegrain Cereals, Starchy Roots and Tubers, and Plantains Group

1. Cereals, starchy roots and tubers, and plantains are staple foods that provide carbohydrates, which are the primary energy source for the body. Carbohydrates also support other important body functions. They play

a key role in energy metabolism and controlling homeostasis, including maintaining body temperature, metabolic activity, brain function and supporting growth, and for daily physical activities (Mann, 2007). WHO and FAO recommend that over half of the energy from food should come from carbohydrates (WHO and FAO, 2002; FAO, 1998; Mann *et al*., 2007).

2. Whole grains, starchy roots and tubers, and plantains provide dietary fibre and nutrients such as iron and zinc, copper, magnesium, selenium, and B vitamins.

3. Eating more whole grains, legumes, fruits, and vegetables and less refined grain can help in reducing the risk of coronary heart disease, type 2 diabetes and overall mortality (Willet *et al*., 2019; WHO and FAO, 2002). In addition, dietary fibres found in whole grains and other plant-based foods protect against colorectal cancer in addition to protecting against weight gain, overweight, and obesity (WCRF and AICR, 2018).

The brain and other organs need carbohydrates to function

10.4 Aflatoxins in grains and other products

Cereals like maize and rice and other grains can be contaminated by aflatoxins (PACA, 2016). Aflatoxins are toxic compounds found in the soil and naturally produced by certain moulds that can contaminate plants any time before or after harvest. Mould, discoloration, and shrivelled grains are common signs that may indicate the presence of aflatoxins in grains. Aflatoxins are also found in nuts, teas, spices and milk, or in meat from livestock that ate grains with aflatoxins (Ali, 2018).

Eating foods with moderate to high levels of aflatoxins can cause severe illness within a week and sometimes death. Long-term exposure to low levels of aflatoxins increases the risk for liver cancer (Konde *et al*., 2015; Felay, *et al*., 2012; Liu, 2010) and is also associated with low birth weight, impaired child growth and immune suppression. The WHO International Agency for Research on Cancer describes aflatoxin B1 as one of the most toxic and carcinogenic substances found in nature.

During storage, foods can be contaminated with aflatoxins when they are stored for too long at warm temperatures in a humid environment. Countries with high temperatures, like Tanzania, offer good conditions for aflatoxin-producing moulds to grow and affect crops while still in the field. Although moulds are destroyed by cooking, the toxins they produce may remain. Thus, it is important to avoid foods that may have been stored for a relatively long time in warm, ambient temperatures with high humidity, even if they show no visible signs of aflatoxin contamination.

10.5 Recommended amounts of cereals, starchy roots, tubers and plantains

Eat four servings of cereal, roots, tubers, or plantains every day, which is about 580 g per day. One serving of cereal, roots, tubers, or plantains is based on 200 Kcal with an average food weight of 145 g. Ensure that at least 204 g of the 580 g is from whole grains.

Given the importance of whole grains to health, a large portion of the cereal, roots, tubers, and plantains food group should be whole grains. Based on the Global Burden of Disease Study, eat at least 125 g or more of whole grains per day, with the bran, germ, and endosperm in their natural proportion to gain their protective benefits (GBD, 2017b). The "Healthy Reference Diet" proposed by the EAT-Lancet Commission recommends eating 232 g per day of whole grains, which provides 811 Kcal of a 2 500 Kcal diet.

This amounts to 204 g for the Zanzibar 2 200 Kcal diet for the general population. This can be from whole grain breakfast cereals, bread, rice, pasta, biscuits, muffins, atta chapatis, pancakes and other sources.

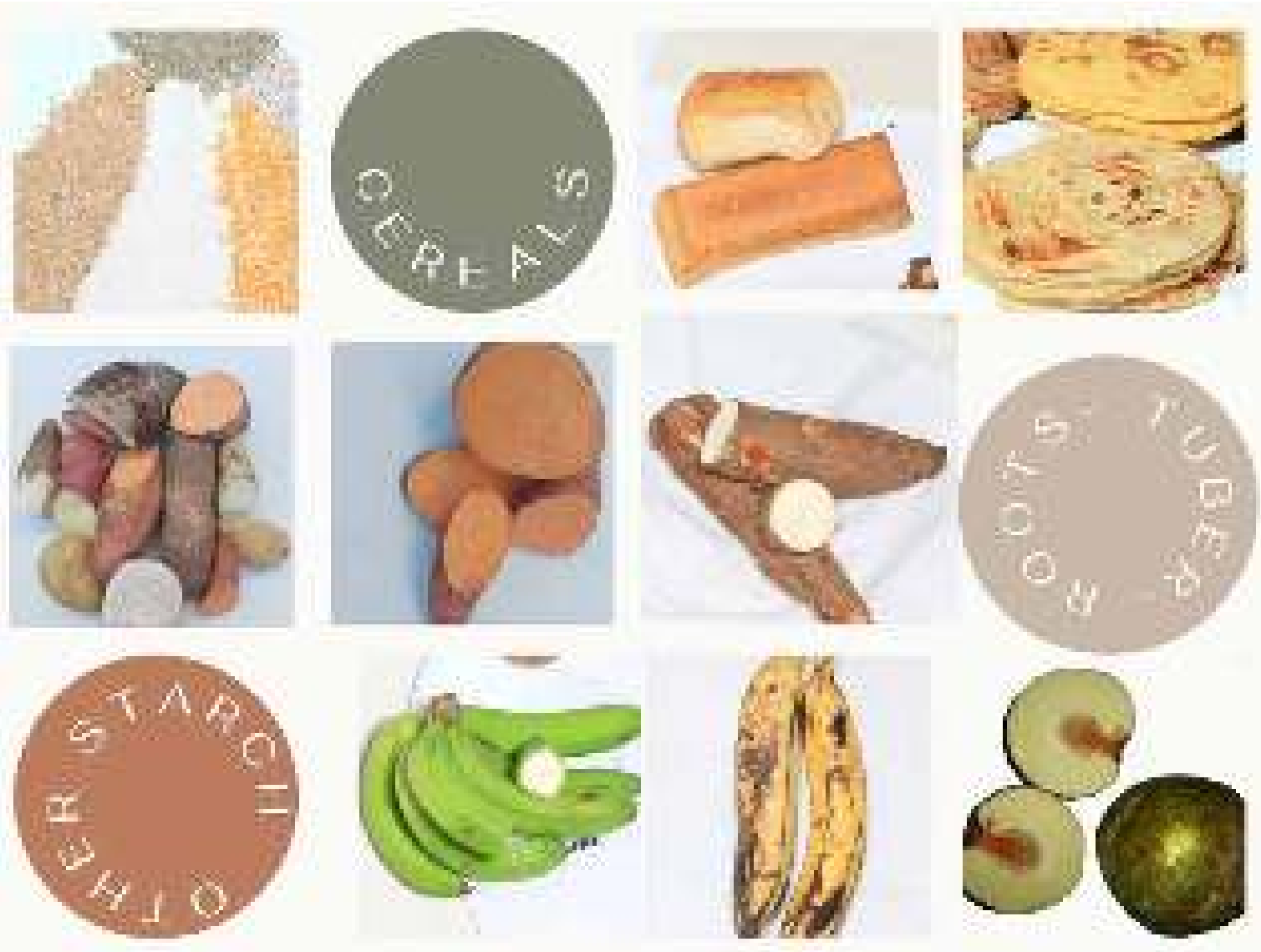
10.6 What would a serving of staples look like?

Table 11: One serving size equivalent for grains (cereals), starchy roots, tubers and plantains food exchange list

Cooked foods	Food serving measure		Nutrient values per serving							
	Cups*/ size	Grams* (g)	Ener-gy^	Pro-tein	Fo-late	Iron	Cal-cium	Zinc	Fi-bre	Vit A
			(Kcal)	(g)	(mg)	(mg)	(mg)	(mg)	(g)	(mcg)
Bread (thick slice)	3 slices	90	225	8	40.5	1.8	44.1	1.3	5.6	0
Bread rolls (white, 5cmx5cm)	3 small rolls	75	200	6.8	21	0.9	19.5	0.6	2	0
Cassava (diced, boiled)	1	132	210	1.6	21	0.9	56.5	0.4	2.5	1.7
Irish potato (boiled)	1.5	230	187	4.3	25.4	1.9	23.3	0.7	4.2	2.5
Pasta	1	124	190	6.7	6.2	0.6	12.4	0.7	2	0
Fried Potato chips/fries †		70	223	24	21	0.6	12.6	0.4	2.7	0
Plantain (ripe, cooked)*	-	150	199	1.7	19.5	1.2	9	0.2	3.3	58.5
Plantain (ripe, boiled without salt)*		150	200	1.65	19.5	1.2	9	0.15	3.3	58.5
Plantain (green boiled)*	1 small	152	176	1.2	39.5	0.9	3	0.2	3.5	68.4
Plantain (green, boiled)*	1 cup	154	179	1.2	40	0.9	3.1	0.2	3.5	69.3

Continued on page 70

Cooked foods	Food serving measure		Nutrient values per serving							
	Cups*/ size	Grams* (g)	Ener-gy^	Pro-tein	Fo-late	Iron	Cal-cium	Zinc	Fi-bre	Vit A
			(Kcal)	(g)	(mg)	(mg)	(mg)	(mg)	(g)	(mcg)
Rice	1	160	205	4.2	8.6	0.9	8	0.7	0.9	0
Sweet potato (boiled)	1	200	225	2.9	65.5	2	51.9	0.7	6	6.1
Ugali (stiff porridge)	0.75	161	210	5.3	1.6	0.2	3.2	0.2	2.1	0
Yams	1.25	170	230	3.4	29.7	1.4	43.9	1	7.3	4.2
*Cup measures (250ml) and food weights are based on USDA and occasionally Australian FCTs ^Based on the Zanzibar Diet Model FCT unless otherwise stated; rounded values †Please note that one fast food order of chips has over double the amount of kcal (427 Kcal) for the same 150g of other starchy foods. In addition, chips have high a fat content which is discussed under the guideline to ''limit intake of oils, fats, salt and sugars".										
Note: Where fields are blank, no value was available in the food composition table.										



10.7 MESSAGES FOR EATING STAPLES

1. Eat staples such as cereals, starchy roots, tubers or plantains every day for a strong and active body.
2. Eat four servings per day and make at least two servings whole grains.
3. Make staples 1/3 of your plate, not all of your plate.
4. Eat more whole grains and less refined grains whenever possible.
5. Eat different types of staples throughout the week. Include traditional grains like millet, sorghum, and roots like potatoes, sweet potatoes and yams as part of your staples.
6. Inspect grains before processing. If they look mouldy, discoloured, or shrivelled, discard them as they may contain harmful toxins.

10.8 Helpful Tips for increasing the intake of cereals, starchy roots, tubers

1. Make simple switches: Alternate starchy foods throughout the week. If you eat rice on one day, the next day try eat sweet potatoes or cassava, and the next day try ugali from whole grain millet or sorghum.
2. Porridge goodness: Whole grains make a good, healthy and wholesome breakfast for the whole family. It can be eaten alone or with added groundnuts or legume flours.
3. Substitute refined flours with whole grain flours when cooking ugali, rice or when baking. There are plenty of recipes using whole grains.
4. Make whole grain snacks: Popcorn, a whole grain, can be a healthy snack if made with little or no added salt or oil. Roasted dried maize and boiled dried maize make great snacks.

11. RECOMMENDATION 1.7: Choose unsaturated fats and oils and eat in small amounts.

11.1. What are oils and fats?

Dietary fats and oils belong to the macronutrient group together with proteins and carbohydrates. Thus, fat is as essential to the diet as protein and carbohydrates in providing the body with energy. Fats play a key role in important body functions and in maintaining life.

11.2 Types of fats and oils

Some fats are healthier and essential in promoting good health and preventing NCDs, while others are linked to negative effects on coronary heart diseases. Knowing the difference is important to determining which fats to avoid, which to eat in moderation and which to limit. Three major categories of dietary fats are unsaturated fats, saturated fats and trans fats. All fats are made up of carbon, hydrogen, and oxygen molecules. The difference between the fats is their chemical structure, particularly in the number of double bonds in the fatty chain.

11.2.1 Unsaturated fats

Unsaturated fats or unsaturated fatty acids have one or more double bond(s) in the fatty acid chain.

Because of the double bond (s), saturated fats are liquid at room temperature but are also found in solid foods.

Unsaturated fats or fatty acids are usually referred to as good or healthier fats. There are two main types of unsaturated fats:

Monounsaturated fatty acids *(MUFA) with one double bond.* Sources include olives, groundnuts, peanuts, sunflowers, canola and safflower oils, most nuts, and avocados. Chicken and poultry also contain MUFAs.

Polyunsaturated fatty Acids (PUFA) with more than one double bond. These are the sources of omega-3 fatty acids. They include sunflower, soybean, corn, and cottonseed oils. Seeds like sesame, flaxseed, sunflower, pumpkin and chia,

and nuts like walnuts and pine nuts, also contain PUFAs. Oily fish such as mackerel, salmon, sardines, herring, kippers, eels, whitebait, tuna and cod liver oil are also sources of PUFAs (WHO, 2018).

11.2.2 Saturated fats

Saturated fats have no double bonds in the fatty chain. They are "saturated" with hydrogen atoms, which means they 'naturally' have the greatest number of hydrogen atoms possible.

With a few exceptions, saturated fats are usually solid at room temperature.

Saturated fats mostly come from animal sources and some from plant oils. Animal sources include butter, ghee and cream. Other major sources of saturated fats are red meats and dairy products. Examples of plant-based oils with saturated fats include palm oil and coconut oil. Other sources of saturated fats are coconut cream and coconut flesh.

Commercially-made baked goods like biscuits, cakes, and pastries, as well as fried foods and chocolate confectionery also contain saturated fat.

11.2.2 Trans-Fatty Acids (Trans Fats)

Trans fats (TFAs) are predominantly a product of industrial processing of partial hydrogenation, where hydrogen atoms are added to vegetable oil (unsaturated fats) to cause it to become solid at room temperature. Trans fats also occur naturally in small amounts in ruminant fat from red meat and dairy products.

Artificial trans fats are common ingredients found in ultra-processed foods. They are referred to as "partially hydrogenated oils" in the ingredients list. TFAs are also found in fast food, snack food, fried food, frozen pizzas, pies and cookies (WHO, 2018). Off-the-counter examples of trans fats are margarine, fat spreads, mayonnaise, and shortening.

Eating products with trans fats increases the risk of developing heart disease and stroke. Thus, avoid products containing partially hydrogenated oils.

11.3 Importance of fats in a diet

1. Oils and fats provide essential and non-essential fatty acids. The body cannot produce essential fatty acids on its own, hence they must come from diet. For example the body cannot synthesize omega-3 and omega-6 fatty acids and therefore omega 3 and 6 should come from dietary sources.

2. Fatty acids are important for normal operations of all body systems. Fats and oils help the body to absorb fat-soluble vitamins A, D, E, and K. Many children and women are deficient of vitamin A in Zanzibar.

3. Dietary fats play an important role as energy sources for the body just as do carbohydrates and proteins. Fats are energy-dense; they contain 9 Kcal of energy per gram of fat versus 4 Kcal in carbohydrates and protein.

4. Fats and oils make food more palatable and are frequently used in cooking. Fats also slow the gastric emptying and intestinal motility, thereby prolonging satiety.

Of the three types of fats, unsaturated fats are healthier than others and help to promote good health when taken in moderation, while trans fats are harmful to one's health and should hence be avoided. Limiting the intake of saturated fats is also essential for better health.

11.4 Unsaturated fats are NCD protective and criticalfor a child's cognitive development

Unsaturated fats play an important role in various key body functions as well as contributing to the prevention of coronary heart disease and healthy neonatal, infant and child development (WHO, 2018).

1. Unsaturated fats, especially the long-chain polyunsaturated fatty acids (PUFAs), alpha linolenic

acid, eicosapentanoicacid (EPA) and decosahexaenoicacid (DHA), contributes to the prevention of coronary heart diseases.

2. Fats and fatty acids are considered a key nutrient that affect the embryo's development during very early stage of pregnancy and early growth. Fatty acids are important for infants' and children's brain and cognitive development. Fats and fatty acids are important for cell membrane functions and control gene transcription.

11.5 Importance of fats in a diet

While unsaturated fats are healthier than saturated fats, they still contain a lot of calories like any other oils and fats. Oils and fats in general, though they are necessary and make the food tastier, contribute to weight gain if taken excessively.

11.6 Health risks of excessive intake of saturated and trans fats

11.6.1 Saturated fats

There is a possible relationship between intake of saturated fats and increased risk of diabetes. On the other hand, there

is convincing evidence that replacing saturated fats with polyunsaturated fats decreases the risk of cardiovascular heart diseases (FAO, 2010b). Reducing fat intake from processed foods that contains lots of fats and trans fats is important for keeping the bad cholesterol or LDL at a normal level. Evidence shows that consuming palm oil from processed foods raises the LDL (Sun *et al.*, 2015).

Many studies, including a systematic review of 15 studies with over 59 000 participants, found that "cutting down on saturated fat led to a 17 percent reduction in the risk of coronary heart diseases (including heart disease and strokes), but found no effects on the risk of dying" (Hooper *et al*., 2015). These study report continued to state: "the review found no clear health benefits of replacing saturated fats with starchy foods or protein. Changing the type of fat, replacing saturated fats with polyunsaturated fats, seems to protect the body better, reduce the risk of heart and vascular problems. The greater the decrease in saturated fat, and the more serum total cholesterol is reduced, the greater the protection."

11.6.2 Trans fatty Acids

Trans fatty Acids (TFA), or partially hydrogenated vegetable oils, should be avoided to reduce the risk of coronary heart diseases events and sudden cardiac deaths (WHO, 2021 d; GBD, 2017 b, FAO 2010 b). In 2010, more than half a million deaths globally were attributed to TFA (WHO 2021 d). TFA raise the LDL (unhealthy) and lower HDL (healthy) cholesterol (WHO,2021 d; GBD, 2017b). In addition, TFA are also associated with a higher risk of developing type 2 diabetes (WHO and FAO, 2002; FAO 2021b, WHO, 2021d; GBD, 2017b). There are indications that TFA may increase the risk of metabolic syndrome such as inflammation and endothelial dysfunction (Mozaffarian, Aro and Willett, 2009).

Trans fats have no known health benefits and there is no safe level of consumption. In the Global Burden of Disease Study, exposure to a diet high in trans fatty acids is defined as average daily energy consumption of greater than 0.5 percent of trans fat from all sources, mainly partially hydrogenated vegetable oils and ruminant products (Willet *et al*., 2019). For a 2 200 Kcal diet, this is equivalent to 1 g of fat which is less than one teaspoon (note that one teaspoon of oil is about 5 grams). Most ultra-processed foods contain more than this amount per serving. In countries with laws on labelling, companies are only required to report amounts of more than 0.5 g per serving.

11.7 Current oils and fats consumption compared to recommended intakes

WHO recommends that total fat intake be less than 30 percent of total energy to avoid unhealthy weight gain. WHO further states that saturated fat intake be less than 10 percent of total energy (WHO, 2020). In order to meet the body's requirement for dietary fat, dietary fat should contribute a minimum 15 percent of total energy requirement per day in order to ensure adequate consumption of essential fatty acids and fat-soluble vitamins (WHO, 2018).

For a 2 200 Kcal diet, 30 percent of total energy from fats translates to a maximum of 660 Kcal or 74 g of total fat per day, and 25 g saturated fats a day from all sources.

In 2015, Zanzibar consumption of oils and fats, including oil-bearing crops such as coconuts, contributed to about 21 percent of total energy in a day. Most of the fat intake in Zanzibar comes from coconuts. It is advised that coconut milk be used with caution because it has a high calorie count and also contains saturated fats which are associated with coronary heart disease risks (Willett *et al*., 2019; FAO and WHO, 2010).

11.8 Recommended daily intakes for Zanzibar

Given that the three types of fats affect the body differently, the recommendation is to consume unsaturated fats in moderation, and avoid trans fats while limiting the intake of saturated fats. For more health benefits, replace saturated fats with unsaturated fats.

Diet model analyses indicate a total fat intake of 28 g or two tablespoons or two servings. Where possible, ensure that these are unsaturated fats from vegetable oils like sunflower, groundnut or olive oil.

Limit the intake of palm oil or coconut oil to 5.4 g or one teaspoon per day since these oils are saturated fats and oils.

11.8.1 What would a serving of fats and oils look like?

One tablespoon for vegetables oils which is about 14 g.

11.9 MESSAGES FOR EATING SMALL AMOUNTS OF UNSATURATED FATS

1. The type of fat and amount of fat you eat matters in protecting your health.
2. Limit added fat to meals to 28 g which is about two tablespoons per day.
3. Choose healthier liquid vegetable oils like sunflower, groundnut, olive and canola oils instead of palm oil, coconut oil, butter, or ghee. Palm oil, coconut oil, butter, or ghee have saturated fats.
4. Eat oily fish and oily seeds and nuts often to get essential fatty acids.
5. Avoid intake of trans fats mostly found in ultra-processed foods and fried fast foods.
6. Use coconut milk in moderation; not more than 1/3 cup per person per day.

