SAVING LIVES
CHANGING LIVES

Fill the Nutrient Gap
Tanzania

FINAL REPORT

National Bureau of Statistics

Tanzania Food and Nutrition Centre

Office of the Chief Government Statistician

WFP
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Contents

List of Acronyms

BMI	Body Mass Index
CFSVA	Comprehensive Food Security and Vulnerability Analysis
CotD	Cost of the Diet
DHS	Demographic and Health Survey
FNG	Fill the Nutrient Gap
IFPRI	International Food Policy Research Institute
IYCF	Infant and young child feeding
MAD	Minimum acceptable diet
MDD	Minimum dietary diversity
MDD-W	Minimum dietary diversity for women
MMF	Minimum meal frequency
MMT	Multi-micronutrient tablet
MNP	Micronutrient powder
MND	Micronutrient deficiency
NBS	National Bureau of Statistics
NMNAP	National Multisectoral Nutrition Action Plan
PORALG	President's Office–Regional and Local Government
PSSN	Productive Social Safety Net
REACH	Renewed Efforts Against Child Hunger and undernutrition
RNI	Reference nutrient intake
SBCC	Social and behaviour change communication
SNF	Specialised nutritious food
SQ-LNS	Small quantity lipid-based nutrient supplement
TASAF	Tanzania Social Action Fund
TFNC	Tanzania Food and Nutrition Centre
TFDA	Tanzania Food and Drugs Authority
TSH	Tanzanian shilling
UNICEF	United Nations Children's Fund
USD	United States dollar
VAD	Vitamin A deficiency
WFP	World Food Programme
WHO	World Health Organization
WHZ	Weight-for-Height Z-score

Background

The United Nations World Food Programme (WFP), with technical input from key research institutes (University of California Davis, the International Food Policy Research Institute [IFPRI], Epicentre, Harvard and Mahidol) and the United Nations Children's Fund (UNICEF), has developed a framework for strengthened nutrition situation analysis and decision-making, now called "Fill the Nutrient Gap" (FNG), which aims to support identification of strategies for improving nutrition with an emphasis on increasing access to nutrients, especially during the critical period of the first 1,000 days. This tool focuses primarily on the dietary intake side of the malnutrition conceptual framework displayed below:

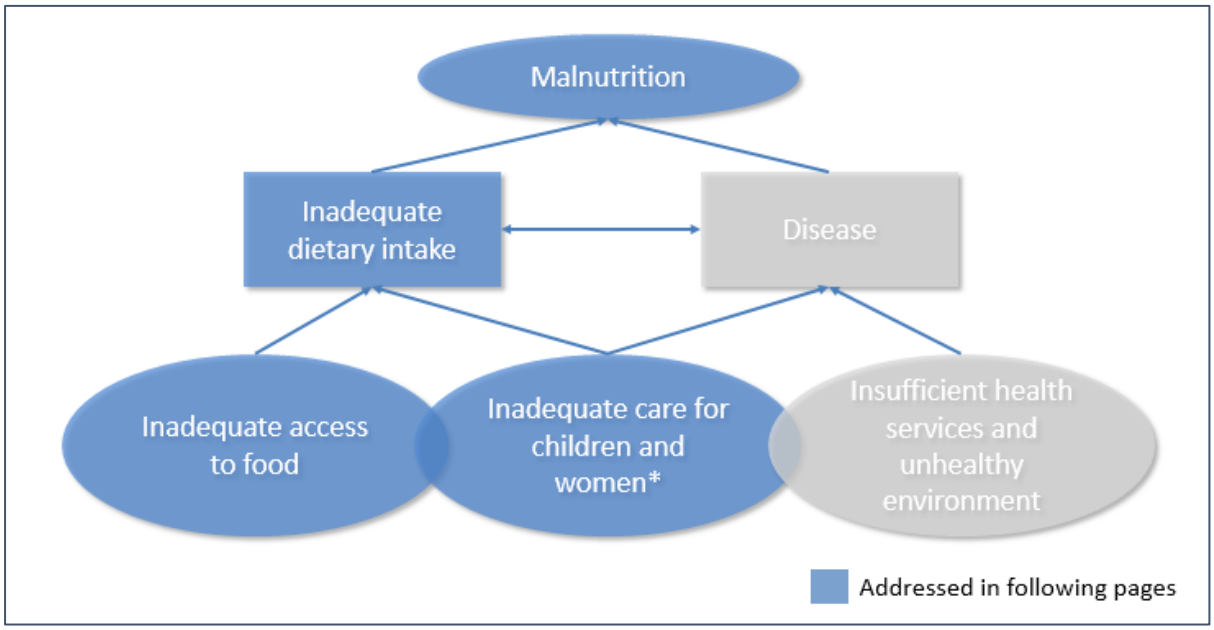


Figure 1: UNICEF Conceptual Framework for causes of malnutrition in society

The FNG tool primarily uses secondary data in combination with the results from linear programming tools such as Cost of the Diet (CotD) and Optifood to better understand the barriers to adequate nutrient intake in a given country context and to model potential interventions to improve access to nutrients, in particular from nutritious foods. Once this information has been consolidated and analysed, context-specific optimal packages of policy and programmatic interventions can be identified. These strategies and possible entry points are collectively identified in collaboration with national stakeholders once the preliminary results of the analysis are available.

Pilot testing of the FNG tool took place in El Salvador, Ghana and Madagascar in 2015–2016. The application of this tool was then validated in a consultation with key technical partners in September 2016. The tool has since been rolled out in Guatemala, Tanzania, Pakistan, Lao People's Democratic Republic, Cambodia, Sri Lanka, Mozambique, Niger, Rwanda and Uganda.

Methodology

The FNG process in Tanzania

The FNG process in Tanzania is elaborated in figure 2 below. The process started in October 2016 with a mission to Tanzania by the members of FNG team based at WFP headquarters. Initial stakeholder presentations were conducted in three group sessions, with participants including representatives of government, United Nations agencies, non-governmental organisations, and academic and research institutions. Stakeholders who could not attend the group sessions were engaged individually. Bilateral meetings were organized with the Tanzania Food and Nutrition Centre (TFNC) and the National Bureau of Statistics (NBS), the key government partners for the FNG in Tanzania.

Secondary data review and CotD analysis and modelling began in-country in October, and were then continued in collaboration with both WFP staff based in the Tanzania country office and the FNG team at WFP headquarters. National stakeholders, primarily TFNC, and the WFP Regional Bureau in Johannesburg were consulted throughout the analysis process.

A multi-stakeholder workshop was held in August 2017 to share the key findings of the analysis and to develop recommendations with key stakeholders. Results were then disseminated more broadly at the Fourth Tanzania Joint Multisectoral Nutrition Review in Dodoma in September 2017.

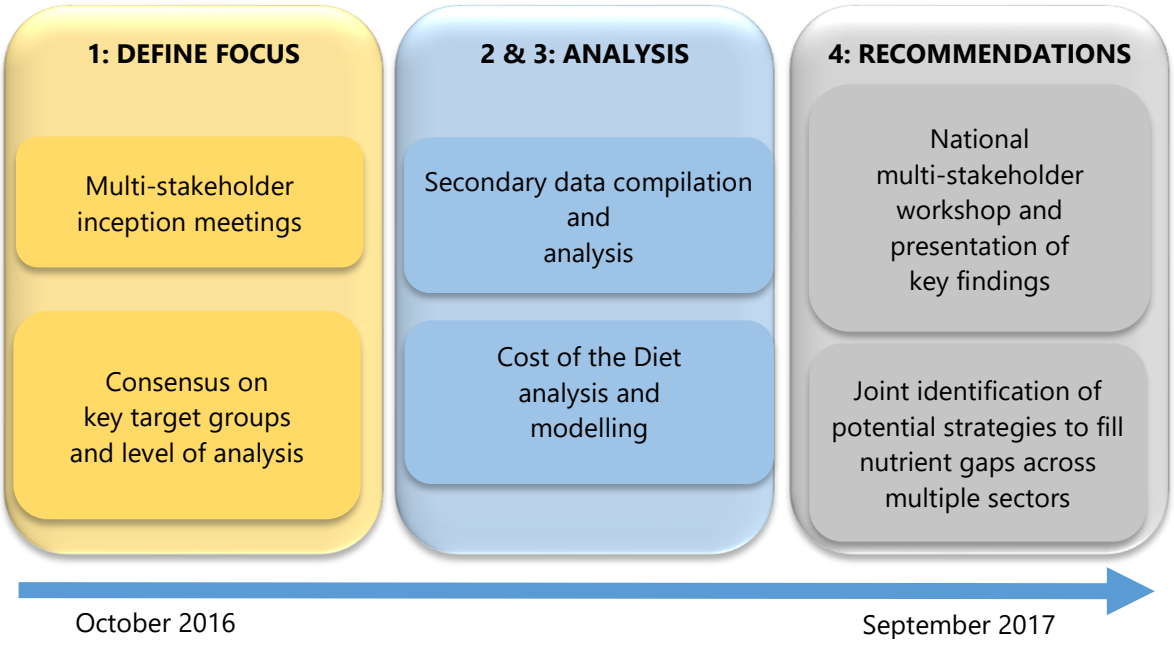


Figure 2: Stakeholder engagement process in Tanzania

Collation and Analysis of Secondary Data

The framework for analysis depicted in Figure 3 helps to consolidate and analyse existing secondary data at country level based on the following categories:

1. **Malnutrition Characteristics:** Review prevalence data of malnutrition characteristics (stunting, wasting, anaemia, underweight, overweight) and if possible data on certain micronutrient deficiencies. If relevant, seasonal patterns of various nutritional problems within populations can be considered. Malnutrition characteristics are reviewed in the initial stage to define priority groups for the analysis.

2. **Enabling Policy Environment**: Investigate whether the policy environment adequately facilitates access to and availability of nutritious foods for the population by identifying possible gaps in national policy, and national legal or regulatory frameworks related to access and availability. Enforcement of these policies and regulations is a key part of the analysis; for example, while there may be a mandatory national fortification policy, compliance of this policy may be low in reality. This section is crucial in identifying current or potential entry points for nutrition interventions.

3. **Availability of nutritious foods on the local market:** Review information on local availability of nutritious foods (natural and fortified) as well as on local production and processing capacity to assess whether it would be possible to meet nutrient needs from locally available foods.

4. **Access to Nutritious Foods:** Determine if the target populations have access to nutritious foods in both lean and non-lean seasons, urban versus rural areas, and based on variations in any other relevant socioeconomic factors. Also gain a better understanding of the adequacy of nutrient intake at the household level and the ability of households to cope with potential shocks.

5. **Nutrient Intake:** Examine likely or confirmed gaps in nutrient intake at the individual or target group level, in particular related to infant and young child feeding (IYCF) practices and the coverage of supplementation and/or fortification programmes. Each age group will have different nutrient requirements (e.g. a 6–11 month-old child will require a diet with much greater nutrient density in iron and zinc per 100 kilocalories than an adult male).

6. **Local Practices:** Identify socioeconomic and cultural factors influencing food purchasing patterns and feeding practices that may currently act as barriers to adequate nutrient intake or could in the future limit the effectiveness of certain food-based interventions, particularly among target groups of interest. Information gathered with tools such as ProPAN can be very useful to gain insights into local preferences and behaviours, which can inform strategies for social and behaviour change communication (SBCC) to improve feeding practices. Focus ethnographic studies or focus group discussions carried out by local academia or NGOs can provide key insights into this often overlooked area of analysis.

7. **Cost Optimization:** Estimate the minimum cost of a locally available nutritious diet utilising linear programming tools, such as Optifood and CotD. Insight can also be gained into what proportion of the population can afford this diet in different geographic areas or among social safety net beneficiaries compared to non-beneficiaries. CotD and similar tools can also be used to model possible intervention options that might improve affordability, such as introduction of fortified foods and/or specialised nutritious foods (SNFs) through market channels or social protection programmes, and cash transfers.

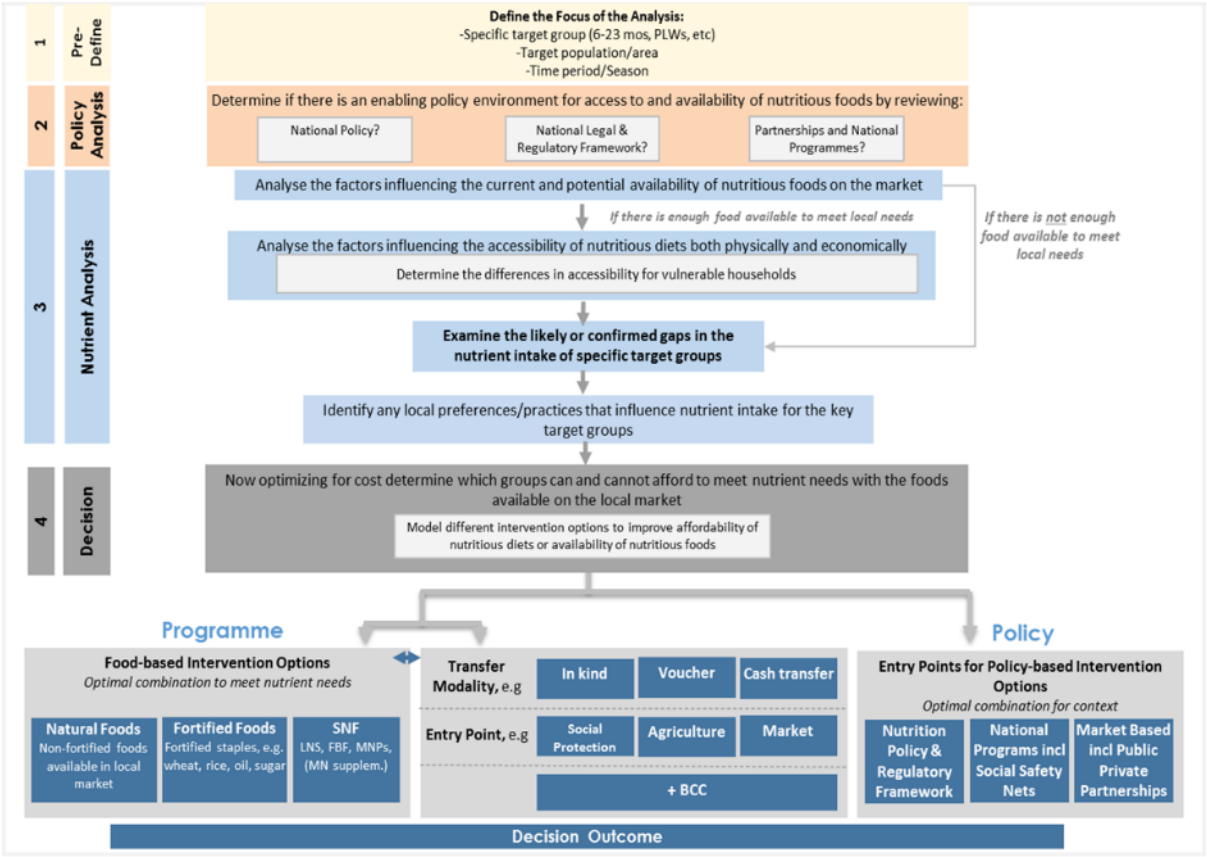


Figure 3: "Fill the Nutrient Gap" framework for situation analysis and decision making

Between October 2016 and August 2017, the secondary data analysis was carried out by the FNG team in consultation and collaboration with TFNC. A data mapping template was used to assist in the identification and review of different information sources relevant to the analysis, as per the categories above, and to highlight areas were data was not found. Data sources were identified, mapped and reviewed in two main stages:

1. **Consultation with national stakeholders:** Prior to and during the October mission to Tanzania, information about the data requirements for the FNG analysis and the FNG data mapping template were shared with the WFP country office and national stakeholders, who, in turn, shared relevant datasets, reports, articles, and documents on standards and regulations with the FNG team. Collaboration with stakeholders was pursued throughout the analytical phase in order to request and share information, share and validate findings, and provide clarifications. Key sources were market price data shared by NBS (mainland Tanzania) and the Office of the Chief Government Statistician (Zanzibar).
2. **Literature search:** In addition to data shared by national stakeholders, a web-based literature search was carried out to identify any further articles or reports relevant to the FNG analysis and to provide a contextual overview of the nutrition situation in Tanzania. PubMed and Google Scholar were used to search for data from studies in academic journals, institutional reports, and working paper series published in the last 10 years, while Google was used to search for grey literature sources.

Through consultation with national and international stakeholders and a review of relevant literature, 140 data sources were identified and reviewed. Key sources of secondary data are shown in Table 1.