11.10 Helpful Tips for choosing unsaturated fats and eating less of them

1. Grill or stir-fry instead of deep-frying, as stir-frys use less oil.
2. Choose liquid fats (oils) instead of solid fats.
3. Cut off visible fats from meats and discard poultry skin before eating.
4. Choose lean cuts of meat with less visible white marbling.
5. Do not add extra oil or fat when cooking meats and poultry.

Table 12: What a serving of fats and oils look like

One serve of fats and oils	Food serving measure		Nutrient values per serving									
	Table-spoon (15ml)	Grams (g)	Energy (Kcal)	Protein (g)	Fat (g)	Carbo-hydrates (g)	Cal-cium (mg)	Iron (mg)	Zinc (mg)	Vit A (mcg RAE)	Folate (mg)	Fibre (g)
Butter (from cow's milk)	1	14	100	0.4	11	0	2.4	0	0	96	0	0
Coconut oil	1	14	126	0	14	0	0	0	0	0	0	0
Cottonseed oil	1	14	126	0	14	0	0	0	0	0	0	0
Groundnut oil	1	14	126	0	14	0	0	0	0	0	0	0
Margarine (fortified)	1	14	102	0.1	11.5	0	0	0	0	115	0	0
Palm oil (red)	1	14	126	0	14	0	0	0	0	800	0	0
Palm oil (refined)	1	14	126	0	14	0	0	0	0	0	0	0
Shea butter	1	14	126	0	14	0	0	0	0	0	0	0
Soya oil	1	14	126	0	14	0	0	0	0	0	0	0
Vegetable oil	1	14	126	0	14	0	0	0	0	0	0	0

Dietary Guideline 2

Limit intake of deep fried and ultra-processed foods that contain high levels of fats, sugar and salt.

12. RECOMMENDATION 2.1: Limit intake of deep-fried foods to reduce risk of type 2 diabetes and coronary heart disease.

Frying is a common method of cooking food both in the home and during commercial food preparation and many people like the taste of fried foods like chips, samosas, kachoris, and maandazi. However, eating a lot of fried foods affects a person's health because of four main reasons mentioned below:

12.1 Frequent fried-food consumption is associated with risk of type 2 diabetes, and coronary and artery disease.

Various studies have found an associated increased risk of eating fried foods with type 2 diabetes (T2D) and cardiovascular events like stroke and heart attack. For examples, a meta-analysis of 17 different studies, involving more than 562 000 participants found that compared to people who ate the least amount of fried foods per week, people who ate the highest amount had a 28 percent increased risk of stroke and heart attack, a 22 percent heightened risk of coronary heart disease and 37 percent heightened risk of heart failure. These risks substantially increased by 3 percent , 2 percent , and 12 percent, respectively, in tandem with each additional 114 g (half cup) weekly serving (Qin *et al*., 2021). Another study that looked at 70 842 women from the Nurses' Health Study (1984–2010) and 40 789 men from the Health Professionals Follow-Up Study (1986–2010) also found a significant association of an increased risk of incident T2D and moderate association with coronary artery disease (Cahill *et al*., 2014). Similar findings were observed in other populations (Honerlaw *et al.,* 2020).

12.2 Deep-fried foods are high in fat and in calories.

Whether homemade or commercially made, fried foods are higher in fat and

calories compared to the same foods cooked with other methods such as boiling, steaming and grilling. When foods are deep fried in oil, they lose water and absorb fat which increases their calorie content.

Eating fried foods easily adds kilocalories to one's diet due to the high energy density of fat. For example, 1 g of fat gives 9 kilocalories compared to the 4 kilocalories from 1 g of carbohydrates or proteins. This addition of calories can cause a person to eat more than the recommended energy required per day (2 200 Kcal). High intake of calories leads to overweight and obesity.

Depending on the type of oils used, deep frying can increase the intake of saturated fats which have negative health effects. Since frying replaces water in the food while absorbing the fat, frying increases fat content in food. Fats and oils high in saturated fats include palm oil, coconut oil, ghee and butter (FAO and WHO, 2010).

12.3 Frying causes the production of chemical by-products involved in the body's inflammatory response

High temperatures during frying causes vegetables to break down and changes their composition (Boskou *et al.*, 2006; Choe and Min, 2007). The chemical by-products of this oil degradation causes inflammatory responses in the body (Qin *et al*., 2021; Boskou., 2006). In addition, the oil breakdown during deep frying with high heat increases trans-fatty acids (Choe *et al*., 2007).

It is therefore not recommended to re-use the oil used for frying to cook other foods afterwards. It is important to discard leftover oil after deep frying and avoid re-using used cooking oils.

12.4 Commercially fried foods contain trans fats which are harmful to health

Commercially fried foods like those from fast food restaurants and ultra-processed foods use hydrogenated oils which are high in trans fats. Fast food restaurants use hydrogenated oils since they are stable during long periods of frying and repeated frying without the need to change oils. Restaurants use hydrogenated oils because they give food a satisfying taste and crunch. Ultra-processed foods manufacturers use trans fats in foods because they are cheaper to produce, increase shelf life of food, and improve the taste and texture of food.

Although widely used, trans fats are associated with an increased risk of heart diseases, type 2 diabetes and obesity and have no known health benefits (WHO and FAO, 2002; WHO 2021d; FAO 2010b; GBD 2017b).

12.5 MESSAGES FOR EATING LESS FRIED FOODS

1. Avoid buying fried foods, choose alternatives like baked, boiled or grilled products.
2. Grill and stir-fry instead of deep-frying.
3. Cook stews.
4. Never reuse oil when you fry.
5. Make consumption of home-fried foods an occasion only a few days a month.

12.6 Helpful Tips to reduce the negative health effects from fried foods

For those occasional times you have to fry foods:

1. Never let the food go brown.
2. Use vegetable oils when you fry.
3. Use a paper towel to remove excess fat.

13. RECOMMENDATION 2.2: Limit intake of ultra-processed foods to reduce NCD risks, overweight and obesity.

Most foods are processed in some way before they are eaten. Foods are usually processed (altered from its natural state) to make them edible, palatable, safe or to extend their shelf life (PAHO, 2015; Monteiro *et al*., 2016).

Some processing can make food unhealthy while other types of processing does not necessarily do so. The NOVA food classification system has categorised foods into four groups according to the nature, the purpose, and the extent of processing the food undergoes after the food is separated from nature, and before it is consumed or made into meals (Monteiro *et al*., 2019).

As described below, Group 1 foods (unprocessed or minimally processed foods) are healthy, and individuals should make natural and minimally processed foods the basis of their diets (FAO and WHO, 2019). This is because minimally processed foods do not add substances such as salt, sugar, oils or fats to the original food except during the final cooking stage at home or in restaurants. Limited amounts of Group 2 foods (processed culinary ingredients) can be used to add variety and taste to foods from Group 1 to make freshly prepared dishes and drinks at home and in restaurants (EduChange, 2018; Heart and Stroke Foundation, 2021; Monteiro *et al*., 2019). Small amounts of Group 3 foods (processed foods) can also be used as part of meals, with limited frequency of consumption. Of great concern is Group 4 (ultra-processed foods) as they are linked to unhealthy outcomes.

13.1 Group 1: Unprocessed or minimally processed foods

13.1.1 Unprocessed foods

Unprocessed foods are edible parts of plants and animals in their natural state without going through any alterations after removal from nature.

Examples of unprocessed foods include plants such as seeds, fruits, leaves, stems, roots and animals such as meat, muscle, offal, eggs, and fresh milk (Monteiro, *et al*., 2016). Other foods include fungi, algae and water.

13.1.2 Minimally processed foods

Minimally processed foods are "natural foods that have been altered by basic processes such as removal of inedible or unwanted parts, drying, crushing, grinding, fractioning, filtering, roasting, boiling, pasteurization, refrigeration, and freezing, placing in containers, vacuum packaging, or non-alcoholic fermentation".

The purpose of processing is exclusively to increase shelf life and storability and enhance the edibility and digestibility of food. Minimally processed foods do not have sugar, salt, oil or other substances added. This food moves very quickly from the farm where it is harvested to the shop where it is sold or to the place where it is consumed.

Examples of minimally processed foods include milled and packaged grain flours, dried herbs, vegetables, fruits, frozen fresh meats, poultry, fish; frozen fruits and vegetables, boiled and fried meat or fish (without salt added) and pasteurised milk (Educhange, 2018; Heart and Stroke Foundation, 2021; Monteiro *et al*., 2019; Reardon 2021).

Unprocessed or minimally processed foods are wholesome and nutrient dense. Make unprocessed or minimally processed foods a major part of your diet. Use unprocessed or minimally processed foods to make delicious, wholesome and healthy meals.

Figure 4: Vegetable group examples of natural/minimally processed, processed and ultra-processed foods

13.2 Group 2: Processed culinary ingredients

Processed culinary ingredients are basic food products extracted and purified from natural foods by processes such as pressing, grinding, crushing, pulverizing and refining. They are mainly used as condiments in homes and restaurants to season or add taste to natural foods when making freshly prepared dishes and drinks.

Processed culinary ingredients typically consist of only one macronutrient in highly purified form (mainly fat, sugar or carbohydrate) and therefore have low nutrient density. Thus, limit use and consumption of this group.

Examples of processed culinary ingredients include sugar, salt, cooking oil, honey, apple cider vinegar and maple syrup.

This group does not include ingredients that underwent further modifications, such as hydrogenated fats (margarine, other spreads or other trans fats) or modified starches as these are considered as ultra-processed foods (Monteiro *et al*., 2019).

Figure 5: Examples of culinary ingredients

13.3 Group 3: Processed foods

Processed foods are simple food products made by adding Group 2 foods like salt, sugar, and oil to natural or minimally processed foods (Group 1 foods). Most processed foods have two or three ingredients. These foods are recognizable as modified versions of Group 1 foods and retain most constituents of the original food.

Monteiro, *et al*., 2016 also indicates that processed foods can have some additives to preserve their original properties or prevent spoilage and increase food safety. For example, adding anti-oxidants to fruits in syrup or adding preservatives to dried salted meats.

Figure 6: Beans and nuts examples of the differences between natural/ minimally processed, and processed foods

Examples of processed foods include:

- Canned or bottled vegetables, fruits and legumes in brine (salt), vinegar, pickling
- Canned fish or bottled fruits preserved in syrup
- Cured, dried or smocked fish or meat (with added salt and other ingredients)
- Tinned fish preserved in oil
- Salted or sugared nuts and seeds
- Simple non-alcoholic fermentation like beer, sweet beer (tongwa), wine and cider
- Bakery freshly made bread
- Cheese
- Fortified foods like flours which are
- Fortified to add nutrients like vitamin A, calcium or vitamin D

(Source: Educhange, 2018; Heart and Stroke Foundation, 2021; Monteiro et al., 2019)

Figure 7: Cereal (grains) examples of natural/minimally processed, processed and ultra-processed foods

Large amounts of sugar salt or oil, can make processed foods nutritionally unbalanced. Therefore, just like processed culinary ingredients they should be used sparingly, and used only occasionally. Make delicious dishes and meals from natural and minimally processed foods as a basis of the diet.

13.4 Group 4: Ultra-processed foods

Ultra-processed foods (UPF) are food or drink formulations from multiple factory-made ingredients (usually five or more ingredients) through a series of industrial processes (Monteiro *et al*., 2016). UPFs typically contain little or no natural foods. In addition to salt, sugar and or oils, UPFs are made with ingredients only found in ultra-processed. This is a distinguishing characteristic of ultra-processed as most of the ingredients used are not found or used in home cooking. UPFs industrial formulation is made entirely or mostly from substances extracted from foods like oils, fats, sugars, starch and protein, or derived from food constituents or synthesized in laboratories. Thus, UPF have little or no natural foods from Group 1.

Figure 8: Fruit examples of natural/minimally processed, processed, and ultra-processed foods

UPFs use additives to imitate sensory qualities of natural foods or of culinary preparations of these foods. UPFs additives are also used to disguise undesirable sensory qualities of the final product and make the food hyper-palatable. Various chemical additives are added to UPFs to give them intense sensory properties that make the food especially attractive to see, taste, smell, and/or touch (Monteiro *et al*., 2019).

Other UPF characteristic are that they are mostly ready-to-consume or to heat up, require very little preparation to be palatable, and are low in cost with a long shelf life (Monteiro *et al*., 2016). Ultra-processed foods are widely available through retail food vendors and supermarkets. UPFs are often packed in attractive packaging with aggressive marketing and health claims.

The processing and ingredients used to make ultra-processed foods are nutritionally unbalanced (Moss, 2013; Brownell, 2012).

13.4.1 Substances only found in ultra-processed foods

Substances only found in ultra-processed foods include various classes of additives. These additives include dyes and other artificial colours, colour stabilisers, flavour or flavour enhancers, non-sugar sweeteners, and processing aids such as emulsifiers, stabilizers, carbonating, gelling, glazing, firming, bulking, anti-bulking, de-foaming, anti-caking and glazing agents, sequestrants and humectants and preservatives, (FAO and WHO, 2017; Monteiro *et al*., 2016).

Since UPFs have little or no natural foods, they use additives to imitate sensory qualities of natural foods or culinary preparations of these foods. UPFs also use these additives to disguise undesirable sensory qualities of the final product.

UPFs also contain ingredients extracted from nutrient components (Monteiro *et al*., 2016, 2019) such as:

- Sugars: fructose, high-fructose corn syrup, fruit juice concentrates, invert sugar, maltodextrin, dextrose, lactose.
- Proteins: hydrolysed proteins, soya protein isolate, gluten, casein, whey protein, and 'mechanically separated meat'.
- Fats: hydrogenated (trans fats) or interesterified oils, derived from further processing of food constituents, like natural oils.

Figure 9: Starchy roots and tubers examples of natural/minimally processed, processed and ultra-processed foods

13.5 Ultra-processed foods are linked to increased risk of non-communicable diseases and ill health

1. UPFs are linked to an increased risk of NCDs such as cardiovascular disease (CVD), coronary heart disease, (CHD) and cerebrovascular disorders, due to added salt and sodium, sugar, saturated fats, trans fats and additives (Pagliai *et al*., 2021; Costa *et al*.,2018; Askari *et al*., 2020; Chen *et al*.,2020; Srour *et al*., 2019; Reardon, 2021).

2. The intake of ultra-processed foods is associated with higher overall cancer risk and breast cancer risk (Monteiro, 2019). UPFs contain preservatives and other chemicals to make them last longer and to improve their texture and flavour. Some preservatives, like nitrates and nitrites used to preserve processed meats, can react with proteins or high heat to form N-nitrosamines, a carcinogen. Nitrates and nitrites increase the risk of developing colon cancer.

3. Other food additives such as artificial food colours, benzoates, saccharin, and sorbates could bring on an array of negative health effects including headaches, allergies, and asthma (Dwivedi *et al*., 2017).

4. Indulging in ultra-processed foods can add excessive calories to a person's diet since UPFs are high in fats and sugar. High intake of UPFs can lead to overweight and obesity and are also associated with early mortality (Srour *et al*., 2019; Rico-Campà, 2019; Hall *et al*., 2019).

5. The processing and ingredients used also make ultra-processed foods not nutritious as they contain large quantities of sugar, salt, and fats particularly trans fats, and are deficient in dietary fibre and micro nutrients (Moss M, 2013; Brownell, 2012). The negative effects of salt and sodium, sugar, saturated fats, trans fats are discussed in detail in the sections below.

Although some products contain added vitamins and minerals and may appeal to consumers as healthy foods; it is important to note that added vitamins and minerals do not make highly processed foods healthy, as they do not contain numerous phytochemicals fibre and nutrients that are beneficial to human health as the natural or unprocessed foods do.

Given the negative health effects of UPFs, avoid the intake of ultra-processed. In 2018, the Unites States of America banned the use of trans fats in food manufacturing after the Food and Drug Administration (FDA) ruled that artificial trans fats were unsafe to eat and gave food-makers three years to eliminate them from the food supply by 2018 (USFDA, 2018). WHO is supporting the global efforts to eliminate industrially produced trans-fat consumption in countries (WHO, 2018d).

It is best to eat more natural unprocessed foods, limit processed foods and avoid ultra-processed foods as much as possible.

Figure 10: Seafood and meat examples of natural/minimally processed, processed, and ultra-processed foods

13.6 How to recognise ultra-processed foods

It is very easy to recognise foods that are minimally processed and/or culinary processed ingredients. Fresh vegetables, fruits, roots and tubers are definitely not ultra-processed; just as pasteurised milk and frozen fresh meat. Plant oils, sugar and salt are used as culinary preparations and hence are not ultra-processed.

However, distinguishing processed foods from UPFs, especially with foods like breads, breakfast cereals and meat products can be difficult sometimes. For example, foods like bread and yogurt could either be processed or ultra-processed foods depending on the type of processing. Figures 4 and 6 to 11 provide pictorial examples of foods from the five of the six food groups to distinguish unprocessed or minimally processed from processed foods, and ultra-processed foods using the Nova food classification system. Figure 5 provides examples of processed culinary foods. Table 13 provides examples of ultra-processed foods. The Healthy Tips box (13.8) in this section will also help to identify and avoid buying or eating ultra-processed foods.

Figure 11: Milk and milk products examples of natural/minimally processed, processed and ultra-processed foods

Table 13: Examples of ultra-processed foods

Beverages • Carbonated drinks/Soft drinks, sodas beverages • Sweetened drinks like concentrates • Juices including fruit flavoured juices • 'Energy' drinks; and 'fruit' drinks; milk drinks, 'fruit' yoghurts cocoa drinks • Ready to drink tea and coffee and hot chocolate mix.		**Snacks** • Crisps, chips** and other sweet, fatty or salty packaged snacks • packaged snacks • Sweets, candy; Chocolates, energy' bars; • Some energy' bars;
Baby foods • Canned and bottled foods like purées • Baby cereals • Infant formulas, follow-on milks,		**Meats** • Reconstituted meats such as sausages, hotdogs, burgers, salami • Corned beef or chicken
Condiments • Stock cubes and gravy granules, • Salad dressings, Mayonnaise • Packaged soup powders or mix, or liquids, • Instant, soups, sauces, gravy and gravy mixes • Packages sauces like tomato sauces, soy sauce, oyster sauce, • Instant sauces and soups. • Instant noodles, pastas and rice • Yeast extracts like Marinate and Bovril		**Confectioneries** • Long shelf life packaged baked goods like biscuits cookies, cakes, pastries, pies, • crackers • Cake mixes, Premixed pancakes • Mass-produced packaged breads and buns (long life) • Breakfast cereals
Meals • **Many fast-food restaurants foods • Ready-to-eat packaged meals and snack foods sold in shops (pizzas, pies, pastas nuggets (fish/meat)		• **'Health' and 'slimming' products** such as powdered or 'fortified' meal and dish substitutes. • Ice cream, frozen desserts, • Sugared and flavoured yoghurts and dairy drinks.
***Most fast-food restaurants' fried foods use hydrogenated oils, hence making the foods part of the-ultra processed foods group. Although fast-food chips may look much the same as home-cooked food, their formulations and the ingredients used in their pre-preparation and cooking render them ultra-processed.*		
Note that Group 4 also includes foods from Groups 1 or 3 that have additives, such as plain yoghurt with added artificial sweeteners and bread with added emulsifiers. In addition, alcoholic drinks fermented and then distilled to make alcohol such as whisky, gin, rum and vodka are also considered Group 4 foods. (Monteiro et al., 2016).		

13.7 MESSAGES ON AVOIDING ULTRA-PROCESSED FOODS

1. Avoid intake of ultra-processed foods
2. Make fresh, natural or minimally processed foods the basis of your diet
3. Choose more fresh, natural or minimally processed foods over ultra-processed foods
4. Occasionally eat small amounts of processed foods

13.8 Helpful Tips to avoid consumption ultra-processed food

1. Avoid foods with a long list of ingredients containing more than five ingredients, including salt, trans fats (hydrogenated oils) and sugar.
2. Avoid foods with ingredients that you cannot add when cooking homemade food as they are not found in homes.
3. Avoid food labels with unrecognisable components or with very unfamiliar names.
4. Read food labels and avoid foods with ingredients such as emulsifiers, flavour or flavour enhancers, or colours or texturisers.
5. Avoid foods with any ingredient extracted from nutrient components like sugar (e.g., lactose or fructose), protein (e.g., casein) or fat like hydrogenated oils (trans fats). These ingredients end with "ose'' like lactose or fructose, or "ein'' like casein.
6. Avoid foods with ingredients like nitrates, nitrites, benzoates, saccharin and sorbates, etc.
7. 'Fresh food' with a long shelf life may indicate the presence of preservatives. Check the label for preservatives such as sodium benzoate, nitrate and sulphite, BHA and BHT. Though these preservatives are found in small amounts, long-term use and excess exposure to them might lead to negative health effects.
8. High fat, sugar and salt content is common in ultra-processed food.
9. Do not be swayed by food marketing and advertising hype. Ultra-processed foods are often marketed as "healthy," "natural" and "organic." While these words may describe the original ingredients, they do not refer to the process of how the food was made. Remember, an organic, natural cookie is still an ultra-processed food.
10. Be smart, do not be swayed by aggressive marketing and branding, attractive packaging and the low cost as you pay a high cost with your health.
11. Cook more often: make delicious meals with fresh ingredients. Heating up frozen pre-made foods does not count.
12. Use quick and easy recipes for delicious homemade pizza, meatballs, fishcakes and baked beans rather than fast foods.

14. RECOMMENDATION 2.3: Limit intake of saturated fats and avoid intake of trans fats to reduce the risk of cardiovascular diseases like heart attacks and stroke, increased "bad" cholesterol and type 2 diabetes.

14.1 What are saturated fats and trans fats?

14.1.1 Saturated fats

Saturated fats are made of carbon, hydrogen and oxygen atoms with no double bond in their structure making them solid at room temperature with few exceptions. The major sources of saturated fats are meats and meat products such as fatty beef or goat, poultry skin, butter, ghee, lard and cheese. Some plant-based oils, such as palm oil, palm kernel oil and coconut oil, also have saturated fats (WHO, 2020a).

14.1.2 Trans fats

The majority of trans fats (TFA) are chemically altered vegetable oils (unsaturated fats) through industrial processing of partial hydrogenation, where hydrogen atoms are added to vegetable oil. The *trans* configuration of unsaturated fats with added hydrogen causes the oils to become solid at room temperature. TFA is also found naturally in very low amounts in ruminant fat in dairy and meat products (WHO, 2018).

Ultra processed foods contain industrial made trans fats which are sometimes called "partially hydrogenated oils" in the ingredients list. Other major examples of the artificial trans fats in addition to ultra-processed foods, include fried fast foods, commercially packaged snack foods, frozen pizzas, packaged frozen meals, pies and cookies, (WHO, 2018). Deep fried foods at household level can convert natural unsaturated vegetable oil to trans fats.

Products brought from shops and are used at home that contain industrial trans fats are margarine, fat spreads mayonnaise, and vegetable shortening. These vegetable-based fats are solid at room temperature because of partial hydrogenation.

As described earlier in Recommendation 1.7, while unsaturated fats confer health benefits when taken in moderation, industrial made trans fats increases CHD risk factors and CHD events and it is recommended to replace saturated fats with unsaturated fats.

14.2 Health risks of eating more than 17 g (1.5 tablespoons) of saturated fats

Multiple studies found that limiting intake of artificially made saturated fats and replacing saturated fats with unsaturated fats decreases the risk of CHDs. Saturated fats, and especially palmitic acids (C16:0), have negative health effects as they increase LDL cholesterol (FAO and WHO, 2010; Willett *et al*., 2019).

WHO recommends that saturated fat intake be less than 10 percent of total energy (WHO, 2020a). Less than 10 percent of total energy translates to less than 220 Kcal, which is equivalent to 24 g or two tablespoons.

The GBD defines exposure to high intakes of saturated as over 7 percent of total energy intake which is about 154 Kcal for a 2 200 Kcal diet translating to 17 g of saturated fats from all food sources. Taking in more than these amounts increases the risk of CHDs.

Given that the recommended intake of total added fats for Zanzibar is 28 g, it's beneficial to use unsaturated fats like groundnut, sunflower and olive oils instead of saturated fats like ghee, butter, cream, palm and coconut oil.

14.3 Avoid trans fats as they increase the risk of NCDs

Eating products with artificially made trans fats/ Trans Fatty Acids (FTAs), even in small quantities is harmful to health and trans fats have no known health benefits.

1. Trans fats increase cardiovascular heart disease risk factors, such as the risk of heart attacks and stroke. This is because Trans-Fatty Acids (TFAs) increase LDL, or "bad" cholesterol, and decrease the good HDL cholesterol, thereby affecting the arteries through fatty deposits (WHO 2021d, GBD, 2017d, FAO 2010b).

2. TFAs are also associated with a higher risk of developing type 2 diabetes. Studies have shown that TFA could impair insulin sensitivity and affect glucose metabolism (Wang *et al.,* 2015).

3. Trans fats have no known health benefits and there is no safe level of consumption (WHO 2021d, GBD 2017d).

In the Global Burden of Disease Study, exposure to a diet high in TFAs is defined as an average daily consumption of greater than 0.5 percent of total energy from trans fats from all sources, mainly partially hydrogenated vegetable oils and ruminant products (Willet *et al*., 2019). Less than 0.5 percent of total energy is equivalent to 1 g of fat. Given that 1 teaspoon of oil is about 5 g, thus consumption of trans fats of over one-fifth of a teaspoon will be harmful.

Given the increased risks of trans fats to heart attack and stroke, adding partially hydrogenated oils (trans fats) to foods is no longer permitted in the United States of America, while in the United Kingdom, some supermarkets have voluntarily removed partially hydrogenated vegetable oil from all their shop brand products. However, for Tanzania, since such laws do not exist yet, consumers should avoid eating foods with trans fats. It is very important to be on the lookout for trans fats in industry manufactured food products.

The trans fats in ultra-processed foods are sometimes called "partially hydrogenated oils" in the ingredients list. Ultra processed foods use trans fats because they are inexpensive to produce and give food products a desirable taste and texture.

A product may claim that it contains no trans fats as long as the content is less than 0.5 g per serving. However, a person may ingest more than 1 g of trans fats from that product if a serving as defined by the package if the total amount of the package is two or more times the defined serving size. For example, if a serving is defined as 50 g and the product is 100 g or more, the total amount of trans fat a person would eat if they eat the whole product, would be 1 g or more. One gram of trans fats is the threshold at which trans fats increases

the risk of CHDs. Therefore, be smart and always refer to the ingredients list and check for "partially hydrogenated oils". If the product has partially hydrogenated oils then the product is NOT trans-fat free (GBD, 2017d).

14.4 MESSAGES FOR REPLACING SATURATED FATS WITH UNSATURATED FATS AND AVOIDING TRANS FATS

1. Replace saturated fats with unsaturated fats to decrease NCD risks.
2. Reduce intake of saturated fats to less than 10 percent of total energy.
3. Choose liquid vegetable oil like sunflower, groundnut, olive and canola oils instead of solid fats, palm oil, coconut oil, butter, or ghee.
4. Avoid trans fat as they increase the risk of NCDs.
5. There are no known health benefits of trans fats while risks are high.
6. Read the ingredients list before buying packaged products. Avoid products containing "partially hydrogenated oils" or trans fats.

14.5 Helpful Tips to reduce consumption of saturated fats and trans fats

1. Cook more often: make delicious meals with fresh ingredients. Heating up frozen pre-made foods does not count.
2. Use quick and easy recipes for delicious homemade pizza, meatballs, fishcakes and baked beans rather than fast foods.
3. Cut out visible fats from meats and discard poultry skin before cooking or eating.
4. Choose lean cuts of meats with less visible white marbling.
5. Do not rely on health claims on the food labels as your guide. Instead, always check fat content, by learning simple food label reading tips.
6. Avoid foods with trans fats or partially hydrogenated oils.
7. Avoid ultra-processed foods.
8. Choose foods with less than 10 g of total fat per 100 g; the less the better. For milk and yogurt choose less than 2 g per 100 g.

14.6 Simple tips for reading nutrition labels to choose foods with lower levels of fats and no trans fats

The nutrition labels on food packaging can help to cut down consumption of total fat and saturated fat, avoid foods with trans fats. Nutrition labels in the front and back of packaging may be shown differently. Most common labelling includes:

Table 14: A guide to fat content on a food label per 100 g food amount

	Fat free	Low	High
Total fat	0.5 g of fat or less per 100 g or 100 ml	Low fat – 3 g of fat or less per 100 g	More than 17.5 g of fat per 100 g
Total fat (liquids)	0.5 g of fat or 100 ml	1.5 g of fat per 100 ml for liquids (1.8 g of fat per 100 ml for semi-skimmed milk	
Saturated fat	0.1 g of saturates per 100 g or 100 ml	Low in saturated fat – 1.5 g of saturates or less per 100 g or 0.75 g per 100 ml for liquids	More than 5 g per 100 g

Products indicating low fat may still have high fat content since a low fat label means that the product's fat content is 25-30 percent lower than a similar product. For foods that have high fat, the lower fat version may still have high fat e.g. mayonnaise.

For lower fat versions, also check the total energy content as it may still be high calorie.

Ingredient list with hydrogenated oils means it contains trans fats.

In other words, that means fat on food labels include shortening, lard, butter, milk solids, monogylcerides, diglycerides, Copha, palm oil, coconut oil, coconut, vegetable oil/fat or animal fat/oils. Reference: American Cancer Society (2020) and the Heart and Stroke Foundation South Africa (2018)

15. Recommendation 2.4: Reduce intake of free sugars to prevent unhealthy weight gain and dental caries.

15.1 What are sugars?

Sugar is one of the three principal dietary carbohydrates with three major sub-groups: monosaccharides, disaccharides and polyols. Monosaccharides components include glucose, galactose, fructose and disaccharides components include sucrose, lactose, trehalose. Polyols are sugar alcohols with components such as sorbitol and mannitol (FAO, 1998).

Sugars, like other carbohydrates also provide energy to the body. In fact, carbohydrates, including polysaccharides like starch are digested and broken down into glucose. Glucose is the preferred energy source for cells throughout the human body including the brain and central nervous system (Howarth *et al*., 2012; Erbsloh *et al*., 1958; Mergenthaler *et al*., 2013). Even though cells need glucose to survive, consuming too much can cause many health problems.

15.1.2 Sources of sugar

Sugars are found naturally in foods, mainly in intact fruit, vegetables, and sugars from milk (lactose and galactose). These sugars are part of a healthy diet when consumed from fresh or unprocessed fruit, vegetables and milk.

Other sources of sugars are manufactured sweeteners. According to FAO, sweeteners includes products used for sweetening foods or drinks that are derived from sugar crops like sugar beets and sugar cane, cereals like maize, fruits or milk, or that are produced by insects like honey. These sweeteners exist either in a crystallized state as sugar, or in thick liquid form as syrups. Some sugar and syrups are also produced from the sap of certain species of maple trees, from sweet sorghum when cultivated explicitly for making syrup and from sugar palm (FAO, 1994). These sweeteners includes a wide variety of monosaccharides (glucose and fructose) and disaccharides (sucrose and saccharose).

Typically, sweeteners are used to make food more palatable and to assist in food preservation. These sweeteners are also referred to as free sugars.

15.2 What are free sugars

Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices, fruit juices concentres (WHO, 2015). Free sugars, are a big public health concern when consumed in excess. Examples of free sugars and foods with free sugars include:

- Free sugars include white and brown sugar, honey, syrup, sugar cane, and natural sugars in fruit juices including natural fruit juices.

A special note on cane sugar

Suger cane or sugar cane juice is one of the unprocessed forms of sugary drinks which in addition to sugar, contains 10-15 percent fiber, some vitamins and minerals and is also a good source of phenolic and flavonoid antioxidants.

However, besides these healthy properties, unprocessed sugar cane juice contains large amounts (10–15 percent) of sugar in the form of sucrose — the same as table sugar (FAO 1994). This translates to 50 g of sugar — the equivalent of 12 teaspoons per 1 cup (250 ml).

Sugarcane juice is very high in sugar and has a high glycemic load despite having a low glycemic index. Therefore, it affects blood sugar significantly (Kalpana *et al.,* 2013).

- Foods with high amounts of added sugars include sugar-sweetened beverages such as carbonated beverages and fruit juices, homemade and commercially made flour and sugar confections such as cakes, biscuits, other baked goods, sweets candies, chocolates, and sweetened tea, jams, tomato sauces, and breakfast cereals.

- Added sugars also include the sugar we add to hot or cold beverages and foods we prepare or take at home, as well

as cane sugar, dates, haluwa, syrup, sweets, and honey.

15.3 Link between free sugars and diseases

Besides the simple carbohydrate, added sugars do not contain any other nutrients, hence this type of sugar just adds calories with no other special nutritional value which is why added sugars are commonly referred to as empty calories.

Since sugary foods and drinks have minimal nutritional value they displace nutritious foods. In fact, the body doesn't need to get any carbohydrates from free sugars. An excessive amount of sugar is harmful to health in several ways:

- Increased intake of free sugars defined as more than 10 percent of total energy (12 tablespoons a day from all sources) is associated with increased body weight (WHO, 2015b).

- Increase in body weight increases the risk of overweight and obesity which are risk factors to several NCDs like, type 2 diabetes, high blood cholesterol, high blood pressure, stroke, coronary heart disease, and cancer; (Malik and Hu, 2019; Willett *et al*., 2019).

- Sugary drinks promote weight gain and as is associated with obesity, particularly among children (Ruanpeng *et al.,* 2017, WHO, 2016b).

- Intake of free sugars such as sweets, sugary foods and drinks cause dental caries (cavities) (WHO, 2015b; Gibney, 2018).

- Sugar-sweetened beverages are directly linked to the increased risk of type 2 diabetes, independent of obesity – meaning a person who drinks a lot of sugary drinks could develop type 2 diabetes even if that person is not overweight (WHO, 2016; GBMRFCDC, 2014).

15.4 Recommended amount of free sugars per day

- Less than 12 teaspoons (50 g) per day.

- Less than 6 teaspoons (25 g) per day for additional health benefits.

WHO recommends that free sugar intake be less than 12 teaspoons (50 g), which is 10 percent of total daily caloric intake. For additional healthy benefits, it is recommended to keep the sugar intake under 6 teaspoons (25 g) which is 5 percent of total daily caloric intake based on a 2 000 Kcal diet (WHO, 2015b). Since sugar has no nutritional value and has adverse metabolic effects, a recent EAT-Lancet Commission paper also suggests to keep intake of sugar to less than 5 percent of energy (Willett *et al*., 2019).

High amounts of sugar can be easily consumed through sugar-sweetened beverages like cola, fruit juices, sweetened tea, and sweetened milk drinks including those soda drinks that may taste sour or may not taste sweet. For example, there are about 5 to 9 teaspoons (25 to 45 g) of sugar in one bottle or can (330 ml) of soft drinks, already exceeding WHO and the EAT-Lancet Commission paper recommendations.

15.4.1 What would a daily amount of 25 grams of added sugars look like?

- Six teaspoons of sugar OR

- One tablespoon (21 g honey) OR

- 250 or 300 ml can of soft drink, or natural fruit juices and sweetened juices and concentrates

- Half cup (125 ml) of sugar cane juice

- 8.5 teaspoons (33 g sugar) in 335 ml glass of orange juice.

Do you know how much sugar is in your beverages?

250 ml to 330 ml beverages, sodas and fruit-flavoured drinks have between 5 to 9 teaspoons (25 g to 45 g) of sugar. Although these drinks have a high sugar content, some do not taste sweet but sour.

15.5 MESSAGES ON LIMITING SUGAR INTAKE

1. Choose safe and clean water instead of sugar-sweetened beverages.
2. Your body doesn't need to get any carbohydrate from added sugar, therefore limit intake of added sugars.
3. Reduce the intake of sugary drinks (e.g. fizzy drinks, juices and cordials) to small amounts and to occasional consumption.
4. Limit the intake of sugary foods (e.g. cakes, banana fritters, chocolates and candies).
5. Minimize the intake of confectioneries like biscuits and cakes, chocolates and candies.
6. Limit intake of sugar cane juice. 1 cup (250 mL) of sugar cane juice is about 50 grams of sugar — the equivalent of 12 teaspoons per 1 cup.

15.6 Helpful Tips reduce to the of consumption sugar

1. Choose to eat fresh fruits or vegetables as a snack instead of sugary snacks or sweets.
2. Use fruits instead of sugar to sweeten foods.
3. While choosing breakfast cereals, opt for wholegrain varieties e.g. All-Bran cereal, Weetabix and oatmeal instead of sugar-coated ones like coco pops and fruit loops.
4. Add more milk to tea and less sugar.
5. Drink water or other healthier beverage options such as sparkling water, unsweetened coffee and herbal tea instead of fizzy drinks.
6. Be aware of condiments containing added sugar such as canned or bottled tomato sauces.
7. Slowly reduce the amount of sugar you put in foods, your state bud will adjust too to less sugary foods.
8. Don't rely on health claims on the lables as your guide. Instead, learn a few simple label-reading tips:

   ◇ Sugar on a food label: Sugar can be called various names on the food label such as sucrose, maltose, lactose, dextrose, fructose, glucose, mannitol, sorbitol, xylitol, glucose syrup, corn syrup, golden syrup, maple syrup, rice malt syrup, malt, agave nectar, concentrated fruit juice, coconut sugar, palm sugar, disaccharides or honey (Queensland Government, 2014 and 2019).

   ◇ Avoid sugars that end with ''ose'' as they are ultra-processed foods.

   ◇ Look for products with less than 10 g of sugar per 100 g. If a product contains fruit, allow 20 g per 100 g of fruit.

   ◇ No added sugar: Although sugar was not added during production, the product could still be high in sugar, for example fruit juice, sugarcane juice, dates and other dried fruits.




16. Recommendation 2.5. Reduce salt intake to lower the risk of elevated blood pressure incidents, strokes, fatal strokes, and fatal coronary heart disease

16.1 What is salt?

Salt is a common name for sodium chloride (NaCl) and the main source of sodium in the diets.

Sodium is a mineral naturally occurring in fresh foods like fresh vegetables, legumes, and fruit.

The major sources of salt and of public health concern, is the manufactured salt used as culinary ingredient added to food during cooking, eating, or during food processing at household, artisanal or industrial level. Salt is used to enhance a food's flavours as well as to preserve food.

Ultra-processed foods and pre-prepared foods consumed outside the home are usually the largest source of dietary salt but in some cases large amounts of salt is added to food cooked at home.

16.2. The body requires very small amounts of salt for various functions.

The body requires very small amounts of salt for various essential functions although many people eat too much salt. WHO limits salt intake to less than 5 grams or one teaspoon per day from all sources.

1. Small amounts of sodium are important for maintaining normal body fluid balance and normal blood pressure, for allowing muscles to contract and relax and for enabling nerve signal transmission (Munteanu and Iliuta 2011; WHO 2012b)
2. Small amounts of chloride help keep the amount of fluids inside and outside of body cells in balance and maintain the acid-base balance. Chloride is one of the most important electrolytes in the blood and helps maintain proper blood volume and blood pressure (WHO, 2012b). Chloride is part of a gastric acid which aids in digestion and

is also an essential part of regulating digestive (stomach) juices secretion and plays a part in the immune system (Munteanu and Iliuta, 2011).

16.3 Iodised salt

16.3.1 What is iodine?

Iodine is mineral found in food that, once ingested, turns into important hormones in the thyroid gland. Dietary sources of iodine include fish, shellfish, eggs, meat, milk, cereal grains, legumes, and iodized salt. Most salts are fortified with iodine (WHO, 2012a).

16.3.2 Importance of iodine intake

These hormones created from iodine are especially important for humans from the 15th week of gestation up to three years for proper development of the brain and the central nervous system, which combines information and coordinates activity across the entire body. In addition, the thyroid hormones play a major role in processing nutrients from the food we eat.

Iodine deficiency disorders can result in brain damage and irreversible intellectual disability; decreased ability to think and learn; hypothyroidism which slows down the body; and goitre, which is an abnormal swelling of the thyroid gland around the neck. Iodine deficiency in pregnancy causes approximately 20 million babies a year to be born with an intellectual disability. Therefore, it is especially important for pregnant women to take adequate iodine.

16.3.3 Recommendation iodine intake

Current recommendation is 150 µg iodine per day for adults and 220 to 290 µg per day for pregnant and lactating women. Using iodized salt within the recommended amounts is adequate to meet the iodine need. As a reference value, US standardized salt contains 45 percent of the RDA 150 ug per day in ¼ tsp of iodized salt. Iodized salt refers to the salt (sodium chloride) that has been fortified with iodine and it is one of the most important sources of iodine.

16.4 Importance of reducing salt intake

Salt is a major contributor to high blood pressure and is associated with higher risks of cardiovascular diseases such as incident stroke, fatal stroke, and fatal coronary heart disease (PAHO, 2021; WHO, 2012b;WHO, 2014).

Cardiovascular disease is the leading cause of death in almost all countries (PAHO, 2021). In Zanzibar, crude prevalence of hypertension in the population is 33.5 percent (Jorgensen *et al.,* 2020). Cardiovascular diseases was the main cause of death in Tanzania in 2019, with a rate of almost 96.04 deaths per 100 000 individuals (Faria, 2021).