Data category	Key data sources
Nutrition situation	DHS 2005, DHS 2015/16, Micronutrients DHS 2010
Policy and programmes	Food and Nutrition Policy Tanzania (draft, 2015); Tanzania National Multi-Sectoral Nutrition Action Plan 2016–2021
Access and availability of nutritious foods	Comprehensive Food Security and Vulnerability Analysis (CFSVA) (2012); Tanzania Livelihood Baseline Profiles (2010); AgriDiet working paper 1 (2014); Annual Agricultural Sample Survey Report 2014/15
Nutrient intake	Measuring Access to Food in Tanzania: A Food Basket Approach (2015); Maisha Bora Baseline Household Survey (2016)
Local practices	Ethnicity and Child Health in Northern Tanzania (2014); Affordable Nutritious Foods for Women Baseline Household Survey (2016); ASTUTE Formative Research Presentation (2017)
Optimisation and Cost of the Diet	Tanzania Mainland Household Budget Survey 2011/12; Zanzibar Household Budget Survey 2014/15; national food price market monitoring data 2016

Table 1: Key sources of secondary data reviewed for each category of the FNG analysis

Cost of the Diet Analysis

The Cost of the Diet (CotD) is a method and software developed by Save the Children UK to better understand the extent to which poverty affects nutritional status. The aim of the tool is to estimate the amount, combination and cost of local foods that are needed to provide individuals or households with their average needs for energy and their recommended intakes of protein, fat and micronutrients through the use of linear programming optimisation. Additional methodology for the software and the analysis can be found in Annex 4.

The CotD analysis was undertaken for all regions of mainland Tanzania (excluding Songwe[1]) and Unguja, Zanzibar. Interventions were modelled in 10 regions, which were chosen in consultation with national stakeholders to be representative of every zone in Tanzania. Within each zone, the region with the highest prevalence of stunting was chosen, as addressing stunting is a key priority in Tanzania's National Multi-sectoral Nutrition Action Plan. Dar es Salaam region was added to ensure the largest population centre was included.

Food Price Data

For the Tanzania CotD, market prices from July 2016 were inputted into the software. July was chosen as it represents a non-lean season month in both bi-modal and unimodal rainfall areas of mainland. Across all regions, a total of 85 food items were included for entry in the software, with a range of 46

[1] Songwe regions was formed in 2016 and thus is not represented in NBS price data collection for that year.

to 67 items for which prices were available in each region. The foods included represent all major food groups. The full list of food items is available in Annex 4.

Household Size and Composition

The household composition used was based upon the target groups for the FNG analysis as identified by key stakeholders. A household size of five people, representing the average household size as per the 2011 Tanzania Demographic and Health Survey (TDHS), was used in all regions to ensure comparability. The household included a child 12–23 months of age, a lactating woman and an adolescent girl (14–15 years old) – the three primary target groups impacting the critical window of the first 1000 days of life – as well as a child 6–7 years of age and an adult man. For this analysis the 12–23-month-old child is used as a proxy for children 6–23 months of age, the 6–7 year-old child as a proxy for school-aged children and the lactating woman as a proxy for pregnant and lactating women (PLW).

Staple-Adjusted Nutritious Diet

WFP's analysis uses a staple-adjusted nutritious diet (SNUT), which is the lowest cost diet that meets recommended intakes for energy, protein, fat and 13 micronutrients, and includes the main staple foods and excludes taboo foods. Staple foods are defined as foods that are generally eaten every day by all household members, and are assumed to be unfortified in the baseline analysis. Taboo foods are defined as foods that are not consumed for cultural or religious reasons, but not due to food preferences.

Staple food preferences for each region of Tanzania were determined through compilation of published research and key informant interviews. The staple in all mainland regions was maize with, in some regions, cassava or plantain, and the staple in Zanzibar was rice; the nutritious diet therefore included at least one serving of these foods every day for all individuals (see Annex 4 for a complete list of staples). In regions where two staple foods were identified, the diet of the child under 2 included a daily serving of only one of the staples; for all other individuals, the diet included a daily portion of both staples. Taboo foods have not been included in the analysis as the secondary data and stakeholder consultation did not identify any that were strong enough to be particularly relevant to the modelled family composition. Optimal breastfeeding levels were assumed for the child under 2. The software was then free to choose any remaining foods to complement the diet to meet nutrient requirements.

Affordability Analysis

The cost of a nutritious diet becomes a more meaningful figure when compared with the money that households currently spend on food. This facilitates an understanding of what percentage of households within the population can afford the nutritious diet. To estimate the percentage of households within the 10 regions who were unable to afford a nutritious diet, the cost of a nutritious diet was compared to percentiles of monthly household food expenditure data at the regional level.

Intervention Modelling

In order to improve affordability of the nutritious diet, a number of interventions were modelled targeting the key target groups: PLW, children under 2 and adolescent girls. A number of other interventions were also modelled targeting the household overall. These interventions were identified primarily through consultations with national stakeholders as well as from the analysis of the secondary data, and were modelled in 10 regions, representing each zone (including the mainland and

Zanzibar) and Dar es Salaam.[2] Models and results are integrated throughout the key messages of this report. More detailed information regarding the interventions and modelling parameters can be found in Annex 4.

[2] The regions were Dar es Salaam, Mtwara, Tanga, Morogoro, Dodoma, Njombe, Rukwa, Kigoma and Kagera on the mainland and Kusini Unguja in Zanzibar.

Introduction

This report seeks to understand the different drivers of the nutrition situation in Tanzania, particularly for the most vulnerable groups, in relation to nutrient access and intake during the first 1,000 days of life. The analysis aims to provide a basis upon which different strategies and intervention packages can be identified that are tailored to the context and targeted at key groups, particularly children 6–23 months, pregnant and lactating women and adolescent girls.

The United Republic of Tanzania, formed in 1964 through the union of Tanganyika and Zanzibar, is a multi-party democracy with a reputation of stability after decades of relatively steady governance and the absence of major conflicts. Tanzania's vast and diverse landscape is divided into 26 administrative regions on the mainland, and five in Zanzibar. Tanzania shares a border with eight countries and is host to refugee populations of over 300,000 from neighbouring Burundi and Democratic Republic of Congo in the northeast regions.

Tanzania is home to a rapidly growing population of 50.1 million, approximately 1.3 million of which are in the semi-autonomous region of Zanzibar. Annual population growth has remained just above three percent for almost a decade, placing Tanzania among the fastest growing countries worldwide (World Bank 2017b).

This same period has seen sustained high economic growth, with an annual Gross Domestic Product (GDP) growth rate of 6–7 percent per year (World Bank 2017a). GNI per capita has also been steadily increasing – the most recent estimate of USD 920 in 2016 is more than triple the value at the turn of the twenty-first century (World Bank 2017b). Tanzania is on track to meet its national development target of achieving middle-income status by 2025 (Ministry of Finance and Economic Affairs 2010; Kavishe 2014).

While economic growth ranks amongst the highest for East African and developing countries, only about two percent of growth has been attributed to agriculture – a sector which comprises about a quarter of total GDP and engages 88 percent of the rural employed population, the majority of which are smallholder farmers (National Bureau of Statistics & Ministry of Finance 2014; World Bank Group 2017). With very little irrigated land and reliance on traditional techniques, agricultural productivity is low and vulnerable to changes in rainfall patterns.

Despite strong economic gains overall, growth has not been equitable, and poverty, food insecurity, and malnutrition persist throughout the country. Poverty headcounts have declined (estimated at 28.2 percent for mainland and 30.4 percent for Zanzibar), though the absolute number of poor has not changed much due to population growth (Office of the Chief Government Statistician Zanzibar 2015; National Bureau of Statistics & Ministry of Finance 2014). Poverty has also decreased more rapidly in Dar es Salaam, the commercial capital, now standing at four percent (National Bureau of Statistics & Ministry of Finance 2014). In contrast, one-third of the population in rural areas is living in poverty and one in ten are in extreme poverty (National Bureau of Statistics & Ministry of Finance 2014).

The majority (80 percent) of Tanzanians are literate, with a slightly lower rate of literacy among women than men (77 percent versus 83 percent). About half of women and men have completed primary school but women are less likely to have any secondary education (23 percent versus 28 percent for men). Enrolments have increased dramatically after the introduction of free primary and secondary schooling nationwide in 2016 (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

Standards of living have been improving slowly but remain poor for the vast majority of the population, especially in rural areas. Sixty percent of households have an improved source of drinking water, but only 19 percent of all households have improved sanitation facilities. Just under one-quarter of households have electricity and more than 90 percent of households cook with wood or charcoal (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

After decades of stagnation due to the HIV/AIDS epidemic, life expectancy began to improve in the early 2000s. As of 2012 it was estimated at 61 years. Although HIV incidence has decreased, six percent of adult women and four percent of adult men (ages 15–49) are living with HIV (Economic and Social Research Foundation et al. 2015). HIV and malaria continue to be common causes of mortality and morbidity, the latter particularly among young children and pregnant women. Nearly all Tanzanians (93 percent) live in areas where malaria transmission occurs, and thus are at risk of infection (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016). Although the focus of the FNG analysis is on nutrient intake, the impact of sanitation and disease must be kept in mind as important potential barriers to nutrient absorption and thus causes of malnutrition.

Malnutrition Characteristics:
Tanzania's nutrition transition

Overall, the key nutrition indicators show that the nutrition situation in Tanzania has exhibited mixed progress over the last 10 years. Prevalence of stunting, while still high at 34.4 percent, is at its lowest recorded level and prevalence of wasting has held steady at or below five percent nationally for the last 16 years (figure 4). However, despite good progress at national level, there continue to be disparities in the geography, socio-economic status, age and sex of those most affected by malnutrition. Deficiencies of iron, vitamin A and iodine each roughly affect around a third of women and children and have changed little in the last five years. Anaemia persists at high rates in both women and children. A rising level of overweight and obesity in women indicates that Tanzania has now entered a nutrition transition period characterized by a double burden of malnutrition and onset of nutrition-related non-communicable diseases.

Unless otherwise noted, the malnutrition characteristics and trends discussed in this section are based on analysis of Tanzania Demographic and Health Survey (DHS) data from 1991–2015/16.

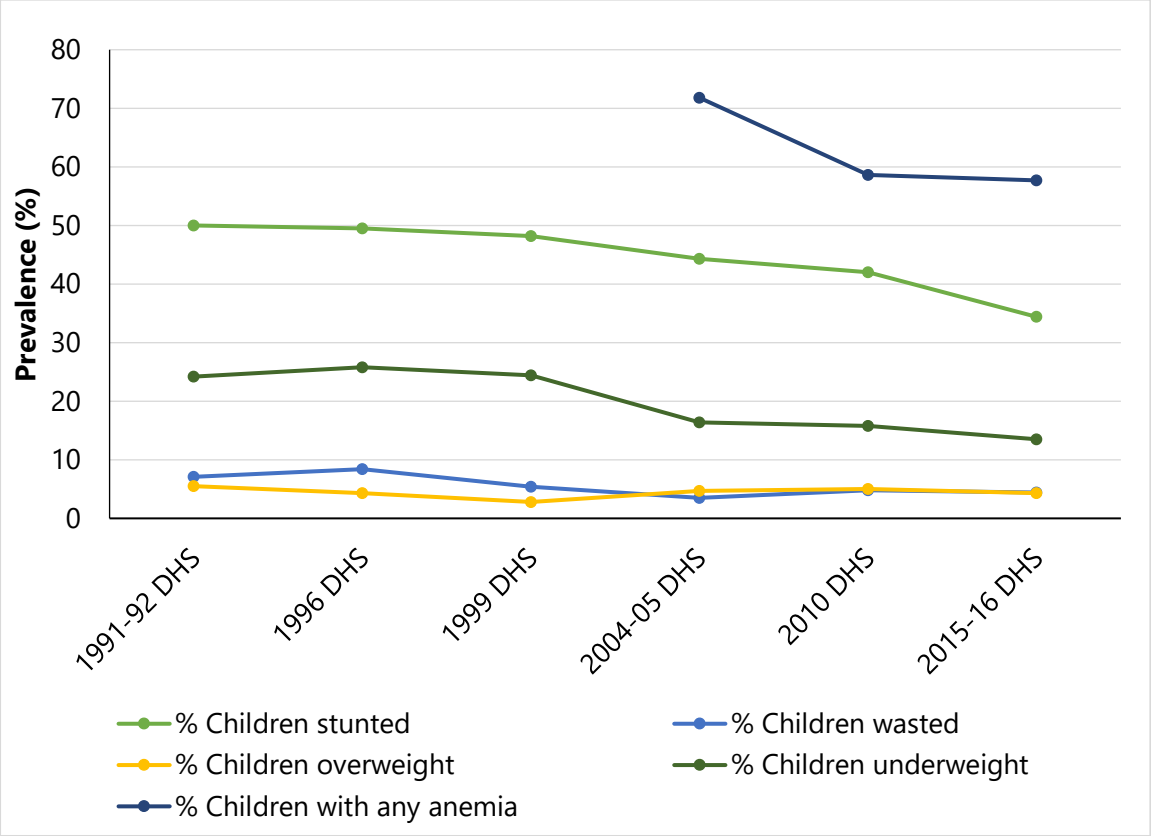


Figure 4: Trends in malnutrition, children 6–59 months 1991–2015 (DHS, various years)

Key message 1a: Pockets of acute malnutrition remain.

Nationally, acute malnutrition rates for children under 5 years have remained below five percent since 2004, with the most recent DHS reporting prevalence at 4.4 percent in 2015. On the mainland, prevalence of acute malnutrition averages 4.4 percent, with a range of 1.2 percent (Lindi) to 6.4

percent (Arusha). In Zanzibar, the overall prevalence is higher at 7.1 percent, with a range of 6.4 percent (Mjini Magharibi) to 8.8 percent (Kusini Pemba).

For most socio-economic parameters (wealth quintile, sex, urban/rural) some variation of wasting prevalence exists within the group, however in all cases it is near or below the five percent threshold for public health significance. Data on a possible seasonal pattern of wasting were not found.

Age, however, seems to be an important risk factor for acute malnutrition in Tanzania (figure 5). At 9.3 percent, children under 6 months of age and 9–11 months display the highest prevalence of acute malnutrition. Prevalence in these two age groups (under 6 months and 9–11 months) has increased steadily over the last 10 years. Conversely, a very sharp drop in prevalence of acute malnutrition is seen for children in the 6–8 month age group: in 2010, 6–8 month olds exhibited the highest prevalence of wasting at 10.9 percent, but this fell by more than half to 4.7 percent in 2015. It is unclear why this trend is different as compared to the less than 6 months and 9–11 months age groups. While changes of wasting prevalence are mainly due to weight changes among children, which can be influenced by morbidity and are hence more subject to fluctuations, stunting shows a steadier pattern. As shown below (see "Chronic Malnutrition"), stunting prevalence has decreased uniformly across age groups.

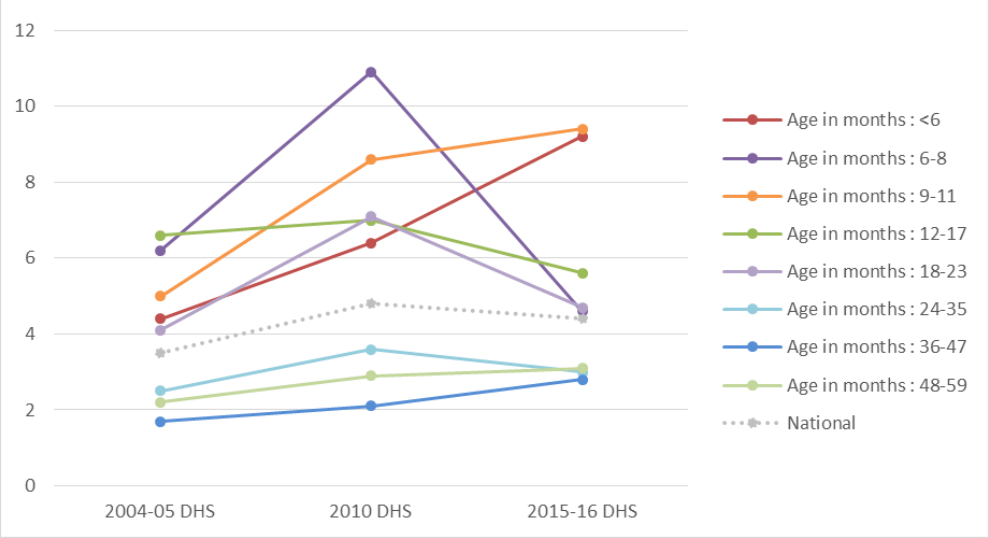


Figure 5: Prevalence (%) of acute malnutrition by age group over time, 2004/05–20015/16. (DHS, 2005, 2010 and 2016)

An estimate of regional caseloads (Annex 1b-c) indicates that approximately 323,000 children in Tanzania are acutely malnourished (WHZ <-2.0), of which one quarter (85,000) are severe acutely malnourished (WHZ <-3.0). The regions of Rukwa, Manyara, Arusha, Dodoma, Geita and Kigoma have among the highest estimated caseloads for children with WHZ <-2.0 and WHZ <-3.0 (figure 6). See Annex 1 for more information on caseload estimates.

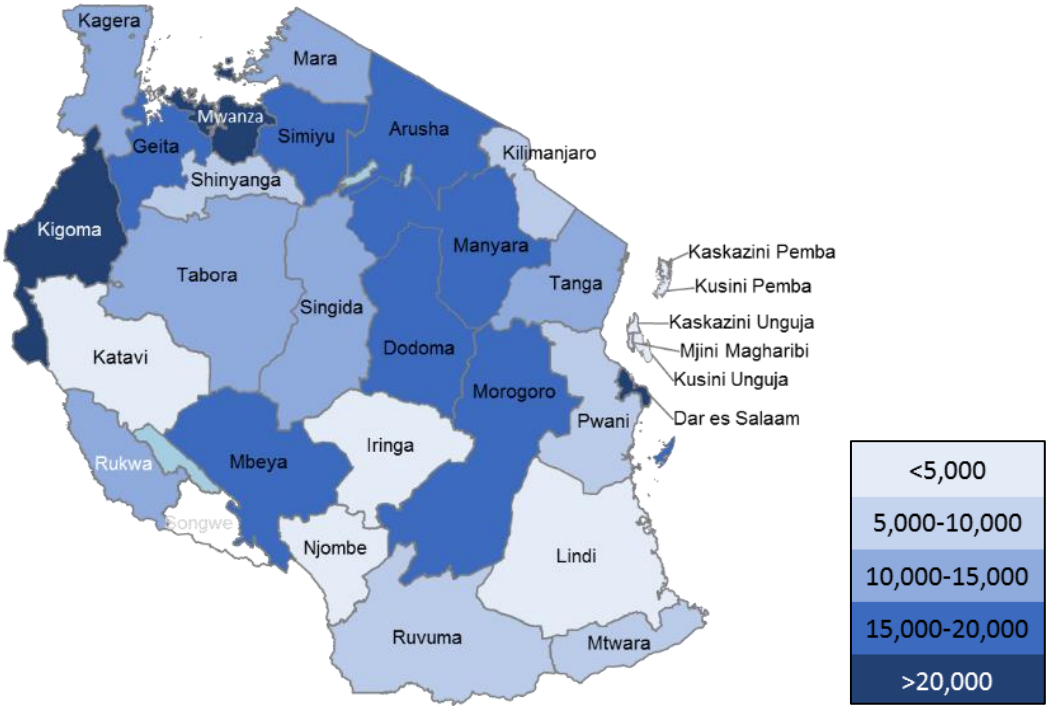


Figure 6: Acute malnutrition caseload among children 6–59 months by region (calculations based on DHS 2016 and population data from the 2012 census)

Key message 1b: Although declining, progress is uneven and chronic malnutrition remains high.

After more than two decades with minimal improvement, the 2015/16 DHS reports a national prevalence of chronic malnutrition (stunting) of 34.4 percent, the first time it has been measured below 40 percent since at least 1991. While still categorized as "high" by the World Health Organization (WHO), this figure represents the largest recorded decrease between DHS surveys.

Good progress nationally in the last five years is echoed in many regions. Of the 26 regions for which trend analysis is possible[3], 23 report a reduction in stunting prevalence since 2010. In nine regions, prevalence decreased by an impressive 10–20 percentage points over five years, while an additional seven regions experienced a reduction of 5–10 points (figure 9). However, progress on stunting reduction was slower in five regions where prevalence decreased by less than 5 points, and three regions did not report any improvement – Kilimanjaro and Rukwa, where the prevalence of chronic malnutrition has increased since 2010 (by 1.4 and 5.9 percentage points, respectively) and Mwanza, where prevalence has remained almost the same as in 2010. In addition, Arusha and Kusini Unguja show a slight decrease since 2010, but stunting prevalence is still higher now than it was in 2004.

Large and steady reductions of more than 20 percentage points from 2004 to 2015 are seen in Iringa (62.4–41.6 percent), Kigoma (59.2–37.9 percent) and Mtwara (58.7–37.7 percent). Smaller, but still steady reductions over this period also occurred in Singida, Tabora and Dar es Salaam.

While trends show a general decrease in most areas of the country, stunting exceeds the 40 percent "very high" classification threshold in six regions – Rukwa, Njombe, Ruvuma, Kagera, Iringa and Geita.

[3] Analysis of trends for Njombe, Katavi, Simiyu and Geita are not available since these regions have been newly created since 2010. Songwe region is also not represented in most data sources as it was created in 2015.

Stunting in Rukwa is particularly critical, with total prevalence at 57 percent, and about half of stunting cases classified as severe (figure 8).

Notably, among the regions reporting higher prevalence of stunting in 2015, there are several that do not report strong reductions over the last five years. Rukwa, in particular, had the highest stunting prevalence of any region (56 percent) in the 2015 DHS, which was an increase of nearly 6 percentage points from the 2010 DHS. In Kagera and Ruvuma, similarly, stunting prevalence was greater than 40 percent, and has decreased only marginally since 2010 (figures 8–9).

Caseload estimation reveals that approximately 2.5 million children in Tanzania are stunted, of which roughly 860,000 are severely stunted (see Annex 1a). The regions of Mwanza, Kagera, Mbeya, Kigoma and Geita have the highest estimated numbers of children affected by chronic malnutrition – about one-third of all stunted children in Tanzania live in these five regions.

There is a discrepancy between urban and rural stunting prevalence of about 13 percentage points (urban, 24.7 percent; rural, 37.8 percent), a gap which has remained steady since 2004 (figure 7).

A consistent discrepancy also exists between the sexes, with male children at a slightly higher risk for stunting than females over the last 10 years. Currently, boys exhibit a stunting rate of 36.7 percent, 4.4 percentage points higher than girls. This is a phenomenon that has previously been identified in sub-Saharan Africa, with one meta-analysis of data from 16 DHS surveys across 10 countries (including Tanzania) finding that boys were more likely than girls to become stunted in all of the countries (Wamani et al. 2007). No conclusions have been drawn regarding underlying causes of this gender disparity, although anecdotal conjectures include behavioural and cultural influences on child feeding practices as well as biological factors.

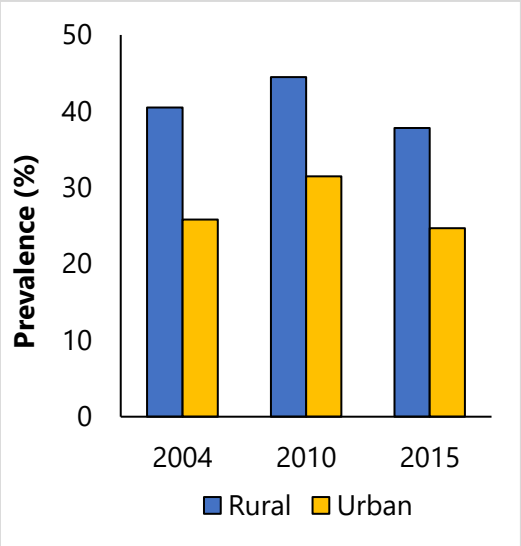
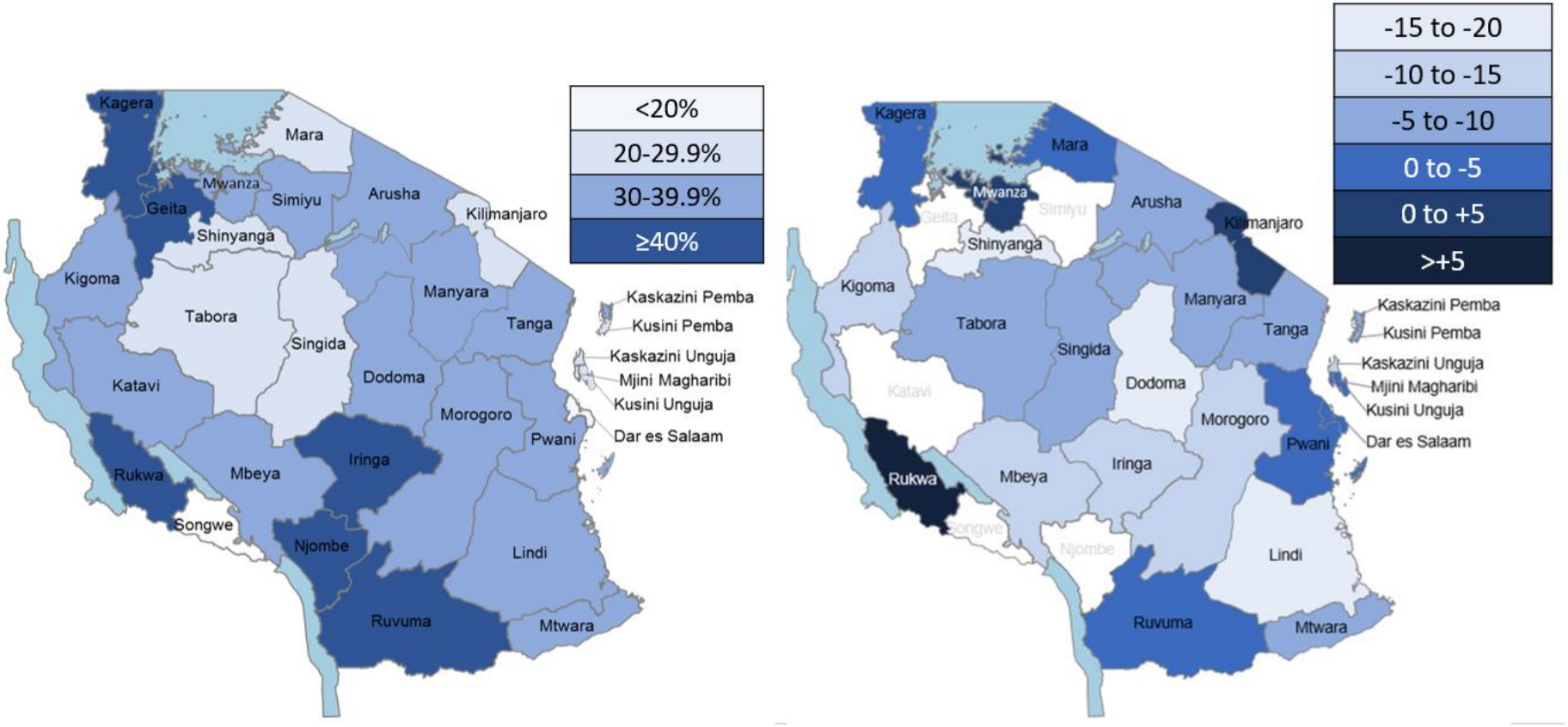


Figure 7: Stunting prevalence in children 6-59 months by rural/urban location (DHS, 2016)



*Figures 8 and 9: Stunting prevalence by region, children 6-59 months (left, DHS 2016); change in stunting prevalence (percentage points) by region, DHS 2010 to DHS 2015 (right, DHS 2010 and 2016)**

**Trend data not available for Geita, Katavi, Simiyu or Songwe*

The prevalence of chronic malnutrition varies with household wealth, with households in lower quintiles exhibiting prevalence above the national average of 34.4 percent (figure 10). Notably, the prevalence rates for all three of the bottom quintiles are all clustered around 39–40 percent, suggesting that resource or other constraints which impede ability to improve nutrition may not be exceeded until a household reaches the upper wealth quintiles. However, even those in the highest quintiles report a prevalence of 19.2 percent, indicating that having adequate nutrient intake and good health is also a challenge among the richer households. It remains to be determined whether this is more related to economic factors (i.e. they are relatively wealthy, but in absolute terms that does not yet provide enough access to adequately nutritious foods), to knowledge (i.e. what are appropriate dietary choices) or to other barriers such as limited time to purchase, prepare and feed adequately nutritious foods or lack of convenient nutritious complementary foods for urban families (the main group in the richest quintile).

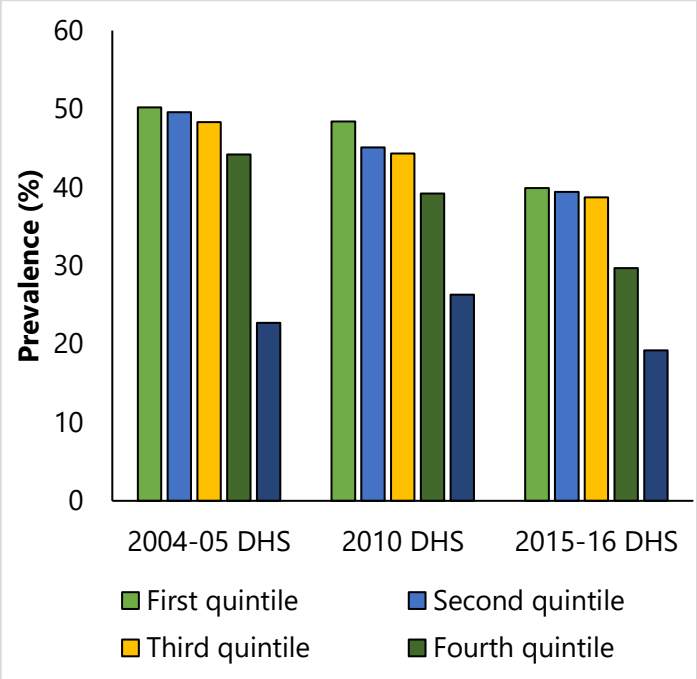


Figure 10: Stunting prevalence in children 6-59 months by wealth quintile. (DHS 2005, 2010, 2016)

Risk of chronic malnutrition also varies with a child's age, though this follows expected trends, with a higher prevalence in older children (between 18 and 47 months) and lower prevalence in younger children (8 months or younger). Over the past decade, there have been uniform decreases in prevalence at all ages, in contrast to the trends with wasting (as discussed above) (figure 11). The fact that there was also a substantially lower prevalence of stunting among the children under 8 months of age in 2015, compared to 2005 and 2010, suggests that there have also been improvements in the early part of the first 1000 days, i.e. on maternal nutrition. Further implications are discussed below (see Key Message 7: Infant and young child feeding practices).

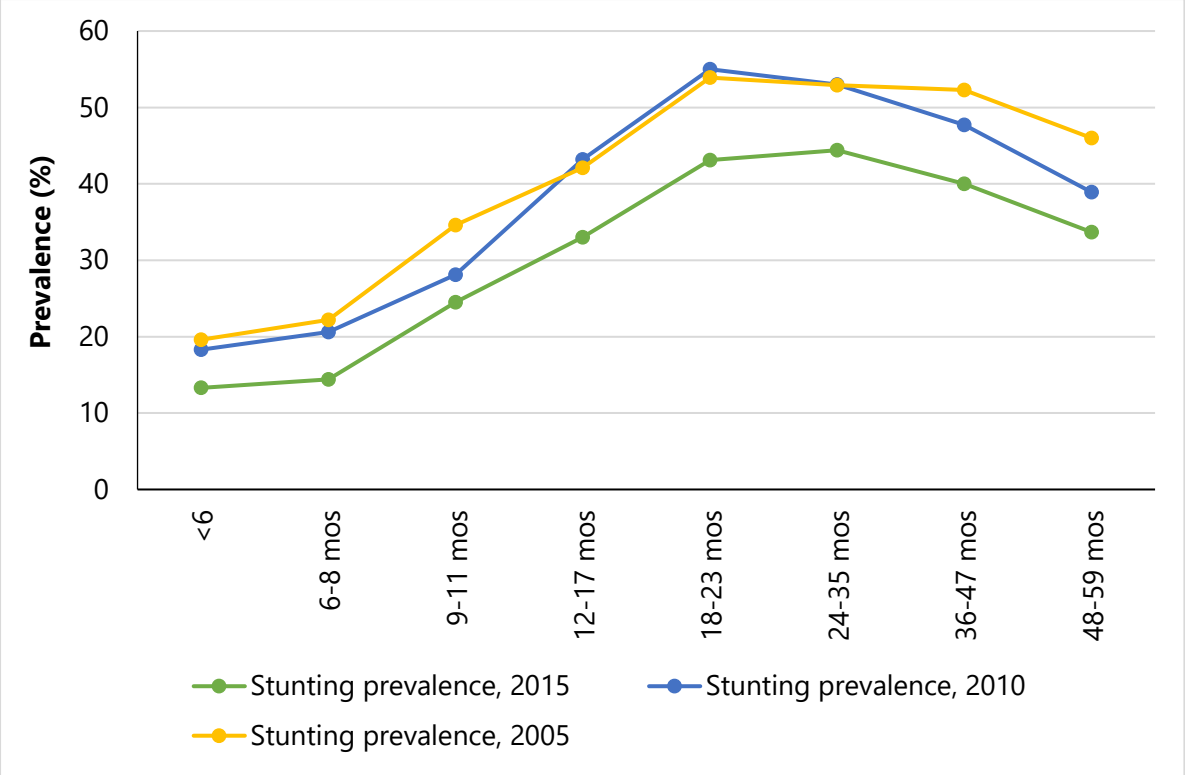


Figure 11: Stunting prevalence by age in months, 2005–2015 (DHS, 2016)

Key message 1c: Micronutrient deficiencies are widespread.