16.5 Current salt consumption and high salt foods

The average intake amount of salt in Zanzibar is currently unknown. WHO also states that countries need to ensure that the levels of salt iodization need to be adjusted over time depending on the observed salt intake in the population, so that the individuals consuming the recommended amount of sodium are getting sufficient iodine.

Regardless of unknown salt consumption, consuming ultra-processed foods, manufactured foods and salted dried or bottled foods could easily push the intake over the recommended daily limit. Commercially prepared foods and meals often have hidden salt, with no information available on the amount of salt it contains.

Even certain foods like bread and breakfast cereals contain a lot of salt although they may not taste salty. Therefore, it is important to check ingredient labels based on the guide in Text Box 1 provides tips on how to recognise of foods high in salts from a label (WHO, 2018; Heart and Stroke Foundation South Africa, 2018).

16.5.1 Examples of food high in salt

- Smoked, cured, salted meat, fish or poultry including, salami, sausages, luncheon meats and corned beef, burger meat

Figure 12: A guide to salt content on a food label per 100 g food amount

	Low	Medium	High
Salt	0 to 300 mg or 0-0.3 g per 100 g	300 to 1,500 mg (0.3-1.5 g) per 100 g	Over 1,500 mg (1.5 g) per 100 g
Sodium	0 to 120 mg per 100g	120 to 600 mg per 100g	Over 600 mg per 100g

- Foods canned or bottled in brine (salt water) such as meats, fish, olives and chili, pickles, beans canned with salt added
- Frozen breaded meats and pre-cooked meals, such as pizzas, pies
- Instant noodles, pre-packaged soups (dried or liquid), stock cubes and gravy granules
- Packaged sauces like soy, oyster, tomato, fish sauces, salad dressing
- Salted nuts, biscuits, crisps, cottage
- Table salt, kitchen salt of all types added to food during food preparation and consumption.

16.6 Recommended amounts of salt intake

WHO strongly recommends that total salt intake be less than 5 g per day or about one teaspoon of salt to keep the sodium level under 2 g per day for adults.

WHO has a strong recommendation on reducing sodium intake for controlling blood pressure in children. The recommended maximum level of intake of 2 g per day of sodium in adults should be adjusted downward based on the energy requirements of children relative to those of adults (WHO, 2012b). These maximum amounts of 5 g of salt per day and adjusted lower for children includes all the salt that is already added to foods purchased and the salt used for home cooking.

16.7 MESSAGES ON REDUCING SALT INTAKE

1. Use salt sparingly when cooking and when eating. Use only iodised salt.
2. Read the ingredients list before buying packaged products. Avoid products containing high salt content.
3. Avoid intake of ultra-processed foods like savoury snacks as they are high in salt.
4. When using salt, rather use the iodised one as it will boost your iodine requirements.
5. Look out for other names of salt (sodium) on the label include MSG (monosodium glutamate), glutamate, Na, any word containing the term sodium,bnitrates, or nitrites like sodium bicarbonate (Baking soda), sodium ascorbate, sodium lactate, yeast extracts, vegetable salt, celery salt, garlic salt, or stock.

16.8 Helpful Tips to limit salt intake

1. Use more herbs and spices to bring out flavour in food rather than salt or sugar.
2. Instead of salt, squeeze lime or lemon over fish and vegetables.
3. Taste your food first before adding salt.
4. Slowly reduce the amount of salt you put in foods, your taste buds will adjust to less salty foods.

Dietary Guideline 3

Shift to healthier practices that support better nutrition and health outcomes.

17. RECOMMENDATION 3.1: Keep your food, home environment, and water safe and clean to prevent diseases.

Food can become contaminated at any point during the food production and preparation cycle, which is from the time of production, harvesting and processing, distribution, and at home during meal preparation and storage. A large proportion of foodborne disease incidents are caused by foods improperly prepared or mishandled at home, in food service establishments or at markets (FAO, 2010a; FAO 2017b; FAO and WHO 2021). Food safety and hygine is critical to prevent illness and diseases.

17.1 What is food safety and hygiene?

Food safety refers to handling, preparing, and storing food in ways that prevent food-borne illnesses. Hygiene is the practice of keeping oneself and the surrounding environment clean and free from germs and other disease-causing elements in order to prevent illness or the spread of diseases (Collins Dictionary, 2021; EC and Turkish National Agency, 2018).

Foodborne illness or "food poisoning" happens when a person gets sick by eating foods contaminated with micro-organisms or chemical substances. Though everyone can get sick, young children, older adults, pregnant women, and those who have a weakened immune system (i.e. YOPI) are at greater risk for developing a foodborne illness.

Food safety and hygiene is important in preventing contamination of food which can cause illness including fever, diarrhoea, vomiting or even death. The prevalence of diarrhoea in children under five years is estimated to be 10.5 percent (MoHCDGEC, 2016). Diarrhoea is one of the top five causes of mortality in children under five years and is also one of the top causes of morbidity in outpatient visitors in health facilities (MoHSW, 2009).

17.2 Ways through which food gets contaminated

There are several ways through which food can be contaminated (Nyachuba, 2010) such as microbial, chemical and physical contamination through various means.

17.2.1 Microbial contamination

Food can also be contaminated with germs.

Germs exist everywhere in nature. They are in the soil, air, water, and the foods we eat (WHO, 2006a). Food spoilage or poisoning happens when germs multiply on and in the foods through:

- Poor hygienic practises such as touching food with dirty hands as well as preparing and storing food in dirty places.
- Inadequate cooking of food to kill germs that exist in or have entered the food.
- Leaving cooked foods or fresh animal-source foods at room temperature for more than two hours can also make food unsafe (WHO, 2006).
- Using contaminated water or ice to wash, pack, or chill foods.
- Using contaminated surfaces, containers, or tools used for food processing and storage.
- Contamination by flies, cockroaches, insects, and pests.
- Cross contamination; contaminated foods contaminating other foods, for example when vegetables or fruits are mixed with meats. During the rearing and slaughtering of animals, for example the salmonella that lives in animal intestines can transfer onto food products.
- Food that has gone past its expiry date.

Food can also be contaminated with aflatoxins (moulds)

Aflatoxins are naturally occurring toxins that are produced by species of a fungus called Aspergillus. The fungus grows and survives on many organic nutrient sources like crops, plants, decaying wood or compost, animal feed, grains and can also be found in animals (FAO 2007, FAO 2004b).

Foods such as groundnuts, tree nuts, spices, chillies, maize, rice, sorghum and cassava are usually contaminated by aflatoxins (Ezekiel, Ortega-Beltran and Bandyopadhyay, 2019). Food contamination by aflatoxins can take place during crop production, before and after harvesting in the following ways:

- If food is not stored properly and is kept in warm temperature (24 to 35 degrees celcius) and with a moisture content of over 7 percent or 10 percent in well ventilated areas (FAO, 2007).
- Aflatoxins can also be found in meat, chicken or milk when livestock is fed aflatoxin-contaminated foods.

17.2.2 Chemical contamination

- Chemicals like pestcides used during production, harvesting, storage and processing or fertilizer residues.
- Cleaning products or chemical residues on cleaning and storage equipment and chemicals sprayed near food.
- Leaching of chemicals from food containers made of non-safe plastics or painted utensils.

17.2.3 Physical contamination

- Physical contaminants that can be found in food include stones, pests, bones, hair, static, sticks, etc.

Food contamination can have serious consequences to human health. Keeping food safe before and while cooking and storage is critical to prevent illness and the spread of diseases. There are five keys to keeping food safe (FAO, 2021, WHO 2001, WHO, 2006a) outlined below.

17.3 Keep hands and the food environment clean

17.3.1 Wash your hands frequently with soap and clean water at critical times, such as:

- Before, during and after preparing or eating food.
- After using the toilet.
- After changing a child's nappy.
- Before and after caring for the sick.

Washing hands is important because contamination can happen when food makes contact with unsanitary hands. Proper hand washing is an important step in preventing food poisoning. Washing hands properly and frequently can greatly reduce the spreading of germs that could cause diarrhoea, cholera, hepatitis, typhoid, and polio (WHO, 2006a; UNICEF and WHO, 2021).

17.3.2 Keep your environment clean and sanitary

- General cleanliness around the house is important especially in areas where food is prepared or stored. Regularly clean all surfaces with clean water and soap or sanitisers to prevent food contamination.

- Protect kitchens and food preparation areas from insects, pests and other animals.

- Keep the environment free of human, animal and foods waste at all times.
  - ◇ Improper disposal of faeces and waste and poor hygiene are risk factors for diarrhoeal diseases. Human faeces and urine carry harmful bacteria. Properly disposing of them can help to prevent the spread of diseases.
  - ◇ Other types of solid wastes that can be problematic include food waste, leftover food, meat and fish parts, and vegetable peelings. These can attract flies, roaches, rats, and other pests that could spread diseases.

17.4 Keep fresh foods away from raw meats, chicken, and fish

- It is important to keep fresh fruits and vegetables and prepared foods away from raw meats and fish to avoid contamination. Raw food especially eggs, meat, poultry, seafood and their juices can contain dangerous micro-organisms which may be transferred to other foods during preparation or storage.

- It is also important to clean surfaces and knives with soap and safe water after preparing raw animal flesh foods and before cutting fruits and vegetables, especially if these are to be eaten raw or cooked in low heat. Wash fruits and vegetables with clean and safe water before preparing or eating.

17.5 Cook foods thoroughly

- Some animal sourced foods like meats, milk, fish, poultry, eggs and seafood carry harmful microbes. When these foods are not cooked thoroughly, the germs survive and get ingested. Therefore, it is important to cook animal sourced foods thoroughly before eating.

- Bring foods like soups and stews to a boil and make sure they have reached 70 degrees Celcius. For meat and poultry, make sure the juices are clear and not pink. Ideally use a thermometer.

- Reheat cooked food thoroughly.

- Serve food immediately whilst still hot.

17.6 Keep your foods at safe temperatures

- Micro-organisms thrive and multiply quickly in warm and humid conditions in temperatures between 5 degrees Celsius and 60 degrees Celsius with some

doubling in number in as little as 20 minutes. Keeping foods below 5 degrees Celsius can slow microbes' growth. Foods do not have to smell bad to have been contaminated with microbes.

- Do not leave cooked or perishable foods at room temperature for more than two hours. In warm weather (over 32 degrees Celsius), do not keep perishable food outside the fridge for over one hour.

- Keep cooked food piping hot (more than 60 degrees Celsius) prior to serving.

- When leaving food out, always keep the food covered to keep it safe from bugs and rodents.

17.6.1 Refrigerate perishable foods immediately where a fridge is available

- Refrigerate or freeze meat, poultry, eggs and other perishables as soon as you get them home from the store or farm.

- Refrigerate or freeze cooked foods within two hours or one hour in warm weather.

- Keep foods in the refrigerator between 1 degrees Celsius and 5 degrees Celsius, and for the freezer below 0 degrees Celsius.

- Do not store foods for too long even in the fridge. Refrigerate leftover food for up to three days and reheat thoroughly before consumption. Freezing will keep foods up to six months or more.
- Do not thaw frozen food at room temperature.

17.6.2 If there is no refrigerator

- Prepare food in smaller quantities that can be finished during the meal and avoid having excess leftovers.

- Do not keep cooked or perishable foods for more than two hours, and in warmer weather do not keep food for over an hour in temperatures above 32 degrees Celsius.

- Share leftovers with others within one or two hours of cooking to avoid wasting food.

- Cook raw meat, poultry, and fresh fish as soon as it is bought or slaughtered, and do not let them keep for more than two hours before cooking. Once cooked, apply the same rules as cooked foods (WHO, 2006a).

17.6.3 Store your food in proper containers

- Prepared foods should be stored in food-safe containers. Avoid using plastic bags to store prepared foods, as it is likely that the bags are not sanitary. Plastics that are not food-safe tend to leach harmful chemicals into the food.

17.7 MESSAGES FOR FOOD SAFETY

1. Wash your hands with soap and clean water every time before and during food preparation.
2. Wash your hands before eating or feeding young children.
3. Wash your hands after using the toilet, after changing a nappy, and after caring for the sick.
4. Clean food preparation areas regularly with soap and water or sanitiser.
5. Dispose of human faeces and urine properly.
6. Keep raw meats, poultry, and fish separate from cooked foods, fruits, and vegetables.
7. Cook meats, poultry, and fish thoroughly. Boil raw milk before drinking.
8. Do not leave cooked food out in room temperature for more than 2 hours.
9. Throw away food that has mould or has gone past the expiry date as it is not good for consumption.

17.8 Helpful Tips for maintaining food safety and a clean environment

1. Use a pit latrine as the safest way to dispose of human faeces and urine waste.
2. Use running water from a tippy tap or tap to wash hands after visiting.
3. Place a tippy tap with water and soap near the toilet for easy access.
4. Pour water when washing hands instead of everyone washing hands from a basin.
5. Cook enough food for a meal to avoid leftovers.

18. RECOMMENDATION 3.2: Make clean, safe water your drink of choice every day for good health.

18.1 Importance of drinking enough clean and safe water

Water is essential for maintaining human life and is ranked second in importance after oxygen. Although water is not a nutrient, we can only survive for a few days without water while we can last for two months without food. Over half of an adult body consists of water.

Water is essential for the digestion and absorption of food, the transport of nutrients, maintenance of normal bowel functions, regulation of body temperature through sweating, blood circulation, transportation of oxygen to cells, and removal of toxins and other wastes from the body. Water makes saliva, prevents constipation and also protects the body by lubricating and cushioning joints and tissues.

Water is lost from the body through breathing, urination, sweating and breastfeeding. On average, a healthy individual loses approximately 1.5 to 2.5 litres of water every day (Sawka, *et al*., 1998; Sawka *et al*., 2005). During illness, water is also lost through fever, vomiting or diarrhoea.

It is important to drink clean and safe water throughout the day to replenish what is naturally lost and to increase water intake when breastfeeding or sick. Do not wait until you're thirsty to drink water, as thirst is a sign that you are already dehydrated. Dehydration is very dangerous for babies, small children and older adults.

18.2 Making water clean and safe

Treating water or making it safe for drinking is an important part of hydration. Untreated water may contain harmful germs that can cause diarrhoeal diseases, even when the water seems clear and clean to the naked eye. Treating water for drinking or preparing food is highly encouraged.

Boiling water or using chlorine or water guard are the most effective methods of making water safe for drinking.

18.3 Recommendation for water intake

Drink 8 to 10 glasses per day (1.5 litres to 2 litres). Drink more water than the recommended amount if breastfeeding, sick, spending a lot of time in the heat or are physically active.

18.4 MESSAGES FOR HEALTHY WATER INTAKE

1. Always boil or treat water before drinking.
2. Drink at least eight to ten glasses of water every day.
3. Choose water instead of sugar-sweetened beverages.
4. Remember to drink before feeling thirsty.

18.5 Helpful Tips for drinking adequate water

1. Carry bottled water with you to have access to clean and safe water.
2. Get in the habit of drinking a tall glass of water after you wake up.
3. Drink a glass of water before or after every meal.
4. Drink a glass of water after you use the toilet.
5. Reduced urine output and dark yellow urine shows that you are not drinking enough water.

19. RECOMMENDATION 3.3: Avoid drinking alcohol and tobacco use to prevent and reduce risk of diseases.

19.1 Tobacco

Tobacco smoking causes lung cancer for the smoker and those who are exposed to it, which is called second-hand smoking or passive smoking (WHO, 2021a; Lee *et al*., 2012). Tobacco smoking can also cause other problems in the lungs like bronchitis (WHO, 2021a; Forey *et al*., 2011). Tobacco smoke is harmful to the foetus when a pregnant woman is exposed (WHO, 2021a; Marufu *et al*., 2015), and the nicotine in the tobacco can be absorbed through a baby's skin.

Smoking is not recommended and can cause harm to a person's health. Tobacco smoking is a risk factor for developing NCDs (GBD, 2016; WHO, 2018c). It increases the risks of heart disease; stroke; and cancers of the bladder, blood, cervix, colon and rectum, oesophagus, kidney, liver, and stomach (American Cancer Society, 2020). Smoking is harmful to the body.

19.2 Alcohol

Alcohol can be harmful to the body. Although a person may not be abusing alcohol regularly, they can still experience its short-term effects on the mind and body (WHO, 2009; Moore *et al*., 2005). Some of the effects include lower inhibitions leading to poor social judgments (Young *et al*., 2008); trouble thinking and concentrating; loss of coordination; dulled vision; and raised blood pressure (WHO, 2009).

There are more serious health outcomes associated with long-term use (WHO, 2009; Moore *et al*., 2005). These include memory loss; loss of attention; liver fibrosis; hepatitis; fatty liver; cancers of the throat, mouth, breast, and liver; and stroke (Marshall, 2014; WHO, 2009). Alcohol can cause great harm to the body (WHO, 2009). Abstaining from alcohol is recommended.

19.3 MESSAGES FOR AVOIDING ALCOHOL AND SMOKING

1. Do not smoke tobacco.
2. Avoid being exposed to second-hand smoke. If you do smoke, keep a distance from people smoking to avoid inhaling the smoke.
3. Abstain from alcohol.
4. Alcohol is not recommended for children aged less than 18 years.

20. RECOMMENDATION 3.4: Be physically active every day to stay strong and keep a healthy weight.

20.1 What is physical activity?

Physical activity refers to any bodily movement that involves moving the body's muscles and that uses up energy. Physical activity can be done at various intensities like doing daily chores around the house, as part of work like farming, fishing, lifting goods, walking, bicycling, or during leisure activities like dancing, or as part of exercise or sport activities (WHO, 2010; WHO, 2020b).

Physical activity and eating a variety of healthy foods is one of the very few lifestyle choices that have a large impact on one's health.

20.2 What is exercise?

Exercise is a type of physical activity that is planned, structured, repetitive and purposeful in order to maintain or improve one's physical fitness. Examples of structured, repetitive, and purposeful exercise include:

- Aerobic (walking, dancing, swimming, riding a bicycle) for example, walking 30 minutes every day or jumping rope for ten minutes six days a week.
- Strength exercises (anaerobic such as push-ups, squats, pull-ups) for example completing 20 push-ups and 50 squats five days a week.
- Flexibility exercise – Range of motion (yoga, stretching, pilates) for example doing yoga for a number of minutes once or twice a week.
- Functional balance exercises (standing with one leg, Tai Chi, muscle strength exercises).

20.3 What is sedentary behaviour

At the lower end of the physical activity range is sedentary behaviour, which is defined as any waking behaviour characterised by low energy expenditure (of 1.5 METS or lower) while sitting, reclining or lying. Examples include desk-based office work, watching television, working or playing on computer, phone or mobile devices, sitting down and chatting, reading a book or selling items, and driving a car.

20.4 Physical activity and its health benefits

20.4.1 Reduces the risk of dying early from leading causes of death from non-communicable diseases

Not being physically active is now identified as the fourth leading risk factor for death around the world, which accounts for about 6 percent of deaths (WHO, 2010). Overweight and obesity account for 5 percent, while high blood pressure, tobacco use, and high blood sugar account for 13 percent, 9 percent, and 6 percent, respectively (WHO, 2010).

It has been shown that regular physical activity reduces the risk of all-cause mortality (Warburton *et al*., 2006; WHO, 2020b). People who are physically active for about 150 minutes a week have a 33 percent lower risk of all-cause mortality than those who are physically inactive (Mok *et al.,* 2019; WHO, 2020b; Nocon *et al*., 2008; CDC, 2021).

20.4.2 Protective factor for prevention and management of non-communicable diseases

Physical activity is protective against various NCDs such as cardiovascular disease mortality, type 2 diabetes, hypertension, and site-specific cancers (Warburton *et al*., 2006; WHO, 2020b; WHO 2010; McTiernan *et al.*, 2019; Lee *et al.*, 2012).

20.4.3 Delays onset of dementia

Physical activity has positive benefits for managing Alzheimer's disease and dementia (Reiner *et al*., 2013; WHO, 2020b).

20.4.4 Supports with weight management

Being physically active is also key to expending energy and helping the body to maintain an energy balance, thus promoting weight control when combined with a healthy diet (WHO, 2020b; WHO, 2007; Warburton *et al*., 2006).

Physical activities use up energy or burn calories (calories refer to the amount of energy in food). When calories are consumed in excess of the body's needs, it leads to weight gain. Excessive weight gain can lead to obesity, which is a risk factor for chronic diseases such as diabetes, high blood pressure, cardiovascular diseases and some cancers (WHO, 2020b). The only way to burn excess calories is by moving the body more through regular exercise or through other physical activities. It is important to burn excess calories to achieve a neutral balance of energy in order to maintain a healthy weight.

20.4.5 Improves mental health and general well being

Physical activity reduce stress, improves mental health and elevates the mood, sense of well-being and self-esteem, and hence wards off depression. In addition, physical activity improves memory and learning, and improve the overall quality of life (WHO, 2020; USDHSS, 2018).

20.5 Negative effects of physical inactivity or sedentary behaviour

Emerging new evidence indicates that high levels of sedentary behaviours are associated with cardiovascular disease, type 2 diabetes, cancer and all causes of mortality.