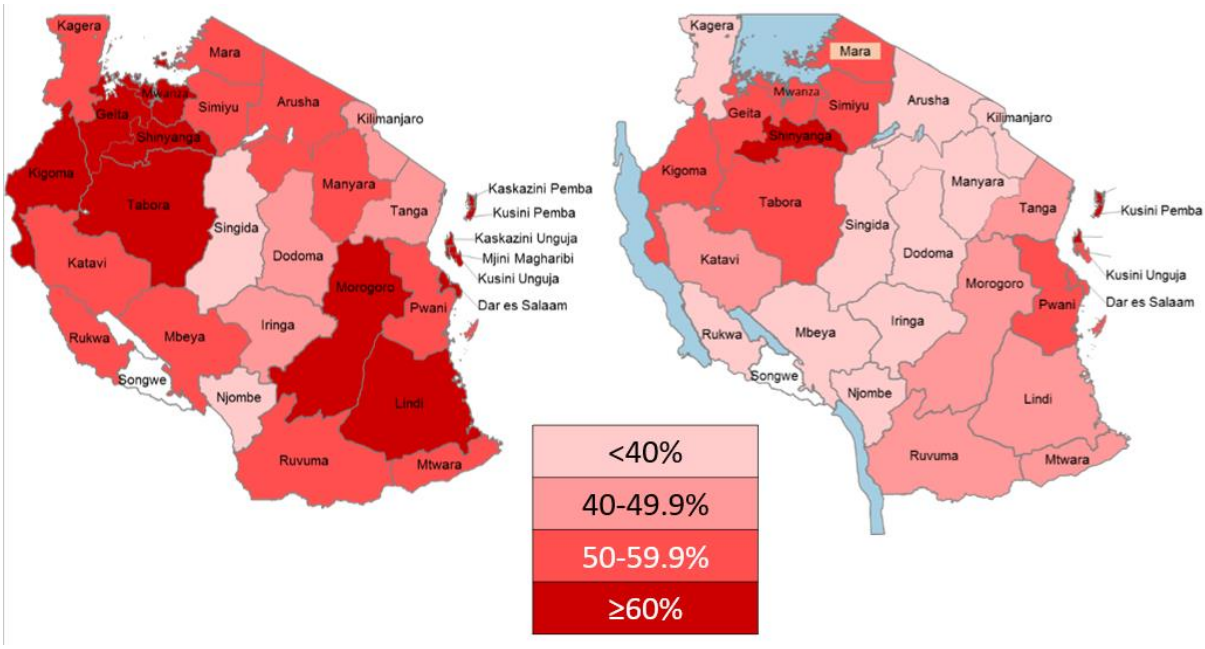
Anaemia

While the DHS in 2010 collected data on both anaemia and iron deficiency ('DHS Micronutrients'), the 2015 DHS only collected data on anaemia. At 58 percent in children 5 years and 45 percent in women in 2015, the national prevalence of anaemia is categorised as a severe public health problem[4] (figures 12–13). There has been virtually no change in the prevalence of anaemia (mild, moderate and severe[5]) in children since 2010, and in women it has increased by five percentage points (Ministry of Health, Community Development, Gender, Zanzibar, et al. 2016).

Regional prevalence varies widely in both groups, from 37 percent in Singida to 71 percent in Shinyanga for children, and 25 percent in Mbeya to 72 percent in Kaskazini Pemba for women. Progress has also been mixed at regional level. While 14 regions have seen a decline in children's anaemia prevalence, almost as many have increased or changed very little. Women's anaemia has increased more often than decreased, with the largest regional increases in Mara and Kigoma.

In 12 regions prevalence of anaemia in children is above 60 percent, of which two regions reach 70 percent – Shinyanga (71 percent) and Kaskazini Pemba (70 percent). Only three regions (Singida, Njombe and Iringa) have measured prevalence at or below the WHO threshold of 40 percent. In 2010, prevalence of anaemia in Mara, Kagera and Rukwa regions was below 50 percent; however all three are now above 50 percent, having experienced the largest five-year increases in prevalence (9–11 percentage points).

[4] WHO classification: Prevalence of anaemia 40 percent or above is categorised as a severe public health problem.
[5] Nationally, cases of severe anaemia represent less than two percent of anaemic children (DHS 2015/16).



Figures 12 and 13: Anaemia prevalence in children 6–59 months (left) and women 15–49 years (right)

The overall proportion of women affected by anaemia is lower than children, but even so, four regions report prevalence of 60 percent or greater, and less than a third are below 40 percent. Mara and Kigoma experienced the largest jumps in women's anaemia, increasing 15 and 20 percentage points respectively since 2010. Five other regions increased by 10–11 percentage points.

While highly prevalent throughout the country, anaemia in children is most critical in two main geographical areas – the contiguous regions of Kigoma, Geita and Shinyanga (all 68 percent or higher) and Zanzibar (65 percent, with all regions above 60 percent). Lake Zone regions are also a key concern as prevalence is very high and it is the only zone to record a significant increase since 2010. Prevalence is generally lower in central, southern and northeastern regions (though Morogoro, at 66 percent, is a notable exception).

Anaemia in women follows a similar geographic pattern to that of children, with lowest prevalence found in the central regions, and higher prevalence in Western zone, parts of Lake zone and Zanzibar. Zanzibar, in particular Pemba Island, presents a critical situation for women's anaemia. In all regions of Zanzibar, the majority of women are anaemic, with at least three in five women on Pemba Island anaemic.

There are only slight differences in prevalence of anaemia between males and females and children living in urban or rural settings. While children from poorer households have a higher risk of anaemia (64 percent in the lowest quintile), even in the wealthiest households one in two children is anaemic.

No major differences in anaemia prevalence between women living in urban and rural settings, nor by income quintile, were evident.

The drivers of anaemia in children are not entirely clear and may vary considerably by region. In the Kigoma-Geita-Shinyanga area, we find very high anaemia (36 percent, 42 percent and 35 percent, respectively), in a context where malaria prevalence is high and consumption of iron-rich foods is lower. In Zanzibar, we find very high anaemia in a context where malaria is almost non-existent and consumption of iron-rich foods in children is considerably higher than average (Ministry of Health, Community Development, Gender, Zanzibar, et al. 2016).

Only a proportion of anaemia cases can be attributed to iron deficiency. As of 2010, 41 percent of anaemia in children and 35 percent of anaemia in women was attributed to iron deficiency. The balance of anaemia cases could be a result of infection (malaria, helminths) or other nutrient deficiencies (vitamin B12, folate, vitamin A) (National Bureau of Statistics & ICF Macro 2011). Sickle-cell anaemia may also represent some of the caseload, however despite the fact that Tanzania is one of the highest burden countries as relates to sickle-cell trait, sickle-cell disease is not likely to affect a large proportion of the population.

The relationship at play between anaemia, iron intake, malaria and other infections, and vitamin deficiencies is complex, and more research is urgently needed to understand the key drivers of anaemia in women and children in the different regions of Tanzania.

Iron deficiency

Iron deficiency was estimated to affect approximately one in three children and women, with prevalence at 35 percent of children 6–59 months and 30 percent of women 15–49 years in 2010. For children, this ranged from 13 percent (Mtwara) to 52 percent (Arusha) at regional level. Children living in urban areas were more likely to be iron deficient. Younger children, aged 6–23 months, also faced an elevated risk of iron deficiency as compared to children 24–59 months (National Bureau of Statistics & ICF Macro 2011).

For women 15–49 years, iron deficiency did not vary much from the 30 percent national average by age, pregnancy status, income, or urban/rural. Regional variation was significant, with prevalence of iron deficiency reaching 50 percent in Tabora, but only seven percent in Mtwara (National Bureau of Statistics & ICF Macro 2011).

Vitamin A

Distribution of vitamin A capsules began in 1987 at government primary health care facilities and was integrated into routine immunisation services in 1997. As of 2010, the Ministry of Health and Social Welfare provided vitamin A supplements to children 6–59 months through biannual campaigns that began in 2001. Maternal coverage consisted of providing a high-dose capsule (200,000 IU) within one month after delivery; however, as of 2010 the policy was being reviewed to align with WHO guidelines recommending vitamin A be provided within six weeks postpartum or within two months to women who are breastfeeding (National Bureau of Statistics & ICF Macro 2011). This policy revision is still pending as of 2017.

In 2010, one third of children 6–59 months were considered Vitamin A deficient (based on RBP level equivalent to serum retinol <0.70 umol/L). At regional level, this varied from 15 percent (Unguja North) to 51 percent (Pemba North). On Mainland, Kagera had the highest prevalence of vitamin A deficiency (VAD) at 47 percent. VAD did not vary much by age, income, or urban/rural location. Prevalence of VAD was somewhat lower in girls (31 percent) than in boys (35 percent) and lower in households where the mother achieved secondary education. The DHS 2010 Micronutrients report found little association between consumption of vitamin A (either through food or supplements, based on mother's recall) and Vitamin A deficiency. Sixty-one percent of children were reported to have received a vitamin A supplement in the past six months, with much higher coverage in Zanzibar than on the mainland (78 percent versus 60 percent): mainland coverage ranged from 12 percent in Shinyanga and 28 percent in Tabora to 80 percent in Ruvuma and 82 percent in Iringa, while on Zanzibar coverage was lowest in Town West (74 percent) and highest in Unguja South (90 percent) (National Bureau of Statistics & ICF Macro 2011).

A slightly higher proportion (37 percent) of women, as compared to children, was considered vitamin A deficient in 2010 (based on RBP level of 1.24 umol/L, equivalent to serum retinol <1.05 umol/L). The same two regions – Unguja North (17 percent) and Pemba North (55 percent) – defined the upper and lower boundaries for regional prevalence. Curiously, VAD in women increased with income (33 percent in the lowest economic quintile versus 42 percent in the highest) and education (34 percent of women with no education versus 42 percent of those with secondary or more), and was higher in urban areas (40 percent, versus 36 percent in rural areas). Pregnant women and younger women were also more at risk (National Bureau of Statistics & ICF Macro 2011).

Nationally, the percentage of women reported to have suffered night blindness during their last pregnancy (less than three years ago) fell just below the five percent threshold for public health significance in all regions in 2010 (there are no data for 2015). However, five regions exceeded this threshold – Shinyanga (12 percent), Tabora (eight percent), Manyara (seven percent), Kagera (seven percent) and Dodoma (six percent) – indicating a significant deficiency in vitamin A for pregnant women.

Iodine

Analysis of women's urinary iodine concentration (UIC) indicates that the median UIC has increased from 160 g/L in 2010 to 180 g/L in 2015, which is considered within the optimal range [*DHS 2010, 2015*]. However, about the same proportion – one-third – of women have UIC that is considered either too low (below 100 g/L) or too high (above 300 g/L). These proportions are nearly unchanged since 2010.

Low UIC in women exceeds 50 percent in Tabora, Rukwa, Kigoma, Shinyanga and Kagera and reaches 76 percent in Geita. Excess UIC is most common in the north-eastern regions of Dar es Salaam (77 percent), Pwani (68 percent) and Tanga (61 percent).

Low UIC is strongly correlated with socioeconomic indicators, with women from the lowest income quintile at 4.5 times higher risk (51 percent versus 11 percent), those with no education at close to double the risk of women with secondary education (46 percent versus 25 percent), and rural women at close to three times the risk of those in urban settings (15 percent versus 44 percent).

The inverse is true for excess UIC, with urban, better educated and better-off women experiencing 2 to 3.5 times more risk than their counterparts.

These patterns are likely strongly linked with consumption of iodized salt, which is virtually the only source of iodine. Poor households are less likely than non-poor households to consume fortified salt (56 percent versus 81 percent, respectively) even though virtually all households consume salt (GAIN et al. 2016). Consumption of fortified foods is further explored below.

Micronutrient Supplementation

Coverage of vitamin A supplementation among children dropped 20 percentage points from 2010 to 2015, although this may have been related to a delay in distribution of supplements in 2015, due to which the DHS did not capture a Vitamin A capsule receipt in the last 6 months (key informant information). In 2015, 41 percent of children 6–59 months nationally had received vitamin A in the past 6 months[6], with coverage ranging from 15 percent in Katavi to 68 percent in Kusini Unguja. Of the regions with the lowest coverage, Katavi and Tabora both report high consumption of vitamin A-rich foods in children 6–23 months in the last 24 hours. In three regions – Simiyu, Manyara and Arusha

[6] The WHO recommends supplementation once between 6-11 months of age and every 4-6 months until 59 months.

– low coverage of supplementation and low consumption of vitamin A-rich foods indicate a potential nutrient gap for vitamin A (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

Two percent of children had received an iron supplement in the preceding week[7]. Use of micronutrient powders is very uncommon, with no national programmes and reported use among less than two percent of children 6–23 months nationally (Ministry of Health, Community Development, Gender, Zanzibar, et al. 2016).

The DHS 2015 reports that nationally 82 percent of women received antenatal iron supplements through public programmes. This good coverage was fairly consistent across regions, with 25 of 30 regions showing at least 75 percent of women received iron supplements during pregnancy. The Lake and Western zone regions of Katavi, Simiyu, Mwanza, Geita and Tabora had the lowest coverage (from 66 percent in Katavi to 73 percent in Tabora) (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

However, only 21 percent of pregnant women nationally took iron supplements for ≥90 days, ranging from seven percent in Kigoma to 33 percent in Kusini Unguja, Kaskazini Unguja and Lindi (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016). A similar proportion, 19 percent, took no iron supplementation during pregnancy. Women in regions in the Lake and Western zones and Mjini Magharibi were least likely to have taken any iron supplementation during pregnancy. These regions, where more than one-quarter (and up to one-third) of women did not take iron supplements during pregnancy, are also those with a higher burden of anaemia (≥50 percent) among women of reproductive age (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

Only a quarter of women nationally received a vitamin A dose in the first two months after delivery, a figure unchanged since 2010. This was particularly low in Rukwa and Shinyanga, where less than ten percent of women were reached with this intervention (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

Key message 1d: Overweight and obesity rates are rising among women.

While overweight and obesity among adults, especially women, is a growing concern in Tanzania, for the moment prevalence remains low in children.

Nationally, the prevalence of child overweight (WHZ > 2.0) has remained below five percent since 1996 and Tanzania is on track to meet the World Health Assembly target set for 2025 of less than seven percent (Global Nutrition Report 2015). However, a few regions report a higher prevalence and unwelcome trends. Mbeya (ten percent), Kilimanjaro (nine percent) and Iringa (eight percent) are all above national average and the global target. Mbeya is the only region where child overweight has increased consistently since 2004. Kilimanjaro and Tanga have also seen large increases in child overweight since 2010 (increases of 5.6 and 4.8 percentage points, respectively) (figure 14).

Children living in urban areas were only slightly more at risk of overweight than rural counterparts (five percent urban versus four percent rural). Prevalence differed somewhat by household income, though the levels were still relatively low (range of three percent in the lowest quintile to six percent in the highest quintile).

[7] The WHO recommends daily supplementation for children 6-59 months in areas with anaemia prevalence of ≥40 percent, which is the case in all regions except Singida and Njombe (37 percent).

While the overall trend in child overweight is holding steady, nationally both overweight (BMI ≥ 25) and obesity (BMI ≥ 30) in women have increased considerably since 2004. Current figures indicate 28 percent of women are overweight, an increase of more than 10 percentage points in as many years, and one in ten women are obese, about twice as many as 10 years ago (figure 14).

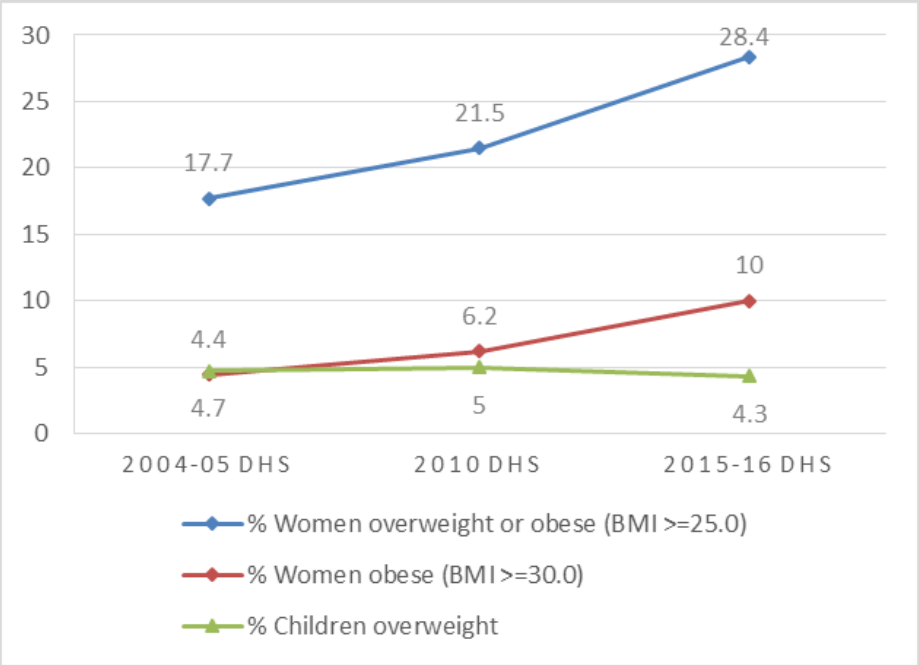
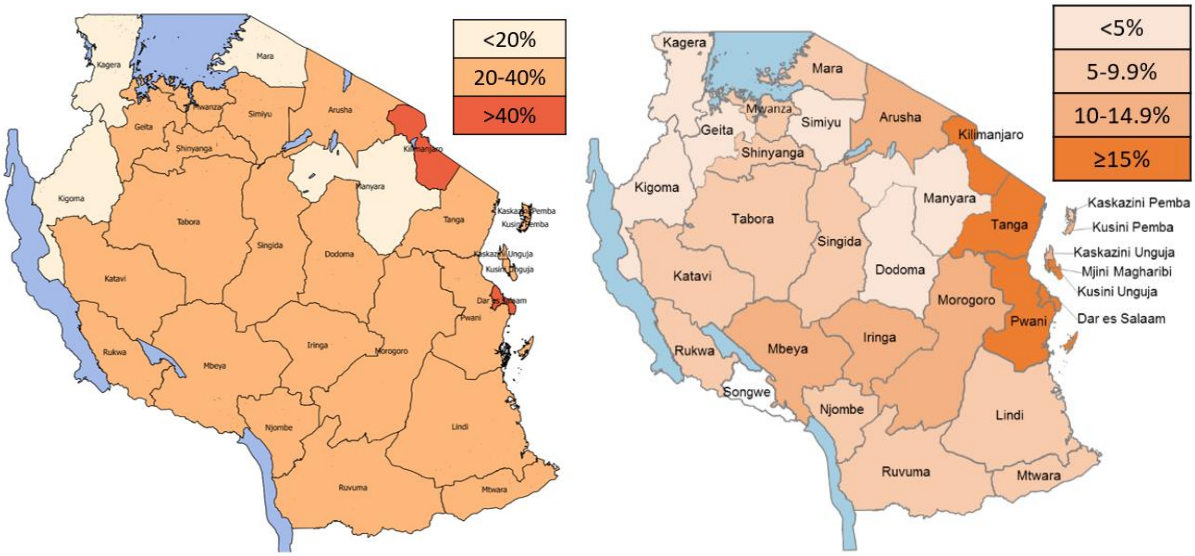


Figure 14: Prevalence (%) of overweight and obesity among women and children over time (DHS, 2005, 2010, 2016)

This trend is apparent at regional level as well. Since 2010, the prevalence of overweight in women has increased by at least five percentage points in 18 of 26 regions where data is available. While prevalence is about average in Lindi and Mtwara, a rapid and alarming increase in overweight of 18 percentage points from 2010 to 2015 was measured in these regions. The prevalence of obesity has also increased in the majority of regions since 2010, however in most this increase was less than 5 percentage points.

Generally, the issue of women's overweight and obesity is more pronounced in wealthier groups, including the wealthier regions along the eastern coast plus Kilimanjaro and Zanzibar (figures 15–17). All four regions exhibiting a prevalence of overweight (including obesity) above 40 percent are in those areas: Dar es Salaam (47 percent), Kilimanjaro (42 percent), Mjini Magharibi (43 percent) and Kusini Unguja (40 percent). These same regions, plus Tanga and Pwani, also record the highest prevalence of obesity in women. In each of these regions, a high proportion (>40 percent) of those who are overweight are obese (figures 15–16).



Figures 15 and 16: Prevalence (%) of overweight/obesity among women (BMI ≥25.0, left) and prevalence of obesity only (BMI ≥30.0, right). (DHS, 2016)

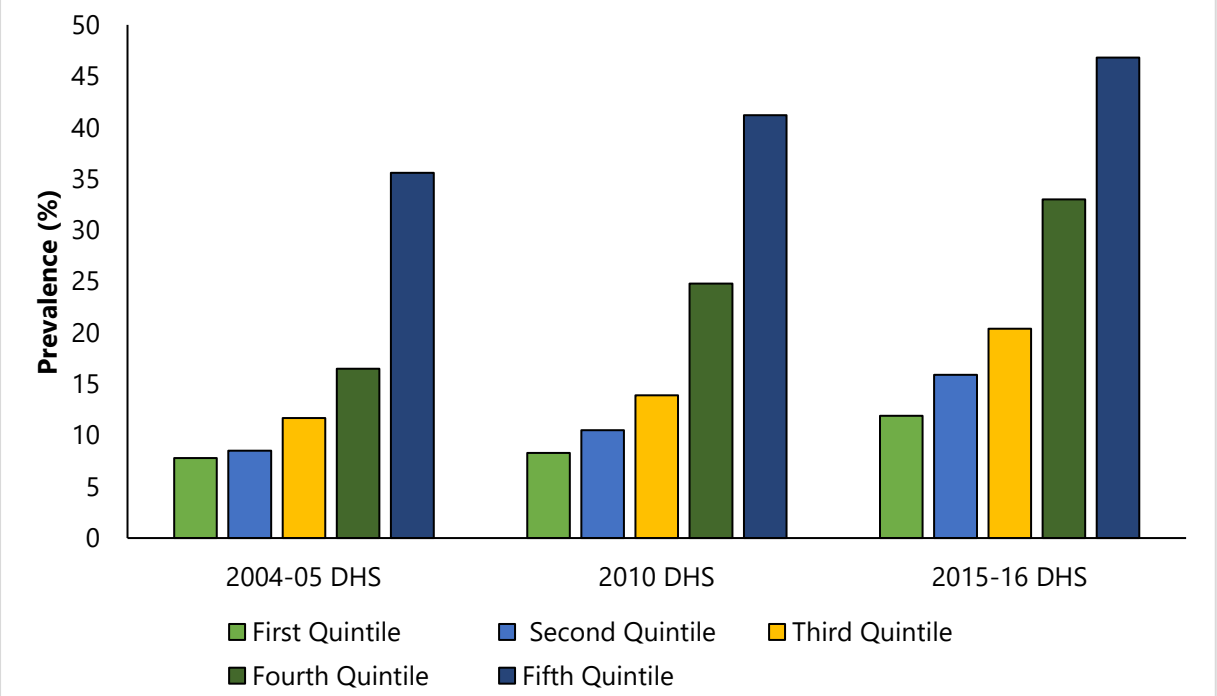


Figure 17: Prevalence of overweight/obesity in women by wealth quintile (DHS, 2005, 2010, 2016)

On the mainland, urban women are twice as likely to be overweight/obese (41.5 percent) and three times as likely to be obese (17.6 percent) as those in rural areas. In Zanzibar, the prevalence of overweight/obesity on Unguja was similar to urban mainland women at 41.6 percent, while Pemba was lower at 31.3 percent. Obesity was less prevalent on Pemba (ten percent) than Unguja (17.6 percent) by half.

The prevalence of overweight and obesity also increases with women's age. One-quarter of Tanzanian women ages 20–29 are overweight or obese, increasing to 42 percent of women by ages 40–49. Currently less than 16 percent of all women over age 30 are considered obese, while less than seven percent of women ages 20–29 are obese.

Given the very high prevalence of stunting in past decades (48–50 percent nationally from 1991–1999, and exceeding 60 percent in several regions), it is likely that the risk of overweight/obesity in Tanzanian women today has been exacerbated by a history of chronic malnutrition. The double burden of malnutrition is an increasing concern in Tanzania, with stunting still at rates of public health significance while overweight and obesity prevalence are rising persistently. Rates of both overweight/obesity among women of reproductive age and of stunting among children 6–59 months are between 30–39 percent in five regions (Tanga, Pwani, Arusha, Mbeya and Morogoro); rates of obesity among women are also between 10–14 percent in all of these regions except for Pwani and Tanga, where obesity prevalence exceeds 15 percent. In Kilimanjaro, where overweight/obesity exceeds 40 percent and obesity exceeds 15 percent among women, stunting prevalence among children was 29 percent, showing a slight increase from 2010–2015 (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

Non-communicable diseases (NCDs) present an increasing public health burden, as Tanzania's sociodemographic and nutrition transitions lead to rural-urban migration and urbanisation, changing diets, and increasingly sedentary lifestyles (particularly in urban centres). An estimated one in five deaths in Tanzania can be attributed to NCDs or injuries, of which the diseases that contribute most are cardiovascular diseases, diabetes, cancer and chronic respiratory diseases. Several of the key risk factors for these chronic NCDs are related to overweight/obesity and physical inactivity, to the extent that it is estimated that improvements in diet and increased physical activity could help prevent up to 80 percent of coronary heart disease and up to 90 percent of diabetes. Women are often at greater risk than men, with higher rates of overweight and obesity and, as of the 2012 Tanzania STEPS Survey, slightly higher rates of hypertension (26.5 percent versus 25.4 percent in men) and high cholesterol (34 percent versus 17 percent in men) (figure 18) (Mayige et al. 2012; Ministry of Health and Social Welfare (MoHSW) [Tanzania Mainland] 2008; National Institute for Medical Research & World Health Organization 2012).

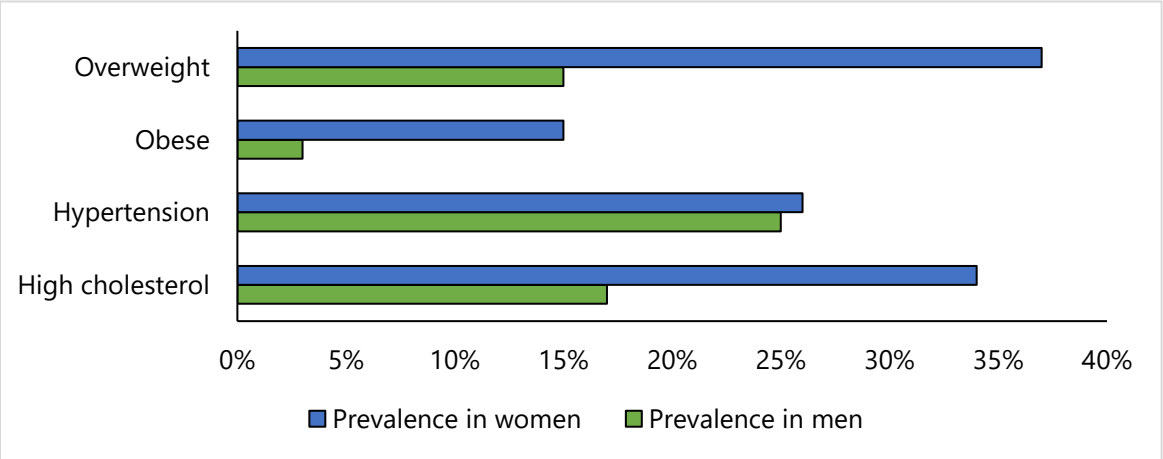


Figure 18: Prevalence of NCDs and risk factors in men and women (National Institute for Medical Research & World Health Organization 2012)

Disparities in economic access to a nutritious diet, which is reflected in nutritional status and the presence of the double burden, can been seen in the national household expenditure curve, where there is a sharp increase in expenditure in the top decile in particular (figure 19).

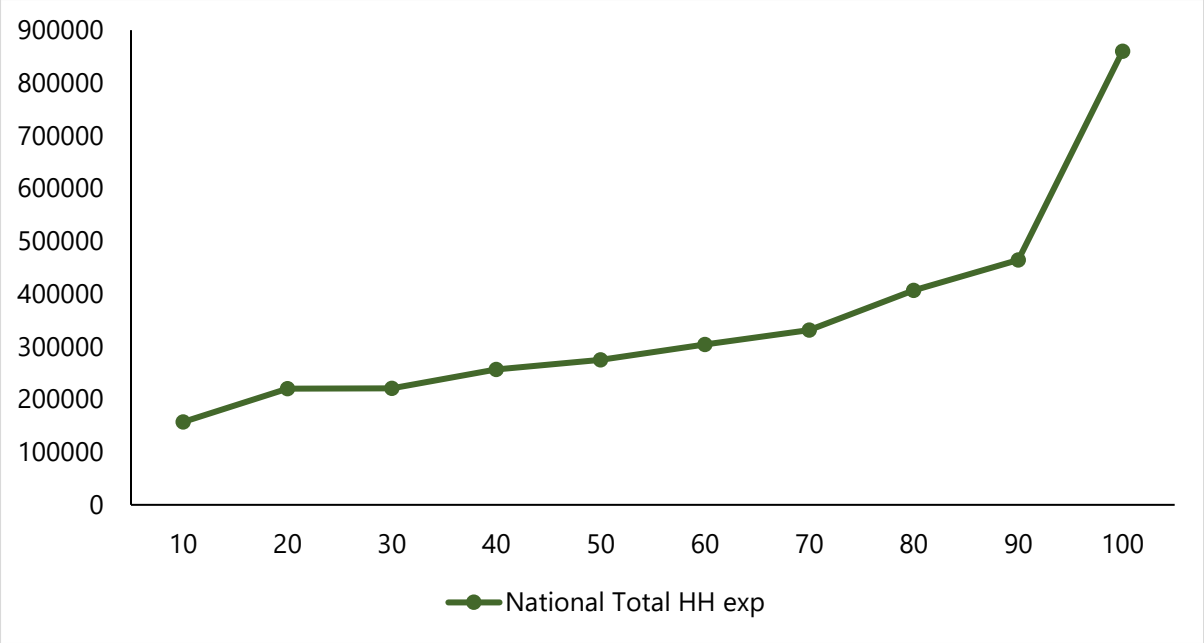


Figure 19: Average monthly household expenditure (TSH) by decile

Nutrition-related policies, programmes and regulatory framework

Over the last 5–6 years, the policy environment as relates to nutrition has evolved significantly in Tanzania.

At national level, the government has signalled its commitment to nutrition in a number of ways, including through (1) joining the Scaling Up Nutrition (SUN) movement as an Early Riser country, (2) creating a High Level Steering Committee on Nutrition[8], (3) creation of a dedicated budget line for nutrition, (4) leading a public expenditure review on nutrition, (5) establishing nutrition focal points in several ministries, the Prime Minister's Office, and at regional and district level, (6) establishing food fortification standards, (7) development of a new nutrition strategy and associated action plan (Ministry of Finance 2014; Kavishe 2014). At sub-national level, multi-sectoral Nutrition Steering Committees have been formed in local governments (United Republic of Tanzania 2016).

High-level political commitment and will is evident in the President's statement that addressing issues of malnutrition is as important to the country's development as rooting out corruption and building physical infrastructure (United Republic of Tanzania 2016). In advance of the 2015 national elections, a call to action was made for all political parties to "explicitly include nutrition lens in their manifestos in line with Tanzania National Nutrition Strategy and other national food and nutrition priority areas" (Seballos et al. 2015; Parliamentary Group for Nutrition Food Security and Child Rights 2014).

Further, in a context where it is recognized that sustained strong economic growth and a relatively stable food supply has not translated proportionally into improved nutrition status, we now find a variety of policies from multiple sectors highlighting nutrition as a key priority or specific objective (Ministry of Health and Social Welfare 2015). A few of these policies are highlighted in Table 4.

While the nutrition policy environment has been strengthened and become more coherent over the past few years, the implementation and impact of these policies at regional and district level is mixed. The 2014 Public Expenditure Review indicated that resource allocation to nutrition increased each year from 2010/11 to 2012/13, and almost doubled overall in that period. However, these allocations were considered inadequate as they represented less than 0.1 percent of GDP and only a fraction was targeted to children under 2 and pregnant women. A recent nutrition stakeholder mapping by REACH (Renewed Efforts Against Child Hunger and undernutrition) indicated that district councils allocated less than one percent of their budget to nutrition (including both nutrition-specific and nutrition-sensitive actions). Only three regions – Iringa, Njombe and Mara – are meeting targets to allocate TSH 1,500 (USD 0.68)[9] per child per year while half of the regions allocate less than TSH 500 (USD 0.23) per child (REACH 2016) .

Efforts have been made to ensure the commitment to nutrition is enacted at district/community level, including through the aforementioned establishment of district nutrition focal points, and the issuance of clear and concise practical guidance for the planning and budgeting of multi-sectoral nutrition activities (Prime Minister's Office 2012).

[8] The Multi-Sectoral High-Level Steering Committee on Nutrition (HLSCN) is chaired by the Permanent Secretary in the Prime Minister's Office. Members include the Permanent Secretaries of nine key nutrition sensitive ministries, Development Partners, Civil Society Organizations and representatives from the private sector.
[9] Based on an exchange rate of USD 1 = TSH 2,200

National Food and Nutrition Policy and National Multi-Sectoral Nutrition Action Plan

A new national Food and Nutrition Policy was drafted in 2015, updating the previous policy from 1992. An aligned National Multi-sectoral Nutrition Action Plan (NMNAP) 2016–2021 translates the policy into evidence-based actions. The NMNAP, which was officially launched at the 2017 Joint Multi-sectoral Nutrition Review in Dodoma, falls within the current National Five-Year Development Plan (2016/17–2020/21), which identifies nutrition as a priority area of focus.

	NMNAP Seven Key Results Areas
i.	Scaling up maternal, infant, young child and adolescent nutrition
ii.	Scaling up prevention and control of micronutrient deficiencies
iii.	Scaling up integrated management of acute malnutrition
iv.	Scaling up prevention and management of diet-related non-communicable diseases
v.	Integration of multi-sectoral nutrition-sensitive interventions
vi.	Improving nutrition governance
vii.	Establishing a multi-sectoral nutrition information system

Table 2: NMNAP key results areas

The overarching goal of the NMNAP is to "…accelerate scaling up of high impact multi-sectoral nutrition specific and nutrition sensitive interventions and creat[e] an enabling environment for improved nutrition, for a healthy and wealthy nation" (United Republic of Tanzania 2016). To achieve this goal, the NMNAP identifies eight key results areas (see Table 2) – which cover undernutrition, governance, information systems and, for the first time, diet-related non-communicable diseases – and associated actions and targets. These actions focus on the most nutritionally vulnerable groups – children under 2 years, children under 5 years, adolescent girls and women who are pregnant, lactating and/or of reproductive age. Table 3 outlines the "SMART" targets set within the NMNAP, which are based on international standards, including the Sustainable Development Goals and the World Health Assembly 2025 nutrition targets.