Physical inactivity is estimated to be the main cause for approximately 21 to 25 percent of breast and colon cancers, 27 percent of diabetes and approximately 30 percent of ischemic heart disease burden (WHO,2005). The evidence from developing countries confirms that physical activity positively influences other chronic disease risk factors such as blood pressure, lipid levels and obesity. A systematic review on the role of physical activity in prevention of hypertension (Diaz and Shimbo, 2013) reported that the elimination of physical inactivity would remove between 6 percent and 10 percent of the major NCDs of coronary heart diseases, type 2 diabetes, breast and colon cancers, and increase life expectancy, although dose–response was not established (Lee *et. al*., 2012).

20.6 Physical activity among Zanzibaris

According to the Zanzibar Non-Communicable Diseases risk factor survey, 64.6 percent of the population in Zanzibar had high levels of physical activity combining work, transport and leisure time. High physical activity was defined as more than ten minutes at a time of activities such as ploughing, sawing hardwood or playing football. Men were found to be more physically active (80 percent) compared to women (50.7 percent). The study also found that about 17.6 percent of the respondents had low levels of physical activity (MoH, 2012).

20.7 Recommendations for physical activity for all age groups

WHO (2020b) recommends that everyone young or old should engage in some form of physical activity. The frequency, intensity and duration differs among children and adolescents between the ages five to 17 years, adults between the ages 18 to 64 years, and adults over 65 years of age as well as in sub-populations such as pregnant women and those living with a disability or chronic conditions.

20.7.1 Children 0-59 months

Babies under one year of age are recommended to be as active as possible with the supervision of parents or caretakers throughout the day when the baby is awake. Activities such as grasping, pushing or pulling, reaching out, crawling, moving their heads, limbs and body can be ways to keep the baby active. Include at least 30 minutes of tummy time which can be spread throughout the day (WHO, 2019).

Toddlers (1-2 years: 12-24 months) should have at least 180 minutes (three hours) of physical activity every day.

Again, the time can be spread throughout the day. Activities such as standing up, running and rolling, chasing ball games, jumping, playing in water and riding a bike can be effectively used to keep this age group active. For one-year-olds, sedentary screen time (such as watching TV or videos or playing computer games) is not recommended. For those aged two years, sedentary screen time should be no more than one hour; less is better. When children are sedentary, engaging in reading and storytelling with a caregiver is encouraged (WHO, 2019).

20.7.2 Pre-schoolers (3-4 years)

Children three to four years old should have at least 180 minutes (three hours) of physical activities spread throughout the day. It should also be noted that they are to have at least 60 minutes of moderate to vigorous intensity physical activities.

This particular age group should have limited screen-watching time – an hour or less is better for a child's good health and development (NHS; WHO guidelines on physical activity, sedentary behaviour and sleep for children under five years of age).

20.7.3 Children and adolescents 5 to 17 years

- Children and young people aged five to 17 years should accumulate at least 60 minutes of moderate to vigorous-intensity, mostly aerobic, physical activity daily.

- Physical activity of amounts greater than 60 minutes daily will provide additional health benefits.

- Vigorous-intensity activities should be incorporated, including those that strengthen muscles and bones, at least three times per week.
- Limit the amount of time spent being sedentary, particular recreational screen time.

In children and adolescents, physical activity confers benefits for the following health outcomes: improved physical fitness (cardiorespiratory and muscular fitness), cardio metabolic health (blood pressure, dyslipidaemia, glucose and insulin resistance), bone health, cognitive outcomes (academic performance, executive function), mental health (reduced symptoms of depression); and reduced adiposity (WHO, 2020).b

20.7.4 Adults 18 to 64 years old

In order to improve cardiorespiratory and muscular fitness, bone health and reduce the risk of NCDs and depression, the following are recommended:

- Adults aged 18 to 64 years should do at least 150 to 300 minutes of moderate-intensity aerobic physical activity throughout the week, or do at least 75 to 150 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity.

- For additional health benefits, muscle-strengthening activities should be done involving major muscle groups on two or more days a week.

Limit the amount of time spent being sedentary.

20.7.5 Older adults from 65 years and above

In addition to the benefits for adults mentioned earlier, physical activity in older adults helps prevent falls and fall-related injuries and declines in bone health and functional ability (WHO, 2020). Physical activity focused on balance training and moderately-intense muscle strengthening activities reduces nearly 30 percent of the risk of falls in older adults with poor mobility (Paterson and Warburton, 2010). In addition, physical activity improves cardiorespiratory and muscular fitness, bone and functional health, and reduces the risk of NCDs, depression and cognitive decline.

The following are recommendations for the elderly:

- All older adults should undertake regular physical activity.

- Adults aged 65 years and above should do at least 150 to 300 minutes of moderate-intensity aerobic physical activity throughout the week, or do at least 75 to 150 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity. Aerobic activity should be performed in bouts of at least 10 minutes duration.

- Adults over 65 years with poor mobilities should perform physical activity on three or more days a week to enhance balance and prevent falls (WHO, 2020b).

- For additional health benefits, adults aged 65 years and above should increase their moderate intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity.

- Adults of this age group with poor mobility should perform physical activity to enhance balance and prevent falls on three or more days per week.

- Muscle-strengthening activities should be done involving major muscle groups, on two or more days a week.
- When adults of this age group cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

20.7.6 During pregnancy and postpartum (lactation)

In pregnant and postpartum women, physical activity during pregnancy and postpartum confers benefits on the following maternal and foetal health benefits: decreased risk of pre-eclampsia, gestational hypertension, gestational diabetes, excessive gestational weight gain, delivery complications and postpartum depression, and fewer new-born complications, no adverse effects on birthweight; and no increase in risk of stillbirth (WHO, 2020b).

All pregnant and postpartum women without contraindications (complications) should undertake physical activity throughout the pregnancy and after delivery (WHO, 2020b).

Do at least 150 minutes of moderate intensity aerobic physical activity throughout the week for substantial health benefits. Strong recommendation, moderate certainty evidence.

It is recommended that pregnant and postpartum women should limit the amount of time spent being sedentary. Replacing sedentary time with physical activity of any intensity (including light intensity) provides health benefits.

20.8 MESSAGES FOR PHYSICAL ACTIVITY

1. Adults from 18 years and older should do at least 150 to 300 minutes a week of moderate physical activity to keep the body healthy.
2. Children aged five to 17 years should do at least 60 minutes a day of moderate to vigorous physical activity.
3. Pregnant women should do at least 150 to 300 minutes a week of moderate physical activity to keep their bodies healthy.
4. Keep babies and young children active daily under adult supervision.
5. Keep children aged one to four years active for at least 180 minutes a day.
6. Limit recreational screen time (television, computer and video games etc.) to no more than two hours per day.
7. Do muscle-strengthening activities at least twice a week.

20.9 Helpful Tips for being physically active

1. Walk or bike instead instead of taking or using motorized transportation or driving.
2. Take the stairs instead of elevators. Choose physical activities that you enjoy like soccer, dancing, walking, and biking.
3. Spread your physical activity throughout the week with bouts of at least ten minutes or more per time.
4. Every bit helps. You can break up your exercise into two or three parts each day to fit your schedule.
5. Be active together. Being active with someone else will keep you accountable and motivated.
6. If physically inactive, start gradually – increasing the duration and frequency of moderate-intensity activity before considering increasing the intensity to vigorous-intensity activity.
7. Take a break from sitting to stand up and move around after every hour.

SECTION 3

Populations with special dietary requirements:

Pregnant and lactating women, under-five children, school-going children and the elderly

Dietary Guideline 4

Optional nutrition for pregnant and lactating mothers, and infants and children, promotes thriving, ensures healthy child growth and development, and improves their chances of survival









21. RECOMMENDATION 4.1: When pregnant or breastfeeding, enjoy a variety of foods including animal source foods, pulses, fruits and vegetables with your meals for your health and the health of your baby.

21.1 Nutrient needs of pregnant and lactating women

Everybody, young and old, should enjoy eating a variety of foods from the six food groups every day to stay healthy and strong.

However, three months before and during pregnancy, and after the baby is born are the times when good nutrition matters most in a woman's life, as pregnant and lactating women have special nutrition needs. Eating a variety of foods therefore becomes more important during pregnancy and lactation, as it supports the mother's and baby's health.

The amount of specific nutrients needs vary based on the stage of pregnancy, the mother's nutritional status, and whether the mother is carrying one or more babies, amongst many other factors.

The nutrient requirements also change during lactation (Table 15 demonstrates the different nutrient requirements). There is no single food with all nutrients to meet the body's needs. It is important therefore to include a variety of foods from all the six food groups to ensure that both the mother and the future baby get the right types and amounts of nutrients they need.

21.2 Importance of good nutrition during pregnancy

When pregnant, eating a variety of food from the six food groups is more important than ever. Eating a variety of foods is one of the most important things a woman can do for herself and for the future baby. Eating a variety of foods will provide all the nourishment needed for a healthy pregnancy and a healthy baby.

Healthy, well-nourished women should gain an average of 12 kg (10 to 14 kg) weight during pregnancy, increasing the probability of delivering full-term infants with an average birth weight of 3.3 kg, and reducing the risk of foetal and maternal complications (FAO, WHO and UNU, 2004).

While all nutrients, including vitamins and minerals, are important to everyone including pregnant women, pregnant women have an increased need of some specific vitamins. When pregnant, women need more nutrients like protein, iron, folic acid (vitamin B9), vitamins A and D, calcium and additional calories to support the growing baby and for the women's health during pregnancy (WHO, FAO and UNU, 2007; FAO and WHO, 2004; FAO, WHO and UNU, 2004). Pregnant women also need additional vitamin C and minerals such as selenium, especially during the second and third trimesters, and iodine and zinc from the first trimester in order to support the growth of the foetus (FAO and WHO, 2004).

21.3 Importance of iron, folic acid, vitamin A and D, calcium, other micronutrients and extra energy during pregnancy

21.3.1 Iron

Iron is important for preventing iron deficiency anaemia during pregnancy, which is common among pregnant women globally. Anaemia during pregnancy increases the risk of maternal blood loss, infections during the birth of her child, low birth weight and preterm birth (WHO, 2003; WHO, 2012b). In addition, anaemia can lead to maternal and perinatal mortality (Fanzo, 2013; WHO, 2012b). In United Republic of Tanzania, about 46.9 percent of pregnant women have anaemia (WHO, 2006b).

There are foods rich in iron such as liver, meat, fish, poultry, green leafy vegetables and pulses. However, during pregnancy, diet alone cannot meet iron requirements. Pregnant women need to maintain iron stores of 500 mg during the second and third trimesters. It is not common for women to keep iron stores of 500 mg from diet alone (FAO and WHO, 2001). WHO therefore recommends that pregnant women should take iron supplements daily as prescribed at their ante-natal clinic or by a doctor. The recommended daily supplementation of iron is equivalent to 60 mg of elemental iron, which is 300 mg ferrous sulphate heptahydrate, 180 mg ferrous fumarate or 500 mg of ferrous gluconate (WHO, 2012b).

21.3.2 Folic acid (folate or vitamin B9)

Folic acid is critical during periods of rapid growth, such as during pregnancy and foetal development, particularly during the first trimester. Folate helps prevent neural tube birth defects, anencephaly and spina bifida during pregnancy in which the baby's spinal cord and brain fail to develop properly (Fanzo, 2013). Adequate folic acid is required to make healthy red blood cells (Fanzo, 2013). Folic acid is required during pregnancy to prevent maternal anaemia, low birth weight, preterm birth and puerperal sepsis, (WHO, 2012b). Folate also helps to form DNA and RNA and is involved in protein metabolism.

Rich sources of folate include fruits such as oranges, tangerines, bananas and peaches. In addition to food sources, WHO recommends folate supplementation prior to conception in planned pregnancies and continued in the first trimester of pregnancy. Supplementation is crucial because the amount of folic acid from food is insufficient to meet the demands of the foetus during that period (WHO,2012b).

21.3.3 Vitamin A

Pregnant women need additional vitamin A to promote foetal growth and development. Pregnant women are more susceptible to vitamin A deficiency during the third trimester (WHO, 2019a; Radhika *et al.*, 2002). Deficiency in pregnant women can lead to night blindness (West, 2003; FAO and WHO, 2004; WHO, 2016b), maternal mortality (Christian *et al.,* 2000) and high risk of infant mortality in the first year of life (Christian *et al.,* 2001). In addition, vitamin A deficiency during pregnancy can lead to preterm delivery and maternal anaemia (Radhika *et al.,* 2002). Vitamin A also helps to boosts immune functions (Fanzo, 2013).

In Zanzibar, over one-third to about half (35.6 percent in Unguja and 47.4 percent in Pemba) of women of reproductive age are vitamin A deficient (NBS and ICF Macro, 2011). In addition, vitamin A intake of 258 mcg RAE is far below the recommended intake of 528 mcg RAE per person per day.

Good sources of vitamin A include organ meats such as liver, kidneys and tripe; orange-coloured fruits and vegetables such as carrots, pumpkins, squash and orange or yellow sweet potatoes; as well as dark green leafy vegetables such as amaranthus, moringa leaves, spinach and cowpea leaves.

21.3.4 Calcium

Calcium is important in pregnant women to help prevent developing pre-eclampsia (Villar *et al.,* 2004; WHO, 2013). About 1000mg of calcium is required during pregnancy. If pregnant women do not consume enough calcium, they are as risk of suffering adverse effects including their unborn babies. Some of the effects of calcium deficiency include osteopenia, tremor, paraesthesia, muscle cramping, tetanus, delayed foetal growth, low birth weight, and poor foetal mineralization (Hofmeyr *et al.,* 2010).

Calcium needs during pregnancy can be met with foods alone. Such foods include dairy products like milk and yoghurt; dark green leafy vegetables such as moringa leaves, cassava leaves, amaranthus and spinach; as well as small fish eaten with bones such as sardines and fish bait, and baobab pulp.

21.3.5 Vitamin D

Vitamin D is needed during pregnancy to reduce the risk of pre-eclampsia, gestational diabetes mellitus, preterm birth, low birthweight and other tissue-specific conditions (WHO and FAO, 2014).

The body creates vitamin D from direct sunlight on the skin when outdoors. So most people including pregnant women should be able to make all the vitamin D they need from sunlight.

Vitamin D is also found in a small number of foods such as oily fish – such as salmon, sardines, herring and mackerel, liver, and egg yolks.

21.3.6 Energy

Energy needs increase particularly during the second and third trimesters of pregnancy. Pregnant women therefore need extra energy to support the woman's own body's changing metabolism and the growth of the foetus, placenta and maternal tissues (Institute of Medicine, 1990). In addition, the extra energy is needed for the increased metabolic demands of pregnancy, and to maintain adequate maternal weight, body composition and physical activity during pregnancy (FAO, WHO and UNU, 2001).

It is recommended that pregnant women take additional 360 Kcal in the second semester and 475 Kcal per day in the third (FAO, WHO and UNU, 2004). However, depending on the woman's age, body weight, and activity level, the energy requirement will vary. Pregnant women should therefore consume carbohydrate-rich foods like whole grains, roots and tubers, pulses, nuts and seeds. Not only are these foods rich in carbohydrates, they are also rich in other important nutrients such as vitamins, minerals, fibre and some proteins.

21.3.7 Selenium

Pregnant women need an additional 2 µg per day during the second trimester and 4 µg per day in the third trimester (FAO and WHO, 2004).

Deficiency of selenium in pregnant women may lead to gestational complications, miscarriages and the damaging of the nervous and immune systems of the foetus (Pieczyńska, 2014).

Food sources provide adequate amounts of selenium during pregnancy. The richest food sources of selenium include Brazil nuts, seafood's like yellowfin tuna, sardines, oysters, clams, halibut, shrimp, salmon, and organ meats. Other sources include muscle meats like beef and turkey, chicken, eggs, cereals like brown rice and other grains, and sunflower seeds. Dairy products, beans and lentils also contain some selenium. The selenium content of soil affects the amounts of selenium in the plants that animals eat, so the quantities of selenium in animal products and plants may vary.

21.3.8 Zinc

The body needs zinc for cell division, protein synthesis and growth (WHO, 2016b). The effects of pregnant women's zinc status on outcomes is unclear (FAO,2001). However, during the third trimester, the physiologic requirement of zinc is approximately twice as high from, 11 mg per day in the first trimester to 20 mg per day in the third trimester, than in women who are not pregnant (WHO, IAEA and FAO, 1996; FAO, 2001; FAO and WHO, 2004).

Poor maternal zinc status has been associated with foetal loss, congenital malformations, intrauterine growth retardation, reduced birth weight, and prolonged labour (Chaffe and King, 2012). Food sources are adequate to provide zinc requirements during pregnancy. Oysters and lean red meat provide highest concentrations of zinc, while poultry, fish and certain types of seafood like crab and lobster and dairy products provide moderate amounts of zinc. Zinc from animal sources is highly bio-available for the body (Wise A, 1995; FAO and WHO, 2004).

Whole grains and pulses like beans, and nuts provide the highest concentrations of zinc while vegetables, fruits and refined cereals provide moderate amounts. Bio-availability of zinc from plant-based foods is lower than that from animal foods due to phytates, which bind zinc and inhibit its absorption (Wise, 1995; FAO and WHO, 2004). Hence, it is important to eat animal-source foods every day in addition to eating plant-based foods.

21.3.9 Vitamin C

An additional 10 mg throughout pregnancy is considered sufficient to meet the extra needs of a growing foetus in the last trimester (FAO, 2001).

Vitamin C needs are met by eating vitamin C-rich foods such as citrus fruits like oranges, guavas, golden apples (embe sakua), baobab, rubber vine, green leafy vegetables, and lemons. Routine vitamin

C supplementation is not recommended (Rumbold *et al.,* 2015).

21.3.10 Iodine

Iodine is required for thyroid hormone synthesis and healthy brain development in the foetus and young child (WHO, 2019b).

During pregnancy, 200 µg per day of iodine is needed to provide for the needs of the foetus and to compensate for the increased loss of iodine in the mother's urine resulting from an increased renal clearance of iodine during pregnancy (FAO, 2001; Glignoer, 2007).

Congenital anomalies, decreased intelligence, and cretinism as well as maternal and foetal goitre are some of the effects of iodine deficiency during pregnancy (Pearce, 2017). Maternal and foetal hypothyroidism are severe outcomes of iodine deficiency in pregnant women.

Iodine needs are meet by simply eating the following foods: fish and other seafood, meat, milk and eggs, and using iodised salt of less than 5 mg per day.

21.4 Recommendations for pregnant women

1. Pregnant women should eat a variety of foods from all the six food groups as stated in the dietary guidelines for all the general population, with more emphasis on eating additional amounts of seafoods and animal-source foods, pulses, nuts and seeds, fruits and vegetables and whole grains to get the key nutrients needed during pregnancy (WHO, 2016b).

2. Pregnant women should add to their diversified diet 14 g of protein or about one additional serving of seafood and animal-source foods which contain more bio-available iron and zinc, such as liver, meat, chicken, fish, and eggs or two servings of pulses, nuts and seeds. It is important to eat more animal and animal products because most of the additional nutrients required during pregnancy can be obtained from animal and animal-source foods. Pregnant women should eat dark green vegetables and orange coloured fruits and vegetables such as pumpkin, amaranths, sweet potato leaves, papaya, mango, orange flesh sweet potatoes, yellow pumpkins and pumpkin flowers, and carrots for vitamin A and other key micro-nutrients.

3. Pregnant women should take daily oral iron and folic acid supplementation with 30 mg to 60 mg of elemental iron and 400 g (0.4 mg) of folic acid from the clinic or as prescribed by the doctor to prevent maternal anaemia, puerperal sepsis, low birth weight, and preterm birth (WHO, 2016b). Where possible, women should take folic acid supplements before conception.

4. Pregnant women should take vitamin A supplementation to prevent night blindness (WHO, 2016).

5. In addition to a diversified diet, pregnant women should keep physically active during pregnancy to stay healthy and to prevent excessive weight gain (WHO, 2016b).

21.5 Nutrient requirements for lactating women

Eating a variety of foods from the six food groups is important for everyone, including breastfeeding women. However, breastfeeding women require additional calories as the production of milk and breastfeeding itself burns up a lot of energy. In addition, breastfeeding women need about 25 g of extra protein, as well as extra amounts of vitamin A, zinc, folate and vitamin C to maintain the mother's health. These requirements would be met with an extra small meal each day (FAO, 2004a; FAO, 1981).

While some of the energy will come from the fat that was stored during pregnancy, during exclusive breastfeeding in the first six months, women need an additional 505 Kcal per day from their diet (FAO, 1981; FAO, 2001). Undernourished women and those with insufficient gestational weight

gain should add 675 Kcal per day during the first six months of lactation.

After six months, the energy requirements for milk production are dependent on the rates of milk production influenced by the baby's age and breastmilk intake, the mother's activity levels, body size, and the percentage of the mother's body fat reserved during pregnancy.