The NMNAP is action-oriented and promotes the deployment of "… simultaneous actions…" in "…multiple sectors…", by "…multiple partners…", at "…multiple levels…" that address both immediate and underlying causes for nutrition (United Republic of Tanzania 2016).

The NMNAP is organized around the three ONES principal: one plan, one coordination mechanism and one monitoring and evaluation framework. A Common Results, Resources and Accountability Framework provides a ready coordination platform and ensures partners across sectors are aligned to the same targets. The NMNAP outlines multiple planned monitoring and evaluation activities, including annual joint multi-sectoral reviews, a mid-term review, a planned mid-term Public Expenditure Review and national nutrition surveys. A new initiative for 2017 on nutrition Scorecards employed at district level will promote accountability of sub-national actors towards the NMNAP targets.

The resources required to achieve the NMNAP's nutrition-specific goals over the five year period have been costed at TSH 590 billion (USD 268 million).[10] Nutrition-sensitive activities are estimated to increase that budget by a factor of four (to TSH 22,262 billion). A serious funding gap, estimated at

[10] This is equivalent to 0.6 percent of Tanzania's gross domestic product (GDP) in 2016, which was US$47.43 billion. However, it should be noted that the NMNAP spans a five-year period, and that in addition to the government, development partners will contribute to the total cost (http://data.worldbank.org/country/tanzania).

about 74 percent of the nutrition-specific budget alone, threatens the ability of the NMNAP's targets to be met.

While the NMNAP document had yet to be fully ratified by mid-2017, nutrition stakeholders have already begun aligning their programming and strategies to the action plan.

NMNAP Impact Target	Baseline year	Baseline value	2021 Target
Reduced prevalence of stunting among children under 5 years	2015	34%	28%
Reduced proportion of women 15–49 years with anaemia	2015	45%	33%
Reduced prevalence of low birthweight	2010	7%	5%
Increased rate of exclusive breast feeding (0–<6 months)	2015	59%	70%
Maintain prevalence of overweight among children under 5 years	2015	<5%	<5%
Maintain Prevalence of Global Acute Malnutrition (wasting) among children under 5 years	2015	<5%	<5%
Reduced prevalence of Vitamin A deficiency (VAD) among children aged 6–59 months	2010	33%	26%
Maintain median urinary iodine of women of reproductive age between 100 and 299 µg/L			100–299 µg/L
Maintain prevalence of Diabetes among adults at 9%			<9%
Maintain prevalence of Obesity among adults under less than 10 percent.			<10%

Table 3: NMNAP Impact targets

National Fortification Regulations

In mainland Tanzania, fortification of wheat flour, maize flour and edible oil has been mandatory since 2011, while mandatory salt iodisation was instituted in 1995. Wheat flour and maize flour are fortified with iron, zinc, vitamin B12 and folate; and oil is fortified with vitamin A (table 4). National specifications for maize flour fortification are lower than the international WHO guidance for most micronutrients (with the exception of folic acid), possibly because the assumed consumption is at a higher level in Tanzania (>300 grams per capita per day). For wheat flour, national specifications mostly correspond to WHO guidance for low consumption levels (<75 grams per capita per day), though the specification for zinc is lower than the WHO recommendation. Although there is no international guidance for the fortification of edible oil, the national vitamin A levels specified encompass a much wider range than the specifications used by WFP; increasingly, fortification of oil with vitamin D is also recommended, given growing evidence around vitamin D deficiency in populations.

	Maize	Wheat	Edible fats and oils

Micronutrients	National specification (min–max)	WHO guidance[11]	National specification (min–max)	WHO guidance[12]	National specification (min–max)	WFP specification (min–max)[13]
Iron (Sodium iron EDTA)	5–25 mg/kg	20–40 mg/kg	30–50 mg/kg	40 mg/kg		
Zinc (Zinc oxide)	20–25 mg/kg	40–80 mg/kg	30–50 mg/kg	95–100 mg/kg		
Vitamin B12	0.0002–0.01 mg/kg	0.01 mg/kg	.0005–.025 mg/kg	0.04 mg/kg		
Folic acid	0.5–0.25 mg/kg	1.3 mg/kg	1–5 mg/kg	5.0 mg/kg		
Vitamin A (retinyl palmitate)		1.5mg/kg	n/a	5.9 mg/kg	6–28 mg/kg*	7.2–10.8 mg/kg
Vitamin D						0.06–0.09 mg/kg

Table 4: National specifications for fortification in Tanzania compared to international guidance from WHO (maize and wheat) and WFP's specifications for edible oil

**National specifications for edible oil also include vitamin E (65–190 mg/kg), which is added as an antioxidant rather than a fortificant.*

The Tanzania food fortification regulations state that all importers and domestic manufacturers except "small-scale and micro-scale manufacturers" are required to comply, though the regulations do not define what constitutes a small or micro-scale manufacturer. In effect, this results in fragmentation based on the market characteristics of commodities, with larger firms fortifying, small local millers not fortifying, and mid-size suppliers limiting production in order not to qualify as sufficiently large to be required to fortify (E. Musinguzi, personal communication, Oct 2016). Producers who do wish to fortify their products must go through a registration and certification process, which can be time- and resource- intensive (United States Agency for International Development 2015).

Nationally, wheat flour production is controlled mainly by two large commercial firms, responsible for 94 percent of all production. These two firms, along with 4 other larger producers, participate in fortification. Maize flour, on the other hand, is widely consumed but not industrially produced, with the majority of production by small-scale millers who are either not required to fortify or who lack the resources to do so. The majority of the vegetable oil market (80 percent) is controlled by two companies in the formal sector, but poor households in particular source unfortified oil from the informal sector (Robinson & Nyagaya 2014a).

Ensuring compliance with regulations is an ongoing challenge. The Tanzania Bureau of Standards and the Tanzania Food and Drug Authority are, respectively, responsible for creating fortification regulations and enforcing them, though their ability to do so is constrained by capacity and staffing limitations (Robinson & Nyagaya 2014b).

As a consequence of issues with compliance and enforcement, and a fragmented market structure, the quality of fortified products at household level is generally inadequate. A 2015 Fortification Assessment Coverage Tool (FACT) survey of household samples showed that while close to 90 percent

[11] Based on consumption levels of 150-300 grams per capita per day (WHO, 2009. Fortification of maize flour and corn meal with vitamins and minerals: Guideline).
[12] Based on consumption levels of <75 grams per capita per day (WHO, 2009. Recommendations on Wheat and Maize Flour Fortification Meeting Report: Interim Consensus Statement).
[13] WFP, 2011. Technical Specifications for the manufacture of: Fortified refined bleached deodorized Palm Olein.

of all wheat flour tested was fortified, only 19 percent was adequately fortified. Similarly, 62 percent of oil was fortified but only 16 percent of oil was adequately fortified. Eighty-eight percent of maize flour tested at household level is not fortified (GAIN et al. 2016).

There are no regulations regarding mandatory fortification for any products produced or imported internationally in Zanzibar. Consequently, the FACT survey found that unfortified products were even more widespread at household level than mainland, with 100 percent of maize flour and close to 70 percent of oil in Zanzibar unfortified (GAIN et al. 2016).

Universal salt iodisation was introduced in the 1990s and has been associated with a drastic improvement in public health as relates to iodine status (Assey et al. 2009). The 2015 FACT survey showed 43 percent of the salt tested at household level was adequately fortified, an additional 24 percent of the samples were found to be over-fortified according to the international standards (GAIN et al. 2016).

Excessive iodine intake has been reported elsewhere in the East African region and has been attributed to various factors, including poor quality control at factories and living closer to salt producers (Assey et al. 2009). In Tanzania, another potential factor is the higher iodine specifications for fortification of salt, which are above the international WHO standards.

Since excessive iodine intake can be problematic for certain vulnerable groups and salt intake is likely to increase with economic growth and urbanisation, it may be prudent in the near future to revisit the iodization levels stipulated in national specifications (Leung & Braverman 2014; Oyebode et al. 2016).

The Tanzania Food, Drugs and Cosmetics Act on Marketing of Foods and Designated Products for Infants and Young Children specifies compositions and requirements for essential nutrients in infant foods, follow-up formulas and complementary foods, although it does not specifically mention fortification or imported versus locally produced foods.

Coordination

With a vast landmass divided into 30 regions and 169 districts and more than 100 actors in nutrition (as identified in the REACH landscape mapping), a key challenge for success in the fight against malnutrition is coordination.

The Tanzania Food and Nutrition Centre (TFNC), established in 1974, is a semi-autonomous parastatal technical body with a mandate to guide, catalyse and coordinate on nutrition actions. On domestic nutrition issues, TFNC collaborated with partners to develop and implement successful community-based nutrition programmes throughout Tanzania and facilitated the development of key policies, such as the 1992 Food and Nutrition Policy. Technical cooperation, training and the joint development with UNICEF of the Nutrition Conceptual Framework, now the global standard, cemented TFNC's reputation internationally as well (Kavishe 2014). However, deterioration of institutional capacity over time has diminished TFNC's effectiveness (Kavishe 2014).

Multiple coordination mechanisms within and between sectors are already in place. Coordination of UN agencies on nutrition is facilitated by REACH. Tanzania is also home to the largest civil society network – the Partnership for Nutrition in Tanzania (PANITA) – and the largest SUN Business Network. The SUN Network, led by the Prime Minister's Office, coordinates across all partners and regular monthly meetings of all development partners enables communication and coordination.

The functioning of these coordination structures has been improving. A 2012 landscape analysis on nutrition coordination conducted by TFNC found that, generally, a coherent coordination structure was in place at national and sub-national levels; however the functioning of these structures was poor

(Tanzania Food and Nutrition Centre 2012). More recently, the 2016 SUN report has shown improvement in coordination, indicating that "…multi-sectoral steering committees for nutrition at regional and district levels… are well functioning" (SUN 2017).

A welcome development in improving coordination across all actors and levels is the NMNAP, in particular the Common Results, Resources and Accountability Framework, which establishes a set of actions and associated targets according to government priorities that all partners are expected to work towards. The NMNAP is seen by many stakeholders as a positive step, binding them to a common framework against which to align their actions in nutrition in line with government priorities as well as coordinate with other partners. Development of the common resource mobilisation strategy is currently underway and will allow the NMNAP to be leveraged to its full potential.

Policy stakeholders at the national and regional levels demonstrate greater awareness of nutrition problems than those at the ward and village levels, particularly regarding stunting and anaemia. While most stakeholders recognized food insecurity as an important cause of malnutrition, few mentioned inadequate caring practices or insufficient health services as possible causes (Tanzania Food and Nutrition Centre 2012). Thus, despite the high level of attention and prioritization given to nutrition at the national level, policies and programmes do not always translate into improved practices or nutritional status at the local level.

National Social Protection Programmes

Tanzania's national social safety net programme, the Productive Social Safety Net (PSSN), is implemented by the Tanzania Social Action Fund (TASAF). It comprises a package of interventions targeted to the extreme poor and those vulnerable to extreme poverty, including conditional cash transfers and a public works programme. Along with vitamin A supplementation, the PSSN is the only large-scale programme in Tanzania with national reach and high coverage for its target groups. Although TASAF cites evidence on long-term improvements in maternal and child health and nutrition stemming from increased utilization of health care services, which is one of the conditions for the cash transfer, the programme does not currently include a nutrition-specific component (Tanzania Social Action Fund 2016).

Availability of foods

Key message 2: Food is generally available but not necessarily accessible.

At the aggregate population level, Tanzania has long been considered a food secure country. The national food self-sufficiency ratio is near or exceeds 100 percent in most years, and availability in 2011 was 2377 kcal per capita (FAOSTAT, accessed December 2017). However, undernourishment is amongst the highest in Africa at 32 percent, with a depth of food deficit of 238 kcal per person per day (figure 20) (FAOSTAT, accessed December 2017). Insufficient calorie consumption is higher in rural areas (48 percent) than urban (31 percent) and the deficit is greatest in Zanzibar (60 percent) and Central zone (56 percent). Thus, although food is available, distribution is inequitable. Furthermore, higher self-sufficiency ratios do not correlate with either lower stunting rates at the regional level (figure 21), or indicators of adequately diverse diets at the zone level (figure 22), indicating the need to examine additional factors of poor nutrition beyond aggregate calorie availability (Kinabo 2014).

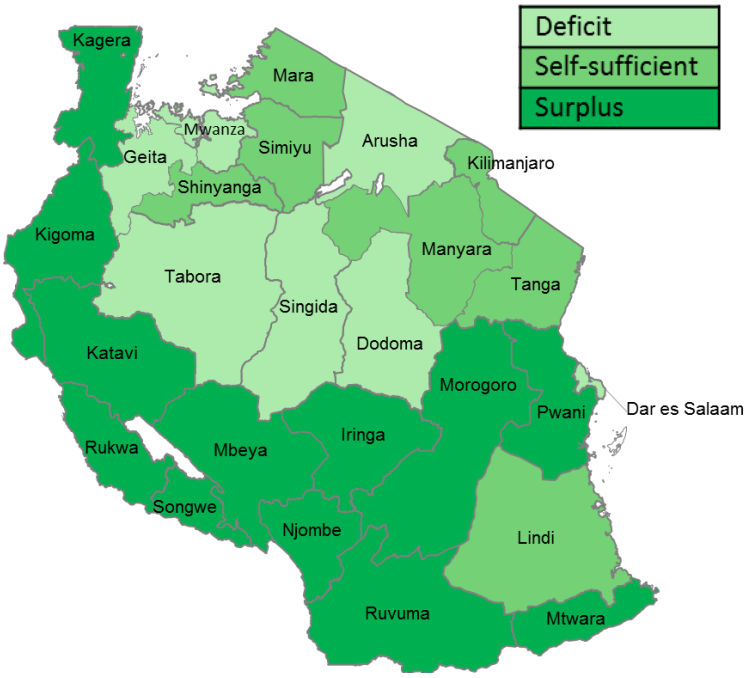


Figure 20: Self-sufficiency ratio (maize) by region, 2014/15 (Ministry of Food and Agriculture, 2015)

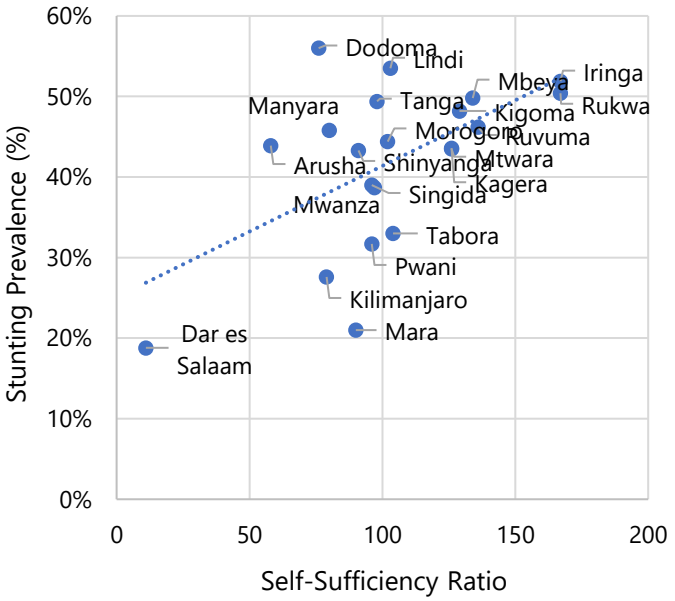


Figure 21: Prevalence of stunting and self-sufficiency ratio (maize) by region (Kinabo, 2014)

Market analysis of food price monitoring data from NBS and OCGS indicate that the majority of Tanzanian retail markets offer a wide variety of foods to local consumers, with large urban or peri-urban markets in every region that operate on a daily or near daily basis. In each region, at least three key staple foods were available (maize, rice and wheat). Along with a range of staple grains, markets regularly stock multiple varieties of legumes, meats, eggs and dairy products, vegetables and fruits. Dried fish was found in all regions and fresh fish in most. While cooking oil of some type was available in all regions, data for 13

regions contained a price for only one variety of oil; it is unclear whether this indicates that there is limited variety is on offer at market or if price data was not collected for other varieties.

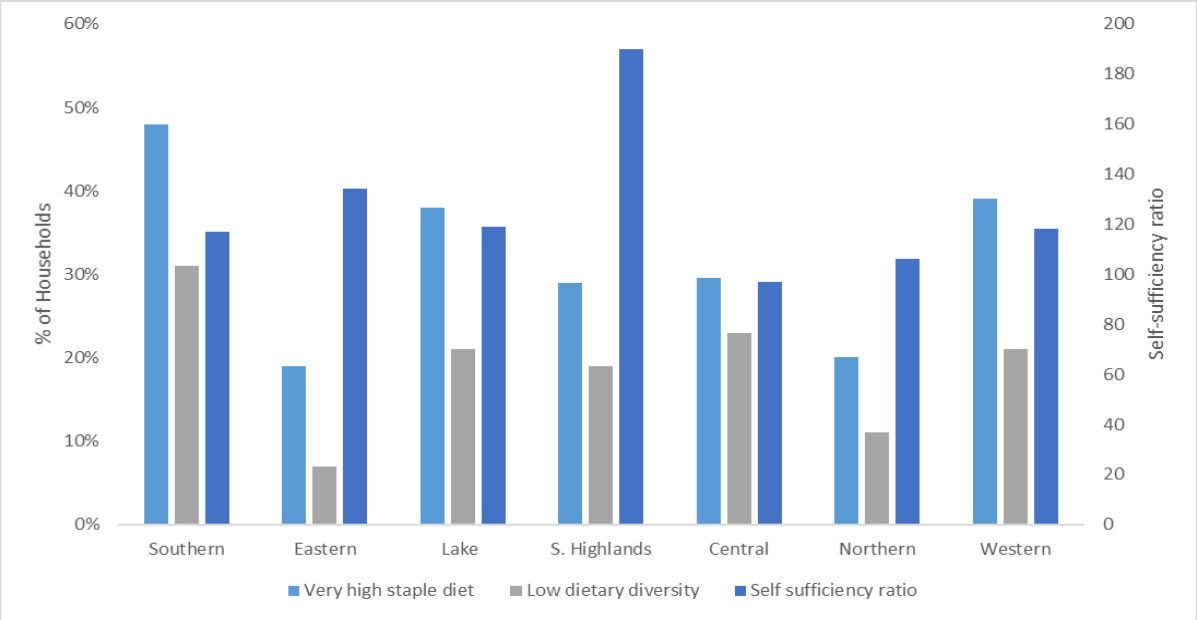


Figure 22: Percentage of households with high staple consumption, low dietary diversity and self-sufficiency ratios by zone (WFP 2013, Ministry of Food and Agriculture 2015)

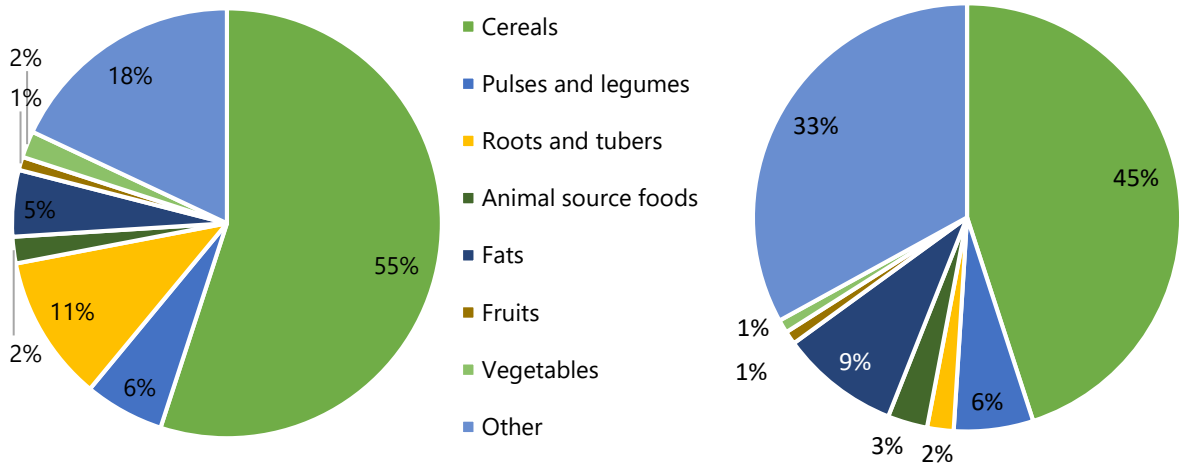
The food list used for the CotD analysis excluded certain foods that were present on the NBS and OCGS price monitoring lists (such as soft drinks, candy and seasonings) due to low nutritional value. In addition, as the NBS/OCGS used standardized commodity lists for price monitoring, they do not necessarily represent all foods present at a given market. The remarks here should therefore be considered as potentially indicative of a lower boundary of availability.

Key message 3: Diets are heavily reliant on unfortified staple foods.

Nationally, an average of 70 percent of energy is obtained from staple foods. Among food insecure households, 80 percent of the calories consumed came from staple foods. Staple foods consumed are nearly always unfortified, except in urban areas.

Maize is the predominant staple across most regions, though in many areas this is combined with another staple food like rice, cassava, or plantain. Patterns of staple consumption largely reflect agricultural production. In the maize-producing South Highland zone, for example, households get an average of half of their calories from maize, while in Lake zone only one third of caloric intake is from maize and a larger percentage is from cassava and banana (Cochrane & Souza 2015).

A food basket analysis further broke down consumption into 15 groups and found that households on the mainland got more than 40 percent of their energy from maize and a further 11 percent from rice, while households in Dar es Salaam consumed less maize but more rice for a combined 40 percent of their calorie intake from these two staples (figures 23–24) (Cochrane & Souza 2015).



Figures 23 and 24: Percentage of caloric intake from different food groups in Mainland Tanzania (left) and Dar es Salaam (right). (Cochrane & Souza, 2015)

** The "Other" category comprises a range of products that are generally consumed in small amounts and are difficult to quantify, including dairy products, other vegetables, sweets and beverages.*

A diet high in staple grains can limit ability to meet requirements for a diverse and nutritious diet. Although dietary diversity nationally was found to be high (83 percent), fewer than half of all households consumed enough calories from non-staples, indicating consumption of a variety of foods and food groups but in insufficient amounts (World Food Programme 2013). Low dietary diversity was more prevalent in rural areas (21 percent versus 9 percent in urban areas) and in the Southern, Central and Western zones (31 percent, 24 percent and 22 percent, respectively).

When a high percentage of calories is supplied by staple foods, it becomes increasingly difficult to meet requirements of micronutrients without exceeding energy requirements. For example, if an adult man gets 70 percent of his energy intake from rice, that staple provides only 19 percent of his riboflavin requirements, five percent of his calcium requirements and none of his vitamin A requirements; as a result, the remaining 30 percent of his dietary intake would need to be very nutrient dense (Solomons 2008). For a child under 2 years or a woman who is pregnant or lactating, even greater nutrient density would be required to meet their needs with a comparable diet.

In the CotD analysis, a diet that meets only energy requirements for the modelled five-person household costs, on average, TSH 2,451 per day (approximately USD 1.11)[14] (figure 25). A diet that meets nutrient requirements for all members of the household, composed of foods purchased at market price and including at least one serving per day of the local staple food(s), costs more than twice as much, an average of TSH 5,550 (USD 2.5) per day. At the regional level, the daily cost of this nutritious diet ranged from TSH 4,008 per day in Katavi to TSH 8,809 per day in Mtwara.

[14] Conversions throughout are based on an averaged 2016 exchange rate of USD 1 = TSH 2,200.

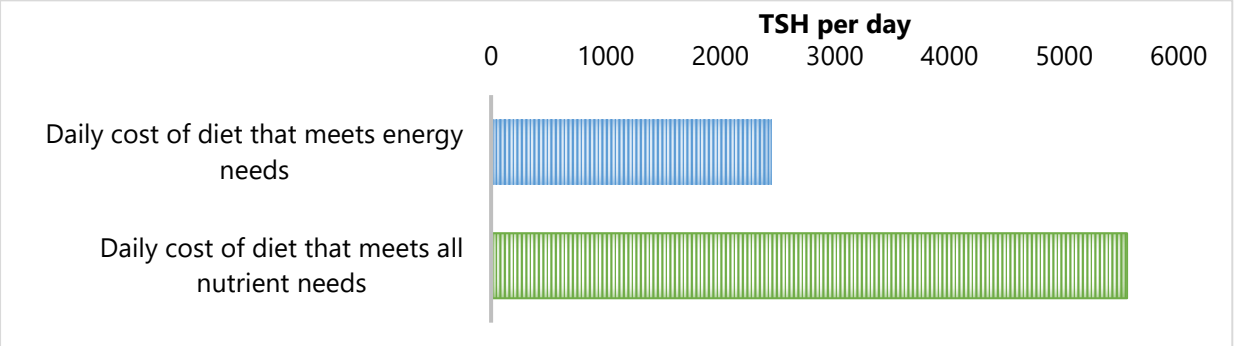


Figure 25: Average daily cost of an energy only diet and a nutritious diet for a five-person household

In most regions, the estimated monthly cost of a nutritious diet was between TSH 100,000–200,000 (USD 45–90) with a few exceptions: in Mtwara the cost was greater than TSH 250,000, while in Pwani and Dar es Salaam the cost was between TSH 200,000–250,000 (figure 26).

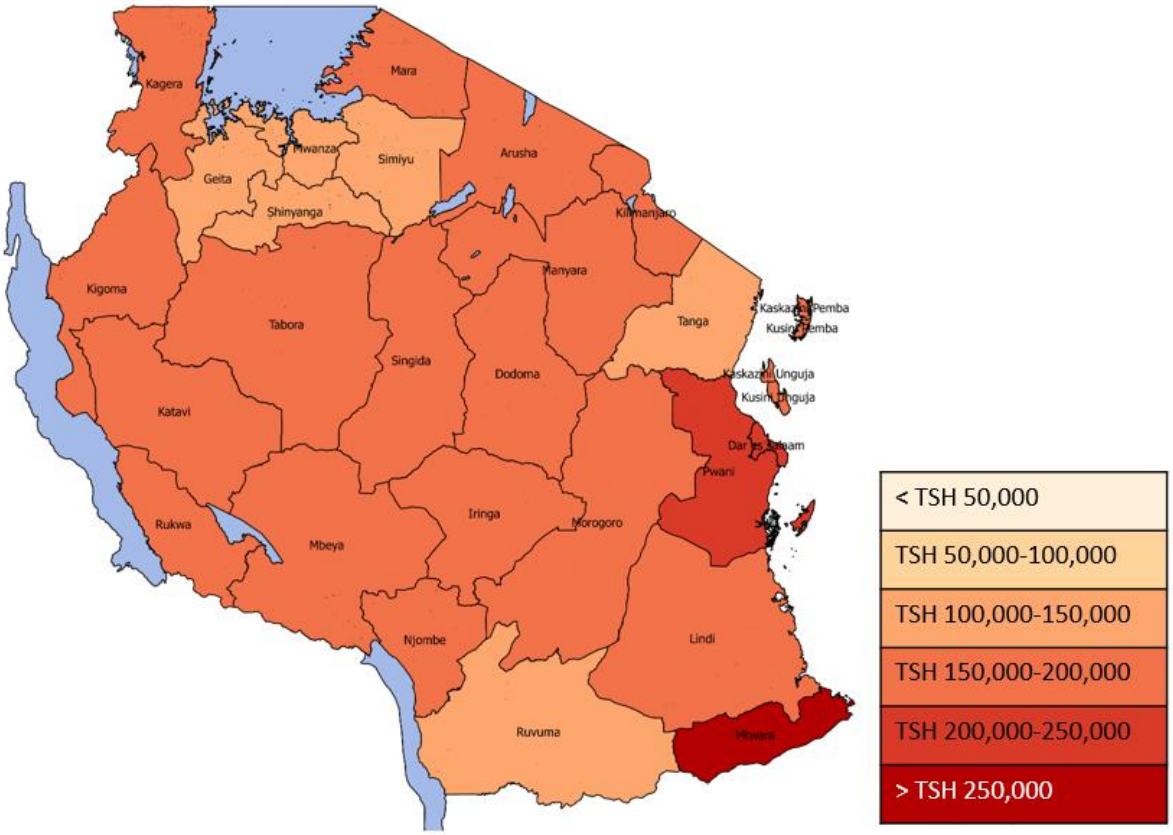


Figure 26: Average monthly cost (TSH) of a nutritious diet for the modelled five-person household, by region

Given high staple consumption, fortification of staple foods is a key entry point for improving the nutritional status of many households; however, the national fortification programme has not had the desired impact on the most nutritionally vulnerable communities. Nationally, over half of households consumed fortified oil, 70 percent consumed iodised salt, one-third fortified wheat flour and less than three percent fortified maize flour (figure 27). Consumption of fortified or fortifiable staples was generally higher among non-poor or urban households than poor or rural households, indicating that poor or rural households were more likely to source these foods from small-scale providers who do not participate in the fortification programme or to self-provision (figures 28–31) (GAIN et al. 2016).

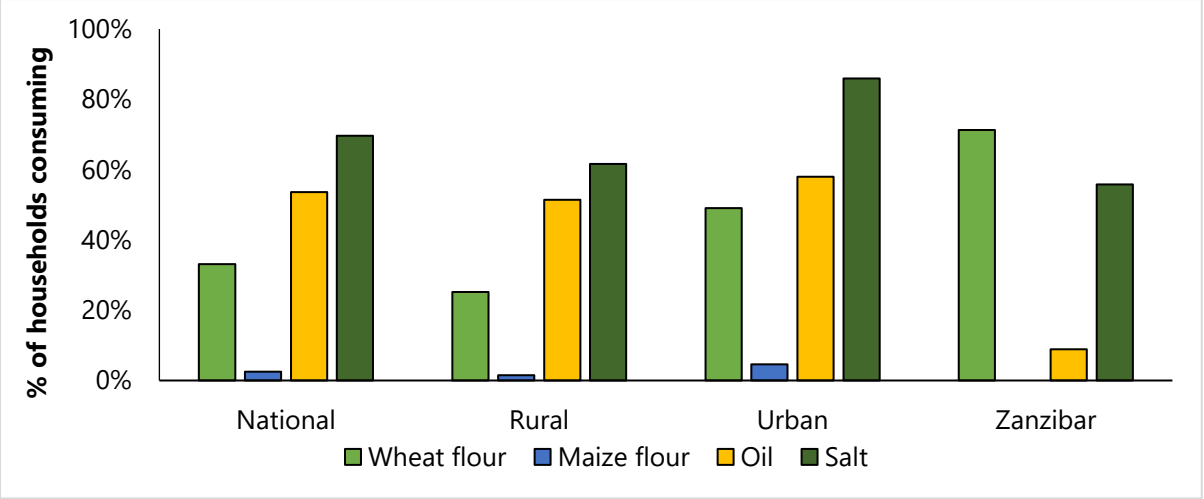


Figure 27: Household consumption of fortified foods by selected area (GAIN et al. 2016)

The potential impact of fortification on access to nutrients at the household level was modelled using CotD. Because maize is the main staple across most of Tanzania as well as the food for which implementation of mandatory fortification is the most challenging, introduction of fortified maize on the market, at a market price of TSH 20 per kilogram higher than unfortified maize, was modelled to show how this would decrease the cost of meeting nutrient requirements for the five-person household. On average across the 10 regions for which modelling was conducted, fortified maize was found to potentially reduce the cost of the diet for the household by an average of nine percent, ranging from three percent in six regions to more than 20 percent in two regions (Kigoma and Rukwa)[15] (figure 32).