Although the quality of milk is not affected by the mother's quality of diet (WHO, 1985; Prentice *et al.*, 1988; Hartmann, *et al.,* 1985; Greiner, 1994) a healthy varied diet with extra amounts of foods from the six food groups is important, as the mother will have to replace the amounts of these nutrients lost through breastfeeding. If nutrient intake is lower than the total demand for both maternal maintenance needs and milk production, the mother's body will mobilize available nutrients from body tissues in order to maintain a constant breastmilk quality and quantity. Thus, additional nutrients are important for the mother's healthy weight, proper function of her body, body repair and protection against diseases.

21.6 Recommendations for lactating women

- Lactating women should eat a variety of foods from all the six food groups as stated in the dietary guidelines for the general population.
- Lactating women need an additional 505 Kcal and extra 20 g protein as well as additional folate, zinc, calcium, vitamins A, and other vitamins like B3, B6, B12, and C and minerals such as selenium, in order to support their health and wellbeing during lactation (WHO, 1998; FAO, 2004a).
- Simply eating more of the usual amount of variety of foods from all the six food groups would allow the mother to meet the higher energy demand while she breastfeeds. Eating additional amounts of a variety of foods would also allow the mother to meet the additional protein, vitamin and micro-nutrient requirements.
- Lactating women should take iron and folic acid supplementation for at least three months after delivery (WHO, 2014b).

21.6.1 Things to avoid during breastfeeding

- Minimize caffeine intake.
- Avoid consuming alcohol and smoking. They can make the baby feel sleepy, nervous and irritable.
- Avoid harmful drugs.
- Consult a doctor when taking medication.

21.7 Recommended food intake during pregnancy

Table 15: Recommended food intake amounts and the nutrients this eating pattern will provide women for during pregnancy

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbohy-drates	Calcium	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	**1862**	**2619**	**109**	**55**	**405**	**1281**	**29**	**15**	**3071**	**544**	**37**
Cereal, roots, tubers, plantain	651	978	18	3	216	111	4	2	266	89	10
Fruits	422	371	4	1	81	179	4	2	310	85	10
Pulses, nuts and seeds	194	302	16	10	32	44	4	2	6	110	9
Sea food and animal products	289	351	56	11	6	199	7	6	1797	108	0
Vegetables	278	168	14	1	21	741	10	2	693	148	7
Fats and oil	28	252	0	28	0	0	0	0	0	0	0

* Provided by the diet model food combinations
** Please note 197 Kcal will come from discretionary calories from foods not part of the six food groups like beverages, sugars, and other snacks.

Table 16: Recommended food intake during lactation

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food Weight	Energy **	Protein	Fat	Carbohy-drate	Calcium	Iron	Zinc	Vit A-RAE	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	**1987**	**2727**	**111**	**55**	**429**	**1293**	**30**	**15**	**3100**	**553**	**38**
Cereal, roots, tubers, plantain	723	1087	20	3	240	124	4	3	295	99	11
Fruits	422	371	4	1	81	179	4	2	310	85	10
Pulses, nuts and seeds	194	302	16	10	32	44	4	2	6	110	9
Sea food and animal products	289	351	56	11	6	199	7	6	1797	108	0
Vegetables	278	168	14	1	21	741	10	2	693	148	7
Fats and oil	28	252	0	28	0	0	0	0	0	0	0

*Provided by the diet model food combinations
** Please note 197 Kcal will come from discretionary calories from foods not part of the six food groups like beverages, sugars, and other snacks.

21.8 MESSAGES FOR HEALTHY EATING DURING LACTATION & PREGNANCY

1. Eating a variety of foods from the six food groups is important for everyone in the family, but caring for and feeding a baby from your own body requires additional amounts of food.
2. Eat more than usual from the variety of foods from all the six food groups to keep yourself and the baby healthy.
3. Eat more liver, eggs, meat, poultry, fish, leafy vegetables and pulses while pregnant for the baby's growth and development.
4. When pregnant, eat extra servings of whole grains, roots, tubers and pulses to support weight gain needed during pregnancy.
5. When breastfeeding, add extra servings of whole grains, roots, tubers and pulses to replenish energy lost through breastfeeding and to support a healthy pre-pregnancy weight. Eat more leafy greens and citrus fruits.
6. Always use iodized salt.
7. Avoid smoking and alcohol as it will harm your baby and yourself.
8. When pregnant, take iron and folate supplements everyday as instructed at the clinic to prevent birth defects and anaemia.
9. Drink plenty of water when pregnant and breastfeeding.

21.9 Helpful Tips for healthy eating during pregnancy and lactation

1. Simply add one or two extra meals to support the needs of pregnancy or breastfeeding.
2. Eat plenty of fresh fruit, vegetables, fish, poultry, whole grains, pulses, beans and nuts and seeds and milk and milk products.
3. Eat more leafy greens for folate and vitamin A intake.
4. Eat more citrus and pineapples for vitamin C intake.
5. Eat more orange fruits and vegetables like papaya, mango, pumpkins and orange-fleshed sweet potato for vitamin A intake.
6. Choose iron and zinc-rich beans, lentils, peas, groundnuts or sunflower seeds for folate, selenium, and zinc.
7. For B vitamins, vitamin D, and iron, eat liver, beef, chicken, fish, eggs or lamb daily.

22. RECOMMENDATION 4.2: Feed your baby breast milk only for the first six months of life and no water, herbs or porridge because mother's milk contains all the food and water your baby needs.

22.1 Mothers' breastmilk

Breastfeeding is the best, safest and healthiest way to feed infants everywhere, with evidence consistently demonstrating its nutritional, health, psychological, and financial benefits (Lancet 2016; UNICEF, 2016).

Mothers' breastmilk contains complete nutrients and energy for infants from birth to six months for the baby to grow and develop.

Breastmilk alone can quench the thirst of babies aged 0 to 6 months. Children aged 0 to 6 months do not need additional foods such as porridge or liquids such as water, tea, or juice (UNICEF, 2020a; WHO, 2019d).

Exclusive breastfeeding (EBF); that is giving a baby less than 6 months old nothing else except breastmilk, has numerous benefits for the mother, baby and the society in general.

22.2 Importance of colostrum in breastmilk for the baby

Colostrum is the special breastmilk that baby gets the first few days after birth, which is a thick, sticky fluid, and sometimes yellow in colour. This first stage of breastmilk production begins during pregnancy and lasts for several days after the baby's birth. Colostrum comes in very small amounts and the flow is slow so that a baby can learn the skill of breastfeeding that requires the baby to suck, breathe, and swallow at the same time.

Colostrum is rich in immunity-boosting compounds such as antibodies and white blood cells, in addition to nutrients like protein and vitamin A, and growth factors

(WHO 2006c; UNICEF and WHO, 2018). It is important that infants receive colostrum from breastmilk and no other foods, because it helps protect babies against infections, illness, and disease. The high levels of secretory immunoglobulin A (SIgA) found in colostrum helps protect the new-born digestive tract and helps to protect babies against viruses and bacteria.

Colostrum helps babies move their first bowels and get rid of the meconium—the tar-like poop that collects in the bowels before birth— thereby helping to prevent new-born jaundice (Y de Vries *et al*., 2018; Toscano *et al*., 2017; CDC, 2020).

22.3 Benefits of exclusive breastfeeding for babies

- Breastmilk protects babies against malnutrition, infections and death. Early initiation of breastfeeding, within one hour of birth is, important for babies because they get the first yellowish breastmilk (colostrum). The "first milk" is rich in protective antibodies, which help the baby's immune system and protect the new-born from acquiring infections, and reduce new-born mortality (UNICEF, 2016; WHO, 2019).

- In the short term, exclusive breastfeeding (EBF), protects babies from diarrhoea and other bowel diseases (WHO, 2021b). EBF reduces the risk of new-born deaths compared to infants who are either partially breastfed or not breastfed at all (WHO, 2021b). In the long term, breastfeeding protects the child from developing some chronic diseases, including type 1 and 2 diabetes later in life (Pereira *et al*., 2014).

- Breastfeeding supports a child's cognitive development and increases intelligence (Victora *et al.*, 2016, UNICEF, 2016). This is because the unique combination of fatty acids in breastmilk contribute to optimal brain development (UNICEF, 2020a).

- Breastfeeding prevents overweight and obesity in adult years compared to not breastfeeding (Victora *et al*., 2016; WHO, 2019).

- Breastfeeding is a unique bonding opportunity between mother and baby. Breastfeeding provides warmth, closeness and contact, which can help the physical and emotional development of the child (UNICEF, 2020a).

- Breastmilk digests easily, is efficiently used and does not cause constipation.

- Promotes proper jaw, teeth and speech development – the action of breastfeeding helps the child's jaws to develop as well as its muscles, such as the tongue. This assists with clear speech, protects against dental caries and reduces risk of orthodontic problems.

22.4 Benefits of exclusive breast feeding for mothers

- Breastfeeding has benefits for the mother as well. Breastfeeding is associated with decreased risks of diabetes and overweight and obesity (Horta *et al*., 2015; Victora *et al*., 2016).

- For women who breastfeed, risks of breast cancer and ovarian cancer are decreased (WHO, 2017; WHO, 2021b; Victoria *et al*., 2016).

- Since during breastfeeding the mother uses up the fat stored during pregnancy, a mother who exclusively breastfeeds her baby loses pregnancy weight faster that a mother who does not (Riordan and Auerbach, 1999; Eiger and Wendkos Olds, 1999).

- Breastmilk is readily available, does not require any special preparation, saves time and makes night feeding easier.

- Breastfeeding delays return of fertility. Mothers who breastfeed exclusively and frequently have less than a 2 percent risk of becoming pregnant in the first 6 months postpartum, provided that they still have amenorrhoea (WHO, 2021b).

22.5 Socio-economic benefits of exclusive breast feeding

- Breastfeeding does not require money to buy the milk.

- Breastfeeding has additional financial benefits beyond those for the mother and baby. Children who are breastfed have increased intelligence, while lack of breastfeeding is associated with economic losses of about US$ 302 billion annually, which is equivalent to 0.49 percent of the world's gross income (Rollin *et al*., 2016; Lancet 2016).

22.6 MESSAGES FOR SUCCESSFUL BREASTFEEDING

1. Breastfeed babies exclusively on demand from immediately after birth to six months of age because breastmilk contains all the food and water the baby needs for the first six months of life. Breastfeeding responsively ensures that babies will receive all they need in order to grow well and remain healthy.
2. Do not give babies any water, tea, honey, sugar water, salt, or juice or any other foods before six months to reduce risk of diarrhoea, infections or death.
3. Breastfeed as soon as possible within the first hour of birth to boost the child's immunity from colostrum (first milk) and prevent new-born deaths (WHO, 2017). Breastfeeding within the first hour of birth allows the child to benefit from the colostrum which is the baby's first natural immunization.
4. After the first six months of exclusive breastfeeding, continue breastfeeding up to two years of age or longer in addition to adequate and safe solid, semi-solid or soft foods (WHO, 2017).

22.7 Helpful Tips for successful breastfeeding

1. To facilitate early initiation of breastfeeding within the baby's first hour of life, place newborns skin-to-skin with their mother immediately after birth.
2. Look for the following signs to know if the baby is getting adequate breast milk:

    ◇ A baby will have at least six to eight very wet nappies/diapers in 24 hours from day 5. (Babies' urine frequency increases from two wet diapers on day 2 to three to four wet diapers on day 3 and 4).

    ◇ The baby's urine is clear as water a few days after birth.

    ◇ A baby will produce bright yellow stools from the fifth day. The first few days after birth, the baby's stool is a dark green, almost black as the baby passes meconium during that time. Frequency of passing stools varies from baby to baby. A baby may also change the frequency as she or he grows older.

    ◇ A baby will have good skin colour and muscle tone.

    ◇ A baby will be alert, responsive and contented.

    ◇ A baby will gain weight and grow in length and head circumference starting with regaining their birth weight by 10 to 14 days old.

23. RECOMMENDATION 4.3: From 6 months, feed your baby a variety of foods, including animal source foods, pulses, fruits and vegetables and continue breastfeeding up to 2 years of age or beyond for healthy growth and development of your baby.

Photo Credit: Adapted from UNICEF & URC/CHS

From birth until six months, breastmilk provides all the nutrients and energy required for the growth and development of the infant. Between six to 23 months of age, the child needs complementary foods in addition to breastmilk.

23.1 Why do children from six months to age two and beyond need nutritious complementary feeding in addition to breastfeeding?

23.1.1 From six months, children need a variety of foods to complement breastmilk in order to meet nutrient needs

Breastmilk is also an important source of energy and nutrients in children aged six to 23 months. It provides half or more of a child's energy needs between the ages of six and 12 months, and slightly more than one-third of energy needs between 12 and 24 months. Breastmilk is also a critical source of energy and nutrients during illness, and reduces mortality among children who are malnourished (WHO, 2021b). In addition, continued breastfeeding up to age two or longer can provide babies with nutrients that are unavailable in settings with limited access to a diverse range of complementary foods (UNICEF, 2016).

However, as per Table 17 and Figure 13, breastmilk alone is not sufficient after six months to meet the infant's energy and nutritional needs that support optimal growth and the development (WHO, 2006c; PAHO and WHO, 2002; WHO,

2009). As noted earlier, around the age of six months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk hence the remaining needs are complemented by other foods through a diet (WHO, 2021b). Further, infants at the age of six months are also developmentally ready for other foods.

The nutritional needs for children six to 23 months of age are greater per kilogram of body weight than at any other time in life. The increase in body size and developmental needs should be fulfilled by introducing age-appropriate foods to supply additional nutrients required for growth (PAHO and WHO, 2002).

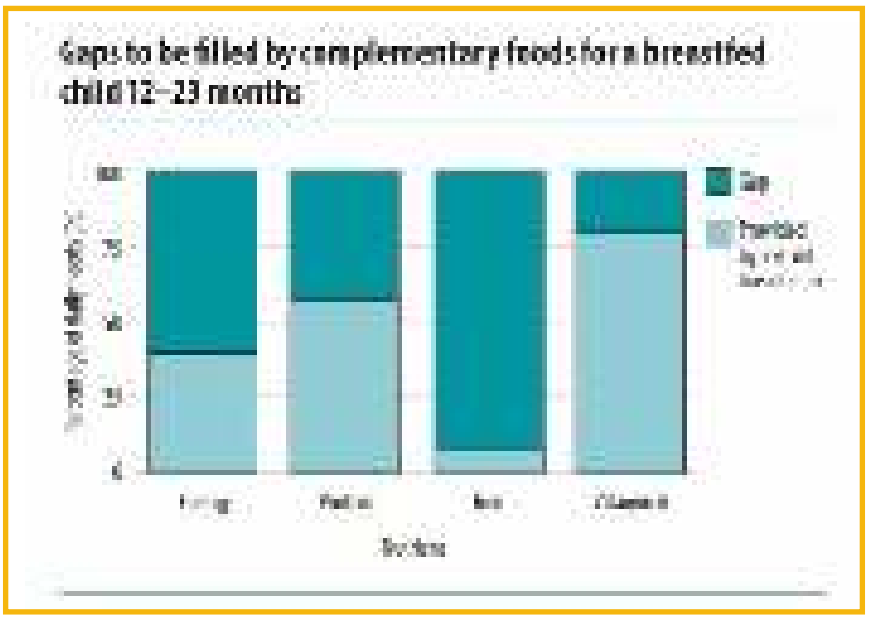
Complementary foods are not meant to replace breast milk but to complement it. If children are not fed the variety of foods from the six groups in right amounts and frequency, they are at risk of undernutrition and poor growth. Delaying the introduction of complementary foods may lead to malnutrition due to inadequate nutrient intake (FAO, 2004; UNICEF, 2016).

The youngest children are most susceptible to the consequences of poor dietary diversity given that their growing brains and bodies need good nutrition the most (UNICEF, 2016).

Table 17: Estimate of energy and nutritional requirements compared to what is provided by breastmilk

Child age	Energy needed	Energy from breast-milk	Energy gap	Iron need-ed	Iron from breast-milk	Iron gap	Vita-min A need-ed	Vita -min A from breast-milk	Vita-min A gap
(months)	(Kcal)	(Kcal)	(Kcal)	(mg/ day)	(mg/ day)	(mg/ day)	(mcg RE/ day)	(mcg RE/day)	(mcg RE/ day)
0-2	405	405	0	1.18	0.05	0*	400	365	0*
3-5	500	500	0	0.9	0.05	0*	400	390	0*
6-8	600	400	200	0.79	0.04	0.75	400	340	60
9-11	700	400	300	0.65	0.04	0.61	400	310	90
12-23	900	350	550	0.5	0.04	0.46	400	280	120
*Although breast milk does not supply enough vitamin A and Iron, the gap of iron and vitamin A is zero in the first six months because this gap is covered from the baby's birth stores.									
Sources: WHO, 2006c; and WHO, 2009.									

Figure 13: Gaps to be filled by complementary foods for a breastfed child from 12 to 23 month (WHO, 2009)



23.1.2 Importance of vitamin A for children aged 6 months to 5 years

Children need vitamin A to support their rapid growth. Vitamin A also reduces the risk of respiratory and gastrointestinal infections (FAO and WHO, 2004).

Vitamin A deficiency is a public health problem in children under six years of age (FAO and WHO, 2004). About a third of the children under the age of five in Zanzibar are deficient in vitamin A (FSND, 2017).

There is a high risk of infant mortality in the first year of life due to vitamin A deficiency (Christian *et al*., 2001).

Deficiency in vitamin A can cause night blindness especially in children aged less than three years (Sommer, 1994; FAO and WHO, 2004).

Adequate intakes of vitamin A also reduce the frequency and severity of diarrhoea and the severity of other infectious disease episodes in children, while diarrhoea is worsened by vitamin A deficiency. Prolonged diarrhoea causes vitamin A loss in young children (WHO, 2019a). In addition, vitamin A deficiency in children under six years of age is associated with concurrent infections which may lead to death (Beaton *et al*., 1993; FAO and WHO, 2004).

In well-nourished populations, the levels of vitamins A and B6 in breastmilk, as well as the infant's birth reserves of vitamin A, are adequate to meet the requirements for infants throughout the first six months of life. Between six to 23 months, breastfeeding provides most of the 400 µg RE/day of vitamin A required by the body with only small amounts needed from the diet. Complimentary dietary sources are only 60 µg RE for six to eight months; 90 µg RE for nine to 11 months; and 120 µg RE for 12 to 23 months (PAHO and WHO, 2002; WHO, 2006c; WHO, 2009). From the age of two, children transition from dependency on breastmilk for vitamin A to dietary sources (FAO and WHO, 2004).

23.1.3 Importance of iron

Children require iron for growth and survival and iron is important for children's cognitive development and brain function. Iron is needed in the formation of blood haemoglobin and in the production of energy throughout the body. Iron deficiency anaemia in under-five children is a serious problem in Zanzibar,

which can lead to infant deaths. Sixty-six percent of children aged six to 59 months are anaemic (MoHCDGEC, 2016).

Iron needs in children double during the first year of life. For the first six months, an infant's iron requirements are met by birth reserves (WHO, 2002; WHO, 2006c; WHO, 2009). From around six months, the child's iron reserves in the body will start to deplete. A breastfed infant aged six to eight months old needs more than eight times the amount of iron and four times the amount of zinc per 100 Kcal food of an adult male (Dewey and Vitta, 2013). The body's iron content is doubled again between one and six years of age. The absorbed iron requirements in children are quite high in comparison to their energy needs (FAO and WHO, 2004).

23.1.4 Importance of zinc

Zinc is important for cell division and the synthesis of protein and growth in children (FAO and WHO, 2004). Deficiency in zinc affects the growth of children and increases their risk of severe infectious diseases (FAO and WHO, 2004). Results from zinc supplementation studies suggest that a low zinc status in children not only affects growth but is also associated with an increased risk of severe infectious diseases (Black, 1998).

23.1.5 Importance of calcium

Calcium is needed for building strong bones and teeth during childhood (FAO and WHO, 2004). From zero to five years, children are growing rapidly and by three years, a child doubles his/her height and quadruples his/her weight.

Infants and young children with low calcium and vitamin D intake are at an increased risk of developing rickets (WHO, 2019c). Vitamin D aids in calcium absorption. Rickets is a bone-softening condition that can cause severe leg bending (bowing), poor growth and sometimes muscle pain and weakness.

Developing strong bones in childhood is important, as bone calcium begins to decrease in young adulthood and progressive bone loss can occur as a person ages, especially in women.

23.1.6 Importance of fats

Fats are an energy-dense source

Dietary fats play an important role as energy sources for the body, especially for growing children who are at risk of suffering energy deficiency due to the high energy demands at this stage of rapid growth. Fat requirements for children under five are higher than for adults (FAO, 2010b; FAO, 2004).

As demonstrated by nature, infants need more fat than older people. Thus, breastmilk contains 40 to 55 percent of its energy in the form of fat (FAO and WHO, 2010). During the complementary feeding period, it has been suggested that 30 to 45 percent of energy should come from fat and the rest from other sources such as carbohydrates and proteins (Dewey and Vitta, 2013). The FAO expert consultation on fats and fatty acids of 2008 recommends the total fat intake for infants between 0 to 6 months should be 40 to 60 (which the infants will get from exclusive breastfeeding). After six months, there should be a reduction of total fat intake to 35 percent of total energy for children 6 to 24 months (FAO, 2010b).

Weaning foods that are starch-based and are characterised by low energy density and an unpalatable viscosity are common in many developing countries, including Tanzania. Oils and fats can play a critical role in reducing the viscosity and improving the energy density of weaning foods. This is because fats are energy-dense since they contain 9 kilocalories of energy per gram of fat compared to 4 kilocalories of protein or carbohydrates.

Fats are important for brain development and for immunity

Fats and oils are an important source of polyunsaturated fatty acids (PUFAs). PUFAs, especially n-3 and n-6 fatty acids (omega-3 and omega-6), play a key role in cognitive development, immune functions and early growth and development in infants and children (WHO, 2006c; FAO 2010b; FAO and WHO, 2010).

Fats are important for the absorption of fat-soluble vitamins

Dietary fats also provide the medium for the absorption of fat-soluble vitamins (A, D, E and K) (FAO, 2010b). The role of fat in the absorption of vitamins is key since vitamin A deficiency in under-five children is a problem in Zanzibar.

23.2 Recommendation on starting complementary foods after six months

- Continue frequent, on-demand breastfeeding until two years of age or beyond (UNICEF, 2020c; WHO, 2019b).

- After six months of exclusive breastfeeding, introduce safe, adequate, complementary foods to infants (UNICEF, 2020c).

- Children should eat a variety of foods from different food groups in sufficient quantities.
  - ◇ Give children iron-rich foods such as puréed or mashed fish, meats and poultry especially liver, pulses, and iron-fortified cereals to prevent iron deficiency anaemia (UNICEF, 2020c).
  - ◇ Give children foods rich in vitamin A such as orange and yellow coloured fruits, vegetables, grains and roots and tubers like orange flesh, sweet potatoes, carrots, ripe mangoes, and papaya to prevent vitamin A deficiency. Liver and dark green leafy vegetables are also rich in vitamin A (UNICEF, 2020c).

- Cow's milk should not be given to babies under 12 months of age. This is because at this age, babies cannot digest cow's milk as completely or as easily as breastmilk or formula. Further, cow's milk contains higher amounts of protein and minerals, which can stress the baby's immature kidneys. Cow's milk does not have the right amounts of iron, vitamin C and other nutrients, and does not provide the right types of fat for growing infants (WHO, 2015; WHO 2021; CDC, 2021).

- Do not add honey, sugar, and salt to complementary foods. Do not give children foods high in sugar or salt like sugar-sweetened drinks, salty snacks or ultra-processed foods, as they are not suitable for babies. These foods can cause tooth decay and can make extra work for the baby's small kidneys. Giving honey to a child before the child is 12 months old may cause serious food poisoning called botulism. Do not give children less than 12 months caffeinated drinks as there is no established safe limit for caffeine for young children (WHO, 2015b; CDC, 2021).

- Gradually increase food consistency and variety: Give infants puréed foods at first and the food should be made thicker as the child gets older and develops (WHO and UNICEF, 2003). Foods such as whole grapes, raw carrots and nuts can cause choking and should not be given to children when they are still learning to chew food properly.

- Start at six months with small amounts of food and increase gradually as the child gets older.

- Increase the number of times that the child is fed as (s)he gets older: Infants aged between six to eight months should start receiving complementary foods two to three times a day; increasing feeding to three to four times daily between nine to 23 months, with additional nutritious snacks offered one to two times per day, as desired, while continuing breastfeeding.

- Practise responsive feeding: Caregivers should interact with the child and respond to their hunger signals. Caregivers should feed the children slowly and patiently, encouraging them to eat but not forcing them. It is also recommended that the caregiver talks to the child and maintains eye contact during feeding times (UNICEF, 2020b).

- When a child is ill, (s)he should be offered more fluids including breastmilk and soft favourite foods for quicker recovery and prevention of weight loss.

The evidence is clear that the caregiver's role in feeding can be as important as the food itself.

Safe food preparation, storage and hygienic practices are also crucial for preventing the spread of disease and ensuring that good nutrition reaches and remains in children's bodies (UNICEF, 2016). Hands should be cleaned with soap and clean water before, during and after preparing food and feeding the child. Caregivers should also wash hands with soap and clean water after visiting the toilet or helping a child use the toilet as well as after changing a baby's dirty nappy. All cooking utensils and containers should be clean. Food should be offered to children immediately after cooking whilst it is still warm. Feeding children food that has been sitting out in room temperature for more than two hours is not recommended.

Table 18: Diet Model 6 to 8 months

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbo-hydrates	Calci-um	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	**130**	**203**	**7.4**	**7.2**	**26.1**	**81.4**	**1.9**	**1.0**	**198.6**	**35.2**	**2.3**
Cereal, roots, tubers, plantain	56	85	1.5	0.2	18.7	9.6	0.3	0.2	23.0	7.7	0.9
Fruits	18	16	0.2	0.0	3.5	7.8	0.2	0.1	13.4	3.7	0.4
Pulses, nuts and seeds	13	20	1.0	0.7	2.1	2.9	0.3	0.2	0.4	7.1	0.6
Sea food and animal products	19	23	3.7	0.7	0.4	12.9	0.5	0.4	116.8	7.0	0.0
Vegetables	18	11	0.9	0.1	1.4	48.2	0.7	0.1	45.1	9.6	0.5
Fats and oil	5	49	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Provided by the diet model food combinations

Table 19: Diet Model 9 to 11 months

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbo-hydrates	Calci-um	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	**213**	**337**	**13.1**	**13.7**	**38.2**	**150.4**	**3.4**	**1.7**	**367.3**	**62.7**	**3.9**
Cereal, roots, tubers, plantain	72	109	2.0	0.3	24.0	12.4	0.4	0.3	29.5	9.9	1.1
Fruits	35	31	0.3	0.1	6.8	14.9	0.3	0.2	25.8	7.1	0.8
Pulses, nuts and seeds	24	38	2.0	1.3	4.1	5.5	0.5	0.3	0.7	13.7	1.1
Sea food and animal products	36	44	7.0	1.4	0.7	24.9	0.9	0.8	224.6	13.5	0.0
Vegetables	35	21	1.8	0.2	2.6	92.6	1.3	0.2	86.7	18.5	0.9
Fats and oil	11	95	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*Provided by the diet model food combinations											

Table 20: Diet Model 12 to 23 months

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbo-hydrates	Calci-um	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	**371**	**550**	**20.3**	**20.2**	**67.6**	**275.2**	**6.2**	**2.8**	**495.9**	**120.6**	**8.4**
Cereal, roots, tubers, plantain	109	163	3.0	0.4	35.9	18.6	0.6	0.4	44.3	14.8	1.7
Fruits	70	62	0.7	0.2	13.6	29.9	0.6	0.3	51.6	14.2	1.6
Pulses, nuts and seeds	73	113	6.0	3.8	12.2	16.6	1.5	0.9	2.1	41.2	3.2
Sea food and animal products	36	44	7.0	1.4	0.7	24.9	0.9	0.8	224.6	13.5	0.0
Vegetables	69	42	3.6	0.4	5.2	185.2	2.5	0.4	173.3	37.0	1.9
Fats and oil	14	126	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Provided by the diet model food combinations

23.3 MESSAGES FOR COMPLEMENTARY FEEDING

1. From six months, give children a variety of foods from the different food groups in addition to breastfeeding to support their growth and development.
2. Breastmilk is still the baby's main food before the age of two years. Continue to breastfeed on demand.
3. Introduce iron-rich foods like puréed meats, liver, kidney, egg yolk, fish, and chicken to babies after six months of exclusive breastfeeding daily.
4. Give beans, peas, lentils, nuts and seeds to infants and young children daily from six months of age.
5. Give green leafy vegetables and yellow and orange coloured vegetables and fruits daily to infants and young children from six months.
6. Do not give infants and young children honey, tea, sugary drinks, or salty foods.
7. Breastmilk and water are the only fluids your baby needs.
8. Give prepared foods immediately after cooking.
9. Give food two to three times a day to infants six to eight months old, while continuing to breastfeed.
10. Give food three to four times a day to infants and young children between nine to 24 months old, while continuing to breastfeed.
11. When your child is ill, offer them more fluids including breastmilk and their favourite foods from six months of age.
12. Offer a variety of starchy foods like orange-fleshed sweet potato, cassava, and provitamin A maize, in addition to rice to children over six months.
13. Prepare foods for infants and young children with clean and safe water.

23.4 Helpful Tips on complementary feeding

1. Add a little bit of vegetable oil to steamed and mashed sweet potato and carrots. Oil helps with vitamin A absorption.
2. Give infants and young children from six months small frequent meals to support their growth and development.
3. From six months, add expressed breastmilk to a child's first food to help them adapt to the new foods and continue to get breastmilk benefits.
4. Give children fatty fish regularly, taking care to remove the bones.
5. It is normal for babies to refuse new foods. Sometimes it can take 10 to 12 times of offering a food before a baby will accept it.
6. Take babies to the clinic every month, to check and monitor that they are growing well and have their growth card filled].

Note: The need for iron and zinc is sometimes difficult to meet. Some studies suggest that a breastfed infant aged six to eight months needs complementary foods with more than eight times as much iron and four times as much zinc per 100 Kcal as an adult male (Dewey and Vitta, 2013). Therefore, in contexts where nutrient-rich foods are limited or not available or during lean seasons, the use of specialised fortified products, such as fortified blended foods, micronutrient powders, or a small quantity of lipid-based nutrients supplements, may be needed (Michaelsen et al., 2017; WHO, 2005).

Table 21: Practical guidance on the quality, frequency and amount of food to offer children 6 to 23 months of age

Child age (months)	Texture	Frequency	Amount of food
6-8	Start with thick, well-mashed, semi-solid/ blended/pureed foods	2-3 meals per day	Start with 2-3 tablespoons per feed, increasing gradually to ½ cup (125ml)
9-11	Finely chopped or mashed foods and foods that baby can pick up	3-4 meals per day*	½ cup (125ml)
12-23	Family foods, chopped or mashed if necessary	3-4 meals per day*	¾ cup (190ml) to 1 cup (250ml)
*Depending on the child's appetite, 1-2 snacks may be offered.			
N.B. If a baby over 12 months is not breastfed, give an additional 1-2 cups of milk per day, and 1-2 extra meals per day.			

24. Recommendation 4.4: Give a variety of foods from the six food groups to children 2 to 5 years to help them grow to their full potential.

Photo Credit: Adapted from UNICEF & URC/CHS

24.1 Importance of a variety of foods for this age group

Good nutrition for children two to five years of age is important to meet the needs of rapid physical growth and development (UNICEF, 2020c).

Inadequate nutrition at this stage is associated with high risks of illness and infections which can have lifelong consequences on education attainment and health (UNICEF, 2020c).

From two years of age, children start to choose their own food, can feed themselves, can eat family meals and some can start to eat outside the home (UNICEF, 2020b; FAO, 2004a).

Families and caregivers should continue to provide a diversified diet from all the six food groups for children in this age group. Children during this age need to be encouraged to eat during meal times especially during sickness (FAO, 2004a).

Table 22: Diet-model-calculated recommended food amount and serving sizes and the nutrients this eating pattern will provide two to five-year-olds

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbohy-drates	Calci-um	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	790	1146	48.6	38.4	144.5	590.4	12.6	6.3	1467.7	223.3	13.6
Cereal, roots, tubers, plantain	289	435	7.9	1.2	95.8	49.5	1.7	1.1	118.0	39.4	4.5
Fruits	141	124	1.4	0.4	27.1	59.8	1.3	0.7	103.2	28.3	3.2
Pulses, nuts and seeds	48	75	4.0	2.5	8.1	11.1	1.0	0.6	1.4	27.4	2.2
Sea food and animal products	145	176	28.1	5.7	3.0	99.6	3.6	3.2	898.4	54.1	0.0
Vegetables	139	84	7.1	0.7	10.5	370.5	5.1	0.8	346.6	74.0	3.7
Fats and oil	28	252	0.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*Provided by the diet model food combinations											

24.2 MESSAGES ON FEEDING CHILDREN AGED 2 TO 5 YEARS

1. Give family meals that contain a variety of foods from the six food groups to ensure a child aged two to five years get all the nutrients they require.
2. Give to a child two to five years old three meals and one to two nutritious snacks a day.
3. Include fish, or animal-source foods like eggs, poultry meat, and milk products to ensure the child gets all the nutrient (s)he needs.
4. Give children orange-colored vegetables, fruits and tubers like papaya, ripe mango, pumpkins, pumpkin flowers, orange-fleshed sweet potatoes, whole grain yellow maize, and dark leafy vegetables.
5. Give pulses, nuts and seeds to children. Adding pulses or nut powders is a great way to add nutrients to children meals.
6. Avoid adding too much spice, sugar and salt to a child's food.

24.3 Helpful Tips on quality, frequency and amount of food to offer children aged 2 to 5 years

1. Serve a child's food in his or her own plate or bowl to ensure children eat enough food.
2. Give fatty fish regularly, taking care to remove the bones.
3. Grow and use bio-fortified crops like orange-fleshed sweet potatoes, yellow maize and bio-fortified beans.
4. Add nutrient-rich food powders like bean, nut and fish powders and moringa powder to children's meals. Adding moringa is a great way to fortify enrich a child's meals because the moringa leaf contains a much higher nutritional value of iron, calcium and complete protein, as well as vitamins A, C, B2, B6 and various minerals compared to other foods. The moringa tree grows easily and quickly.

25. RECOMMENDATION 4.5: Provide healthy meals and snacks for school-aged children throughout the day

25.1 Dietary needs for school-aged children aged 5 to 18 years

Like adults, children from five years of age need to eat a variety of foods in sufficient quantities. Since their brains and bodies are still developing, special attention should be given to nutrients that support their growth and development such as protein, iron, calcium, vitamin A, B vitamins, and healthy fats.

In addition, children cannot do well in school if they do not get enough nutritious food. Children need nutritious meals and snacks throughout the day in order to stay focused and to learn.

The needs of school children between five to nine years and 10 to 18 years differ due to varying physiological stages of development. Table 25 in Annex 1 provides detailed nutrient requirements.

25.1.1 Dietary needs for children 5 to 9 years

Providing good nutrition during this age is important as it provides a second window of opportunity for growth and development. Children in this age group require good nutrition to improve learning (UNICEF, 2021; FAO, 2004a), and help shape positive dietary practices that can continue into adulthood (UNICEF, 2021).

In addition, good nutrition at these ages impacts on their current and future nutritional status, including breaking intergenerational cycles of malnutrition (UNICEF, 2021). Good dietary practices during this stage reduce the risk of overweight and obesity and dental carries (WHO, 2006d). If maintained, positive dietary practices developed at this stage and continued into adulthood may reduce the risk of chronic diseases later in life (WHO, 2006d).

25.1.2 Dietary needs for children/ adolescents 10 to 18 years

Between 10 to 18 years, there is a growth spurt (both height and weight) which requires additional nutrients (FAO, 2004; WHO, 2006e). Children aged 10 to 18 years need a healthy diet as this period is a another window of opportunity for growth (UNICEF, 2021; WHO, 2006e). During these years, good nutrition is important for psychosocial development, as it establishes dietary and lifestyle habits that continue into adulthood and provides an opportunity for catch-up growth after stunting in early childhood (UNICEF, 2021; FAO, 2004; WHO, 2021c; WHO, 2006e).

During puberty and adolescence, energy needs increase especially for boys because of physical activity (FAO, 2004). Girls need additional iron (more than double) compared to boys and men when the start to menstruate, and will continue to need it well into adulthood to prevent anaemia (FAO, 2004; WHO, 2006b).

25.2 Eating patterns among adolescents in Zanzibar

A study conducted by Mbawalla and Ally, 2018 among adolescents to explore dietary habbits showed that few adolescents consumed healthy snacks, more than half of the population consumed vegetables once or twice a week, and approximately 40 percent consumed fruits once or twice a week.

The study also showed that only 28 percent of the respondents consumed breakfast on a daily basis. This shows that the majority of adolescents do not consume breakfast and they generally do not eat healthy foods on a daily basis.

In this study, sweets, sugary beverages and fast foods were highly consumed by more than a quarter of these adolescents on a daily basis, indicating that consumption of these foods is on a higher side. High consumption of these foods is known to be a risk factor for non-communicable diseases.

25.3 Recommendation 4.5 a: School-aged children should enjoy breakfast before school to enable them to be productive and perform well.

25.3.1 Importance of eating breakfast

1. Breakfast is a very important meal for everyone, including school-aged children. It is required for energy in the morning and for good school work.

2. Breakfast is especially important if children have to walk a long distance to school or do not eat much at mid-day (FAO, 2004). If children do not eat breakfast, they will be hungry and not be able to concentrate and learn at school (UNICEF, 2019).

3. A study found that increased frequency of habitual breakfast was consistently positively associated with academic performance (Adolphus *et al*., 2013).

4. Seven out of eleven studies found that breakfast has a positive effect on task behaviour in school-aged children (Adolphus, Lawton and Dye, 2013). An adequate diet especially at breakfast is associated with higher academic achievement (UNICEF, 2019).

5. Eating breakfast is associated with a reduced risk of becoming overweight or obese and a reduction in the body mass index (BMI) of children and adolescents (de la Hunty, Gibson and Ashwell, 2013). Children who miss or skip breakfast have been found to have a higher BMI than their peers. The higher BMI in children who skip breakfast is attributed to high consumption of snacks and sweetened beverages that are high in calories and low in nutrients in between meals (UNICEF, 2019).

6. Children who habitually consume breakfast are more likely to have adequate micronutrients and energy intake (Intiful and Lartey, 2014).

25.4 Recommendation 4.5 b: Encourage school-aged children to eat healthy snacks such as fresh fruits, vegetables and nuts.

In addition to balanced meals, school children should consume healthy snacks. Nutritious meals and snacks for children should include whole grains, fish, meat, poultry, milk, eggs, pulses, nuts, and seasonally available fruits and vegetables to ensure that both sufficient energy and micronutrients are provided. Consumption of healthy snacks increase intake of essential nutrients required for growth and development of school children.

Children do not need sweets, sugary drinks or ultra-processed snacks. While these may be readily available and convenient to take to school, they only provide empty calories – meaning energy without valuable nutrients. Empty calorie foods displace healthy foods that support growth and development. Sweets and sugary foods can cause obesity and dental health problems. Avoid giving children ultra-processed foods which have a lot of fat, sugar and salt. A diet that is high in fats and sugar can lead to overweight and obesity in children.

Children need to drink milk often to support bone growth and health. In addition, they should be encouraged to be physically active to enhance bone mass and density. For increased fitness, bone health, mental health, cognitive outcomes and reduced risks of developing NCDs, children and adolescents should be physically active at least 60 minutes per day. Physical activity should be moderate to vigorous-intensity, and mostly aerobic across the week (WHO, 2020).

25.5 Recommendation 4.5 c: Provide school-aged children with a lunch box to take to school.

25.5.1 Importance of providing a lunch box for school children

- Since, from five until 18 years of age children spend most of the day at school, it is important to provide a healthy meal for these children while they are in school in addition to a diversified breakfast before going to school and a wholesome meal when they are back from school. That way the children stay nourished throughout the day.

- A healthy lunch or snack for school helps children stay alert, concentrate and learn at school.

- A healthy lunch or snack for school gives children the nutrition they need during the day.

- Carrying food from home is less expensive, more convenient, more hygienic.

- When a parent/caregiver packs a child's lunch, they will always know what the child will be eating. If children are given money to buy food, parents/caregivers are not there to monitor what they buy or eat. The likelihood of children buying unhealthy snacks or food is very high.

- School lunches help set healthy eating habits for children in the future.

25.5.2 What to consider when packing a school lunch for children

- Packed lunches should contain a variety of foods, like vegetables such as carrots, cucumbers, fruits from a wide selection, whole grains like chapatti, breads, popcorn as well as plant proteins like nuts and seeds, e.g. groundnuts.

- Consider food safety. Since most of the packed foods may not be refrigerated, pack non-perishable foods that do not require refrigeration after two hours.

- Include water to stay hydrated and to avoid children buying or drinking sweetened beverages.

25.6 How much from the six food groups should school aged children eat per day?

Table 23: Diet-model-calculated recommended food amounts and the nutrients this eating pattern will provide six to nine year-olds

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbohy-drates	Calci-um	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	1276	1695	65.1	42.6	250.2	1057.9	20.9	8.9	1977.9	373.7	25.1
Cereal, roots, tubers, plantain	434	652	11.9	1.8	143.8	74.2	2.6	1.6	177.0	59.1	6.8
Fruits	282	247	2.8	0.7	54.2	119.6	2.6	1.3	206.4	56.7	6.4
Pulses, nuts and seeds	97	151	8.0	5.0	16.2	22.2	2.0	1.2	2.8	54.9	4.3
Sea food and animal products	145	176	28.1	5.7	3.0	99.6	3.6	3.2	898.4	54.1	0.0
Vegetables	278	168	14.3	1.4	20.9	741.0	10.1	1.5	693.2	148.0	7.5
Fats and oil	28	252	0.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Provided by the diet model food combinations
** Please note 50 Kcal will come from discretionary calories from foods not part of the six food groups like beverages, sugars, and other snacks.

Table 24a: Diet-model-calculated recommended food amounts and serving sizes and the nutrients this eating pattern will provide 10 to 18 year-old GIRLS

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbohy-drates	Calaci-um	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mcg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	1696	2404	101.3	49.5	373.3	1209.7	26.2	13.3	2994.4	469.2	30.0
Cereal, roots, tubers, plantain	723	1087	19.9	2.9	239.6	123.7	4.3	2.7	295.0	98.6	11.3
Fruits	282	247	2.8	0.7	54.2	119.6	2.6	1.3	206.4	56.7	6.4
Pulses, nuts and seeds	97	151	8.0	5.0	16.2	22.2	2.0	1.2	2.8	54.9	4.3
Sea food and animal products	289	351	56.3	11.4	6.0	199.1	7.1	6.5	1796.9	108.2	0.0
Vegetables	278	168	14.3	1.4	20.9	741.0	10.1	1.5	693.2	148.0	7.5
Fats and oil	28	252	0.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Provided by the diet model food combinations
** Please note 148 Kcal will come from discretionary calories from foods not part of the six food groups like beverages, sugars, and other snacks.

Table 24b: Diet-model-calculated recommended food amounts and serving sizes and the nutrients this eating pattern will provide 10 to 18 year-old BOYS

Food group	Recommended amounts per day	Energy and nutrient values per serving*									
	Food weight	Energy**	Protein	Fat	Carbohy-drates	Calci-um	Iron	Zinc	Vit A	Folate	Fibre
	(g)	(Kcal)	(g)	(g)	(g)	(mg)	(mg)	(mcg)	(mcg RAE)	(mg)	(g)
Total nutrient intake	2007	2840	110.8	61.9	440.8	1294.4	29.6	15.2	3100.4	554.4	37.9
Cereal, roots, tubers, plantain	723	1087	19.9	2.9	239.6	123.7	4.3	2.7	295.0	98.6	11.3
Fruits	422	371	4.2	1.1	81.3	179.3	3.9	2.0	309.6	85.0	9.6
Pulses, nuts and seeds	194	302	16.0	10.1	32.4	44.4	4.0	2.5	5.6	109.8	8.7
Sea food and animal products	289	351	56.3	11.4	6.0	199.1	7.1	6.5	1796.9	108.2	0.0
Vegetables	278	168	14.3	1.4	20.9	741.0	10.1	1.5	693.2	148.0	7.5
Fats and oil	35	315	0.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Provided by the diet model food combinations
** Please note 248 Kcal will come from discretionary calories from foods not part of the six food groups like beverages, sugars, and other snacks.

25.7 MESSAGES FOR HEALTHY EATING

1. Provide a healthy breakfast, packed school lunch, dinner and snacks to children every day.
2. Add protein-rich foods like boiled eggs, nuts, and seeds to children's snacks.
3. Add liver, eggs, meat, poultry, and fish to children's meals.
4. Limit children's intake of salty snacks such as potato chips and salted peanuts.
5. Avoid giving children fried foods with a lot of fat such as doughnuts and deep-fried chips.
6. Do not reward children with sweets and avoid giving them sugary foods such as biscuits and cakes.
7. Replace children's sugary drinks with clean and safe water or milk.
8. Prepare foods for infants and young children with clean and safe water.

25.8 Helpful Tips to reduce the consumption of salty snacks, fried foods, and sweets for children

1. Offer homecooked meals and snacks instead of sweets or ultra-processed foods.
2. Pack healthy snacks in children's lunch boxes such as fruits, plain yoghurt and wholewheat bread with peanut butter and unsalted nuts instead of packaged ultra-processed foods.
3. Encourage children to eat whole foods instead of ultra-processed foods.
4. Replace sugary beverages with water or unsweetened milk.
5. Sweeten food with fruits instead of sugar. For example, add fruits to plain yoghurt to make it sweeter.
6. Avoid giving foods that are high in fats such as pizza, deep-fried chips and doughnuts.
7. Instead of fruit juice, offer whole fruits.
8. Cook children's food with minimal salt to avoid excess intake.

26. Recommendation 4.6: The elderly (over 65 years) should eat a diversified diet, and be physically and socially active for a good quality of life.

Healthy eating, physical activity, and social activity are important for the elderly. As a person gets older, the body's needs also change hence certain nutrients become especially important for good health.

26.1 Importance of good nutrition for older adults

Good nutrition is important:

- For energy and help to control weight, thus preventing weight loss or weight gain.
- To prevent the weakening of muscles and bones (osteoporosis).
- In helping to prevent some diseases, high blood pressure, heart disease, high cholesterol, type 2 diabetes, and certain cancers. It also helps manage pre-existing health conditions.
- For providing critical nutrients, which is important since older adults are more vulnerable to nutritional deficiencies and nutritional problems are more common. Critical nutrients for older adults include calcium, vitamin D, vitamin B12, potassium and dietary fibre.

26.2 Recommendations for older adults

- The elderly should eat a variety of food from all food groups every day to meet all nutritional needs. Eating small, frequent meals five to six times throughout the day can help with increasing the variety of foods eaten. Eating small frequent meals also may be favourable to those with a poor appetite or decreased digestive functions.
- Eating in the company of others is important for emotional and mental wellbeing, as well as physical support in the case the older person has physical disability or impairment.
- The elderly are at risk of certain nutrients deficiencies. Eating a varied diet of

seafood, animal products, whole grains, beans, nuts, fruits, and vegetables can help the elderly to meet all nutrient needs.

- Along with eating a varied diet, drinking eight to ten glasses or more of clean and safe water and being physically active daily are recommended.

- While the food nourishes the body, engaging with others and receiving support from family are just as important.

As we age, our bodies' functions start to decline. Vision, hearing, muscle mass, coordination, and mental acuteness are few of the noticeable functions that decline with age. Physical weakness and impairment can be a barrier for the elderly to stay active and to feed themselves. The older adults may also feel loneliness and experience depression that can, in turn, affect their physical activity levels, and their desire to cook and to eat. These factors all contribute to their risk of malnutrition.

Below is the list of the nutrients and their food sources:

Calcium	Small fish eaten with bones, milk, greens
Zinc	Seafood, eggs, whole grains, beef, liver, goat, cashew nuts, beans
Magnesium	Seafood, whole grains, soya beans, nuts, banana, meat
Vitamin B6	Meat, whole grains, liver, egg yolks, beans,
Folate	Greens, whole grains, oranges, liver, beans, nuts
Vitamin D	Sardines, egg yolks

26.3 MESSAGES FOR HEALTHY EATING FOR THE ELDERLY

1. Eat a variety of food from all the six food groups every day.
2. Enjoy your meals in the company of others.
3. Focus on eating more fruits and vegetables.
4. Eat seafood and animal products daily.
5. Drink eight to ten glasses or more of clean and safe water throughout the day.
6. Be physically active every day as your functional ability allows, and adjust your level of effort for physical activity relative to your level of fitness.
7. Start by doing small amounts of physical activity, and gradually increase the frequency, intensity and duration over time.

Dishes of Zanzibar

Annexes

SECTION 4

21.1 Annex 1: Daily nutrient requirements for children and adolescents (4-18 years)

Table 25: Daily nutrient requirements) for children and adolescents (4-18 years)

Nutrients		CHILDREN		ADOLESCENTS	
		4 - 6 years	7 - 9 years	10 - 18 years (female)	10 - 18 years (male)
Energy (Kcal/day)^		**1413** (boys) (17.7-19.7kg)	**1761**(boys) (24-26.7kg)	**2344.5** (34.7-56.7 kg)	**2838.6** (33.3-67.8 kg)
		1285.5 (girls) (16.8-18.6kg)	1626 kcal/day (girls), (23.3-26.6 kg)		
Protein (g/day)^^		**17.1** (boys) (19.7 kg)	**25.9** (boys) [7-10yrs] (28.1 kg)	**41** [11-14 yrs] (46.1 kg)	**40.5** [11-14 yrs] (45 kg)
		16.2 (girls) (18.6 kg)	**26.2** (girls) [7-10 yrs] (28.5 kg)	**47.4** [15-18 yrs] (56.4 kg)	**57.9** [15-18 yrs] (66.5 kg)
Vitamin A (µg RE/day)		**450**	**500**	**600**	**600**
Iron (mg/day)	15% bio-availability	**4.2**	**5.9**	**9.3 - 21.8** [11-14 yrs]*	**9.7** [11-14 yrs]
				20.7 [15-17 yrs]	**12.5** [15-17 yrs]
	12% bio-availability	**5.3**	**7.4**	**11.7 - 27.7** [11-14 yrs]*	**12.2** [11-14yrs]
				25.8 [15-17 yrs]	**15.7** [15-17 yrs]
	10% bio-availability	**6.3**	**8.9**	**14 - 32.7** [11-14 yrs]*	**14.6** [11-14 yrs]
				31 [15-17 yrs]	**18.8** [15-17 yrs]
	5% bio-availability	**12.6**	**17.8**	**28 - 65.4** [11-14 yrs]*	**29.2** [11-14 yrs]
				62 [15-17 yrs]	**37.6** [15-17 yrs]

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Nutrients		CHILDREN		ADOLESCENTS	
		4 - 6 years	7 - 9 years	10 - 18 years (female)	10 - 18 years (male)
Folate (µg DFE/day)		**200**	**300**	**400**	**400**
Zinc (mg/day)	High bio-availability	**2.9**	**3.3**	**4.3**	**5.1**
	Moderate bio-availability	**4.8**	**5.6**	**7.2**	**8.6**
	Low bio-availability	**9.6**	**11.2**	**14.4**	**17.1**
Calcium (mg/day)		**600**	**700**	**1300****	**1300****
Vitamin C (mg/day)		**30**	**35**	**40**	**40**
Selenium (µg/day)		**22**	**21**	**26**	**32**
Magnesium (mg/day)		**76**	**100**	**220**	**230**
Iodine (µg/day)		**90** [0-4.9 yrs]	**120** [6-12 yrs]	**150** [13-18 yrs]	**150** [13-18 yrs]
Thiamine (mg/day)		**0.6**	**0.9**	**1.1**	**1.2**
Riboflavin (mg/day)		**0.6**	**0.9**	**1.0**	**1.3**
Niacin (mg NE/day)		**8**	**12**	**16**	**16**
Vitamin B6 (mg/day)		**0.6**	**1**	**1.2**	**1.3**
Pantothenate (mg/day)		**3**	**4**	**5**	**5**
Biotin (µg/day)		**12**	**20**	**25**	**25**
Vitamin B12 (µg/day)		**1.2**	**1.8**	**2.4**	**2.4**
Vitamin D (µg/day)		**5**	**5**	**5**	**5**
Vitamin E (mg TE/day)		**5†**	**7†**	**7.5**	**10**
Vitamin K (µg/day)		**20**	**25**	**35-55**	**35-55**

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Nutrients	CHILDREN		ADOLESCENTS	
	4 - 6 years	7 - 9 years	10 - 18 years (female)	10 - 18 years (male)
^Manually calculated by averaging total energy levels per age group. ^^0.83 g/kg per day of protein with a protein digestibility-corrected amino acid score value of 1.0. *Bio-availability of dietary iron during this period varies greatly. **Particularly during the growth spurt. †At present, data are not sufficient to formulate recommendations for vitamin E intake for different age groups except for infancy. DFE: daily folate equivalents TE: tocopherol equivalents NE: niacin equivalents Yrs: years				
Sources: FAO and WHO, 2004; FAO, WHO and UNU, 2004^; FAO, WHO and UNU, 2007^^.				

27.2 Annex 2: Average nutrient requirements for pregnant, lactating and non-pregnant, non-lactating women (18-49 years)

Table 26: Average nutrient requirements for pregnant, lactating and non-pregnant, non-lactating women (18-49 years)

Nutrients		19-50 years (not pregnant)	PREGNANT			LACTATING		
			1st trimester	2nd trimester	3rd trimester	0-3 months	4-6 months	7-12 months
Energy (Kcal/day)		2200	-	2560	2675	2705	2705	2660
Protein (g/day)		41	66			61		
Vitamin A (ug RE/day)		270	370 + *			450		450
Iron (mg/day)	15% bio-availability	20	n , s, d			10		
	12% bio-availability	25	n , s, d			12		
	10% bio-availability	29	n , s, d			15		
	5% bio-availability	59	n , s, d			30		
Folate (µg/day)		400	600 + ^			500		
Zinc (mg/day)	High bio-availability	3	3.4	4.2	6	5.8	5.3	4.3
	Moderate bio-availability	4.9	5.5	7	10	9.5	8.8	7.2
	Low availability	9.8	11	14	20	19	17.5	14.4
Calcium (mg/day)		1000	1000†	1000†	1200	1000		
Vitamin C (mg/day)		45	55			70		
Selenium (µg/day)		26	26††	28	30	35	35	42
Magnesium (mg/day)		220	220			270		
Iodine (µg/day)		150	200			200		
Thiamine (mg/day)		1.1	1.4			1.5		
Riboflavin (mg/day)		1.1	1.4			1.6		
Niacin (mg NE/day)		14	18			17		

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Vitamin B6 (mg/day)	1.3	1.9	2.0

*Pregnant women should take Vitamin A supplementation in addition to diet
^Pregnant women take daily oral folic acid supplementation and where possible, before conception
†No calcium levels for 1st and 2nd trimester given, hence pre-pregnancy levels are assumed
††No selenium levels for 1st trimester given, hence pre-pregnancy levels are assumed

n: No figures are given for dietary iron requirements in pregnant women because the iron balance in pregnancy depends not only on the properties of the diet but also on the amounts of stored iron.
d: Dietary sources
s: The increased iron requirement cannot be obtained from the diet and thus daily supplemental iron and folic acid is recommended during pregnancy and for at least three months after delivery (WHO, 2014b).

Note: Unless otherwise stated, energy and all other nutrients listed above can be met by simply eating a variety of foods.

Sources: FAO and WHO (2004); FAO, WHO and UNU (2004); FAO, WHO and UNU (2007).

27.3 Annex 3: One serving size in Kcal, grams and household measures and total number of servings per day for different age groups

Table 27: One serving size in Kcal, grams and household measures and total number of servings per day for different age groups

				Number of servings per day based to total Kcal per day					
				2211 Kcal	2619 Kcal	2727 Kcal	2404 Kcal	2840 Kcal	1695 Kcal
	Energy per one serving (Kcal	**Food weight per one serving (gram**	**Common household measures for one serving size equivalent**	**GP-18-65 years**	**Pregnant women**	**Breast feeding women**	**10-18 years girls**	**10-18 years boys**	**6-9 year olds**
Cereal, roots, tubers, plantain	200	145	About 1 cup of rice, Pasta, diced, sweet potato and cassava, plantain, green banana, and ¾ cup cooked ugali,	4	4.5	5	5	5	3
Fruits	80	140	One medium banana or apple; or one large orange, peaches; two small tangerines, or peaches, OR One cup cut fruit like papaya, mango or small fruit like berries, grapes, jujube, jelly palm, black/java plum, OR rubber vine (ma)bungo)/ saba comorensis) (no sugar added) golden apple (embe sakua /spondias cytheera) OR quarter cup baobab pulp (with no sugar added)	2	3	3	2	3	2
Vegetables	70	140	1 cup cooked vegetables OR 2 cups raw leafy or salad vegetables or	2	2	2	2	2	2
Pulses, nuts and seeds	130	97	One serving is ½ cup cooked beans, bambara nuts, soya beans or cowpeas or Coconut milk, 1/3 cup OR 3 tablespoons peanuts, or seeds like flax, chia, sunflower; pumpkin seeds OR 1½ teaspoon peanut butter or flour (About 97 grams of pulses or 30 g of nuts and seeds*)	2	2	2	1	2	1

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				Number of servings per day based to total Kcal per day					
				2211 Kcal	2619 Kcal	2727 Kcal	2404 Kcal	2840 Kcal	1695 Kcal
	Energy per one serving (Kcal	**Food weight per one serving (gram**	**Common household measures for one serving size equivalent**	**GP-18-65 years**	**Pregnant women**	**Breast feeding women**	**10-18 years girls**	**10-18 years boys**	**6-9 year olds**
Sea food and animal products	130	145	2 eggs (95 g) , or 2 match box size ~60 g red meat (beef, goat, sheet); or beef liver, or 3 match boxes size ~90 g fish, or poultry like chicken, quails, duck, or rabbit One serving: 1 cup milk or sour milk (245 g) or - ¾ cup or 1 small tin yoghurt (200g) or 4 dice-size pieces of cheese (30 g)	1	2	2	2	2	1
Fats and oil	125	14	One 15 millilitres table spoon	2	2	2	2	2.5	2
Miscellaneous and beverages	197	53	Sodas and sugar sweeten beverages 300ml is 130 to 180 Kcal	1	1	1	1.25	1.25	0.25

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27.4 Annex 4: One serving size in Kcal, grams and household measures and total number of servings per day for under five Children

Table 28: One serving size in Kcal, grams and household measures and total number of servings per day for under five Children

				Number of servings per day based to total Kcal per day			
				203 Kcal	337 Kcal	550 Kcal	1146 Kcal
	Energy per one serving (Kcal	**Food weight per one serving (gram**	**Common household measures for one serving size equivalent**	**6-8 months**	**9-11 Months**	**12-23 months**	**2-5 years**
Cereal, roots, tubers, plantain	200	145	About 1 cup of rice, Pasta, diced, sweet potato and cassava, plantain, green banana, and ¾ cup cooked ugali	0.4	0.5	0.75	2
Fruits	80	140	One medium banana or apple; or one large orange, peaches; two small tangerines, or peaches, OR One cup cut fruit like papaya, mango or small fruit like berries, grapes, jujube, jelly palm, black/java plum, OR rubber vine (ma)bungo)/ saba comorensis) (no sugar added) golden apple (embe sakua / spondias cytheera) OR quarter cup baobab pulp (with no sugar added)	0.13	0.25	0.5	1

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				Number of servings per day based to total Kcal per day			
				203 Kcal	337 Kcal	550 Kcal	1146 Kcal
	Energy per one serving (Kcal	**Food weight per one serving (gram**	**Common household measures for one serving size equivalent**	**6-8 months**	**9-11 Months**	**12-23 months**	**2-5 years**
Vegetables	70	140	1 cup cooked vegetables OR 2 cups raw leafy or salad vegetables or	0.13	0.25	0.5	1
Pulses, nuts and seeds	130	97	One serving is ½ cup cooked beans, bambara nuts, soya beans or cowpeas or Coconut milk, 1/3 cup OR 3 tablespoons peanuts, or seeds like flax, chia, sunflower; pumpkin seeds OR 1½ teaspoon peanut butter or flour (About 97 grams of pulses or 30 g of nuts and seeds*)	0.13	0.25	0.5	0.5

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				Number of servings per day based to total Kcal per day			
				203 Kcal	337 Kcal	550 Kcal	1146 Kcal
	Energy per one serving (Kcal	**Food weight per one serving (gram**	**Common household measures for one serving size equivalent**	**6-8 months**	**9-11 Months**	**12-23 months**	**2-5 years**
Sea food and animal products	130	145	2 eggs (95 g) , or 2 match box size ~60 g red meat (beef, goat, sheet); or beef liver, or 3 match boxes size ~90 g fish, or poultry like chicken, quails, duck, or rabbit One serving: 1 cup milk or sour milk (245 g) or - ¾ cup or 1 small tin yoghurt (200g) or 4 dice-size pieces of cheese (30 g)	0.13	0.25	0.5	0.5
Fats and oil	125	14	One 15 millilitres table spoon	0.4	0.75	1	2
Miscellaneous and beverages	0	0	-	0	0	0	0

27.5 Annex 5: The FBDGs Taskforce

	Organisation/Department	Name
1	Ministry of Agriculture, Irrigation, Natural Resources and Livestock (MAINRL)- Department of Food Security and Nutrition	Mansura M. Kassim
2	Ministry of Agriculture, Irrigation, Natural Resources and Livestock (MAINRL)- Department of Food Security and Nutrition	Ali Mohammed Omar,
3	Ministry of Agriculture, Irrigation, Natural Resources and Livestock (MAINRL)- Department of Food Security and Nutrition	Ahmed Gharib Khamis
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SECTION 5

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