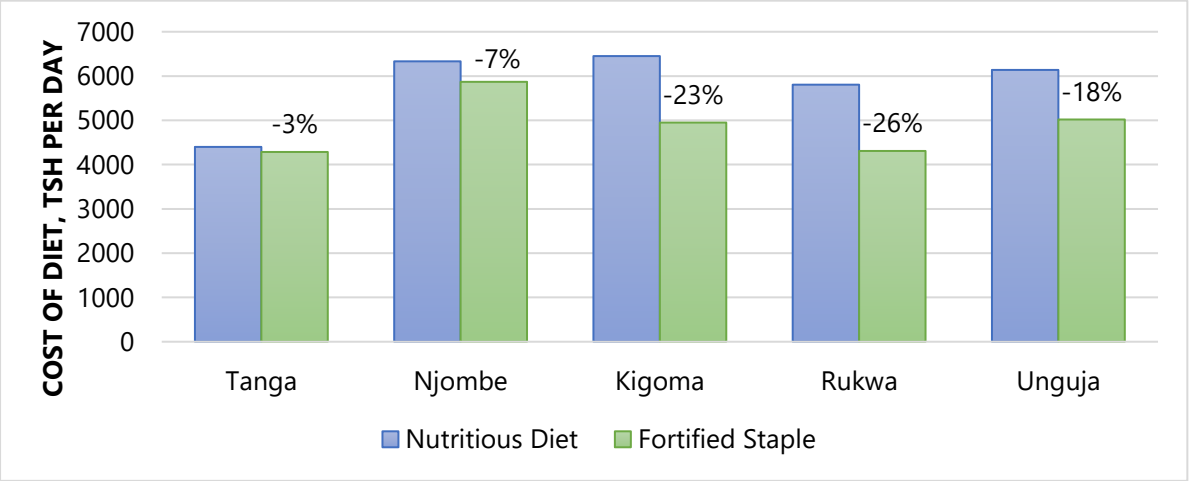
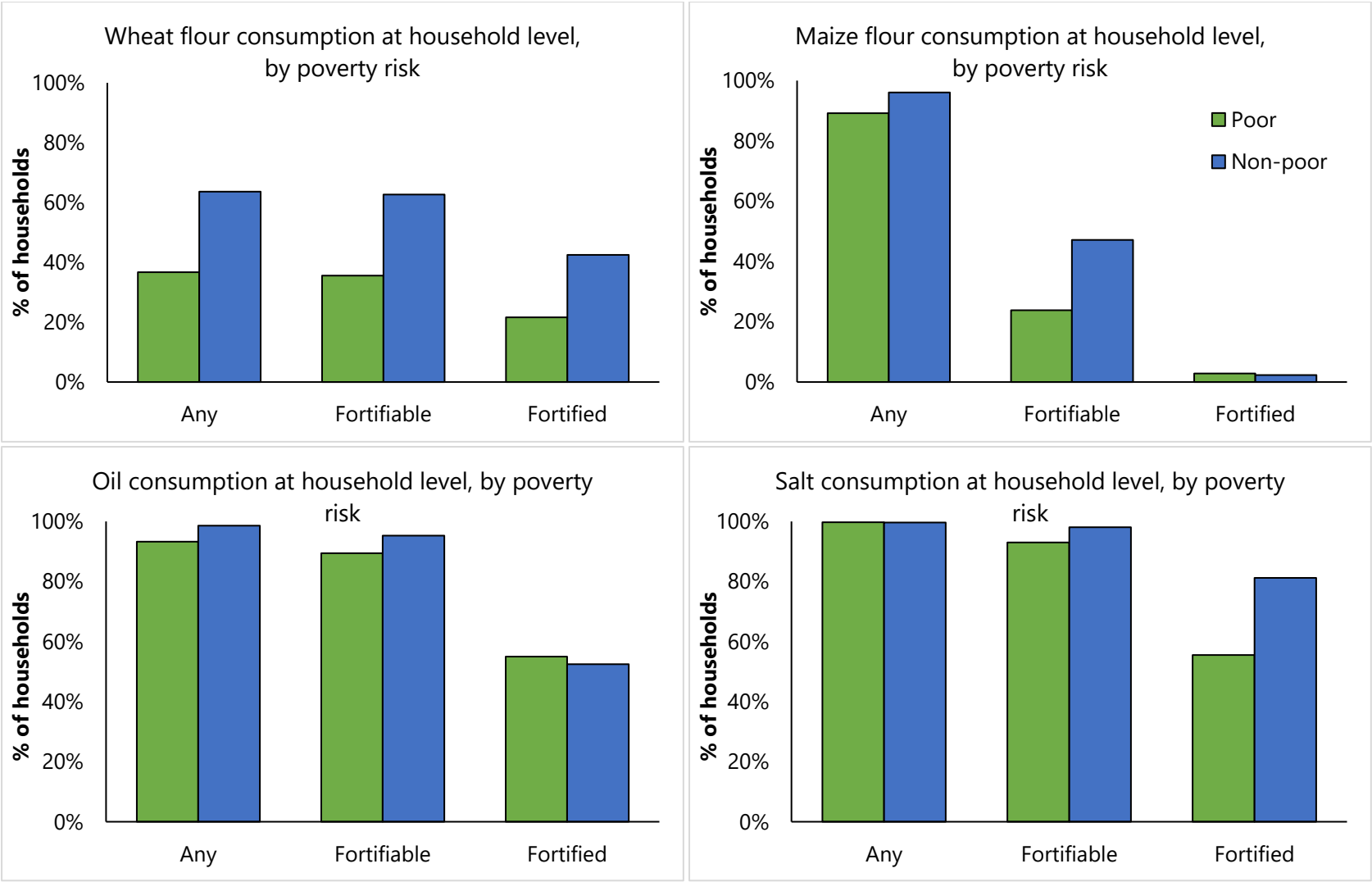


Figure 32: Average daily cost of a nutritious diet (TSH) for a modelled household, without and with market introduction of fortified maize

[15] In Kigoma and Rukwa, the cost of a nutritious diet decreased more than in other regions with most interventions modelled. This is likely because beef liver, a cheap source of nutrients included in the diets in other regions, was not available and instead dried fish were included in the nutritious diet at a higher price. Interventions that provide a less expensive or free source of nutrients therefore replaced this expensive food purchase.



Figures 28–31: National coverage of fortified products at household level by poverty risk, where "fortifiable food" was not made at home and was assumed to be industrially processed and "fortified food" refers to food for which a sample was obtained or for which the brand consumed has been confirmed through quantitative analyses to be fortified (GAIN et al. 2016)

The potential impact of fortification on access to nutrients at the household level was modelled using CotD. Because maize is the main staple across most of Tanzania as well as the food for which implementation of mandatory fortification is the most challenging, introduction of fortified maize on the market, at a market price of TSH 20 per kilogram higher than unfortified maize, was modelled to show how this would decrease the cost of meeting nutrient requirements for the five-person household. On average across the 10 regions for which modelling was conducted, fortified maize was found to potentially reduce the cost of the diet for the household by an average of nine percent, ranging from three percent in six regions to more than 20 percent in two regions (Kigoma and Rukwa)[16] (figure 32).

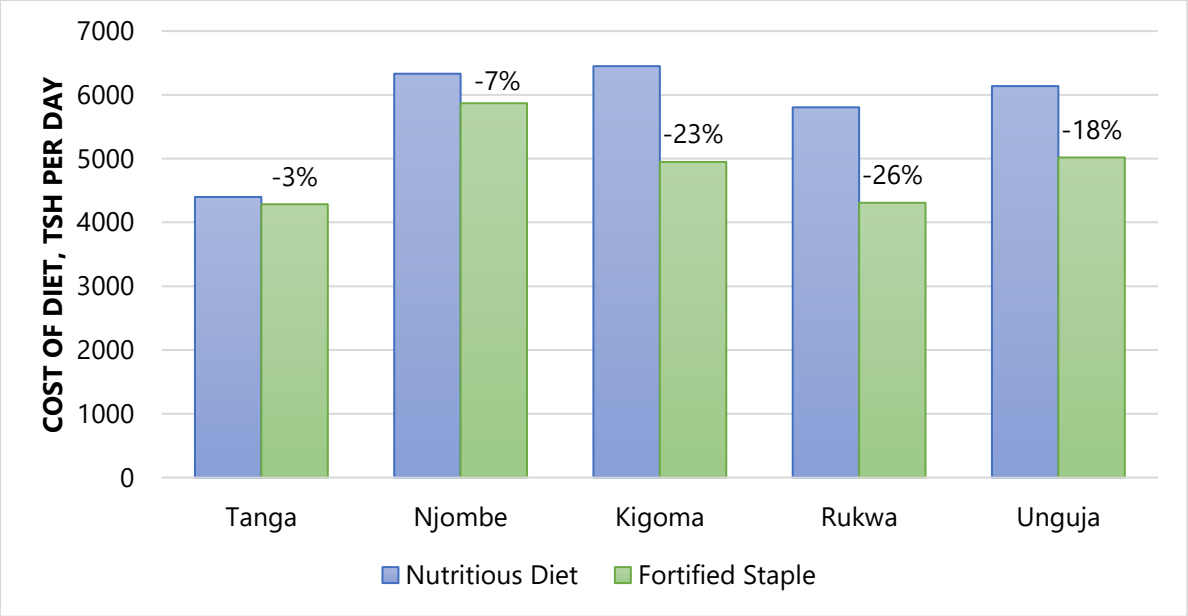


Figure 32: Average daily cost of a nutritious diet (TSH) for a modelled household, without and with market introduction of fortified maize

Attitudes toward Fortified Foods

In the Affordable Nutritious Foods for Women baseline study, knowledge of fortified foods was low: only one third (30 percent) of respondents had heard of fortified foods or seen the fortification logo, and less than ten percent could identify any of the specific staples used as vehicles for fortification (Smith & Kaishozi 2016). Fewer than half of those who had seen the logo knew what it meant, but those who did know reported that they were more likely to buy the fortified product because of nutrition benefits.

Perceptions of fortified foods varied, with 40 percent of all respondents saying they would be hesitant to purchase them or that children did not like the taste. One-quarter of respondents reported that they did not trust millers to add unknown elements to their food. Many respondents, however, had positive attitudes toward fortified foods and expressed both a willingness to feed such products to their children and an awareness of their nutritional benefits (figure 33) (Smith & Kaishozi 2016).

[16] In Kigoma and Rukwa, the cost of a nutritious diet decreased more than in other regions with most interventions modelled. This is likely because beef liver, a cheap source of nutrients included in the diets in other regions, was not available and instead dried fish were included in the nutritious diet at a higher price. Interventions that provide a less expensive or free source of nutrients therefore replaced this expensive food purchase.

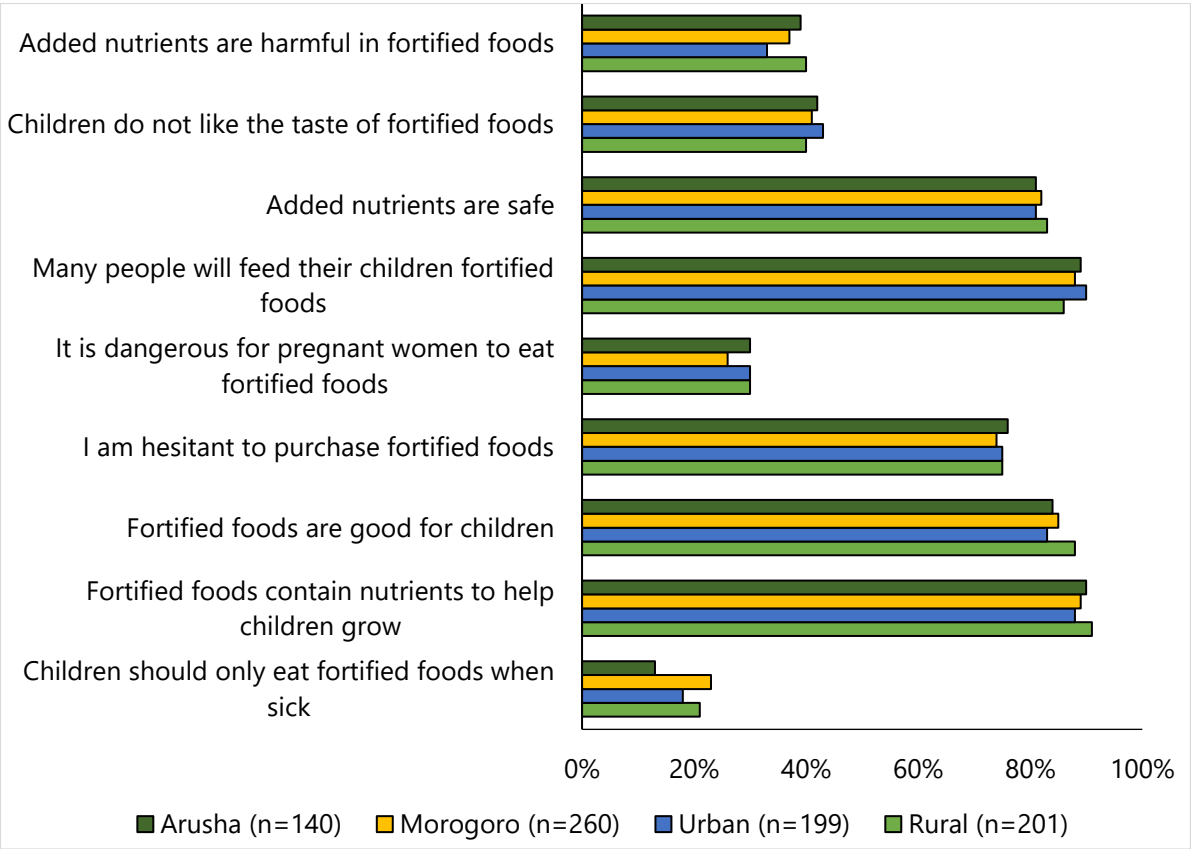


Figure 33: Perceptions of fortified foods by region and selected area (Smith & Kaishozi 2016)

Key message 4: Crop diversification amongst smallholder farmers is critical to support better nutrition.

Most food available in local markets is produced through domestic agricultural activity. Agriculture is a key sector for the Tanzanian economy, comprising one quarter (25 percent) of the GDP and 88 percent of the rural employed population (The United Republic of Tanzania 2016). The majority of farmers are smallholders who cultivate less than two hectares of land and rely on traditional farming techniques and rainfall (National Bureau of Statistics & Ministry of Finance 2014). The predominant staple crop is maize, which covers 42 percent of total planted land and is grown mainly for subsistence using traditional methods and technologies (World Food Programme 2013). Wheat production, on the other hand, is almost entirely through large-scale commercial operations using modern inputs.

Although maize dominates, a vast and varied ecological landscape lends itself to cultivation of an array of crops including rice, wheat, sorghum, cassava, vegetables, fruits, nuts, seeds and cash crops such as cotton, sisal and tobacco. Fruit and vegetable production, however, occurs at significantly smaller volumes than grains. The 2014/15 Annual Agricultural Sample Survey shows that the area and quantity harvested of amaranth, pumpkin, cucumber, eggplant, cabbage and okra are a fraction of that of key staple crops (figure 34), and cultivation is limited to just a handful of regions in many cases. For every ton of fruits and vegetables (mostly tomatoes) harvested, there are 15 tons of maize harvested in the short rainy season and 30 tons in the long rainy season. Fruit and vegetable production occurs often at the micro level and some 14 percent of this production is damaged or lost, often owing to difficulties with storage and transport (Kinabo 2014).

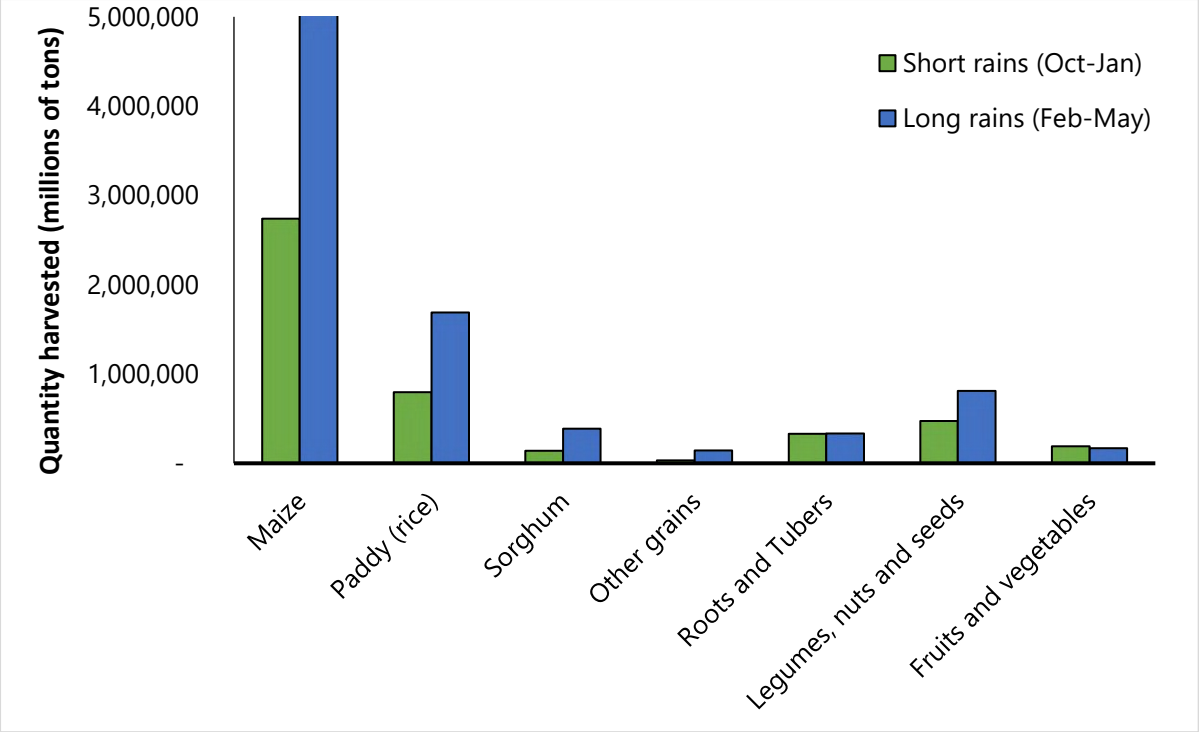


Figure 34: Quantity harvested, 2014-15 agricultural season, short and long rains. "Other grains" category sums total production of bulrush millet, finger millet and wheat. "Roots and Tubers" category sums total production of beans, cowpeas, green gram, chickpeas, Bambara nuts, pigeon peas, simsim (sesame) and groundnuts. "Fruits and vegetables" category sums total production of okra, watermelon, onion, eggplant, cabbage, tomato, cucumber, amaranth and pumpkin. In both short and long rainy seasons, tomato harvest accounts for more than half of tonnage in the "fruits and vegetables" category. (NBS Annual Agricultural Sample Survey, 2015).

Lean season

There are two rainfall regimes – a bimodal pattern in Northern, Lake and part of Eastern zone, and a unimodal pattern covering the remainder of the country. The unimodal rainfall, called *Msimu*, is from November–May, with the lean season from November–March. The bimodal rains are from mid-September–January (*Vuli*) and from March–June (*Masika*), with lean season from October–January (figure 35). Nationally, food shortages are most common from October–February in bimodal areas, where they are attributed in rural areas to poor rains and in urban areas to lack of money (USAID 2017; World Food Programme 2013).

Smaller studies have suggested that in some regions, low consumption of fruits and vegetables may be due in part to seasonal lack of economic access: households may consume fresh produce that they grow themselves, but cannot afford to buy fruits and vegetables to maintain consumption during the lean season (Mbwana et al. 2016).

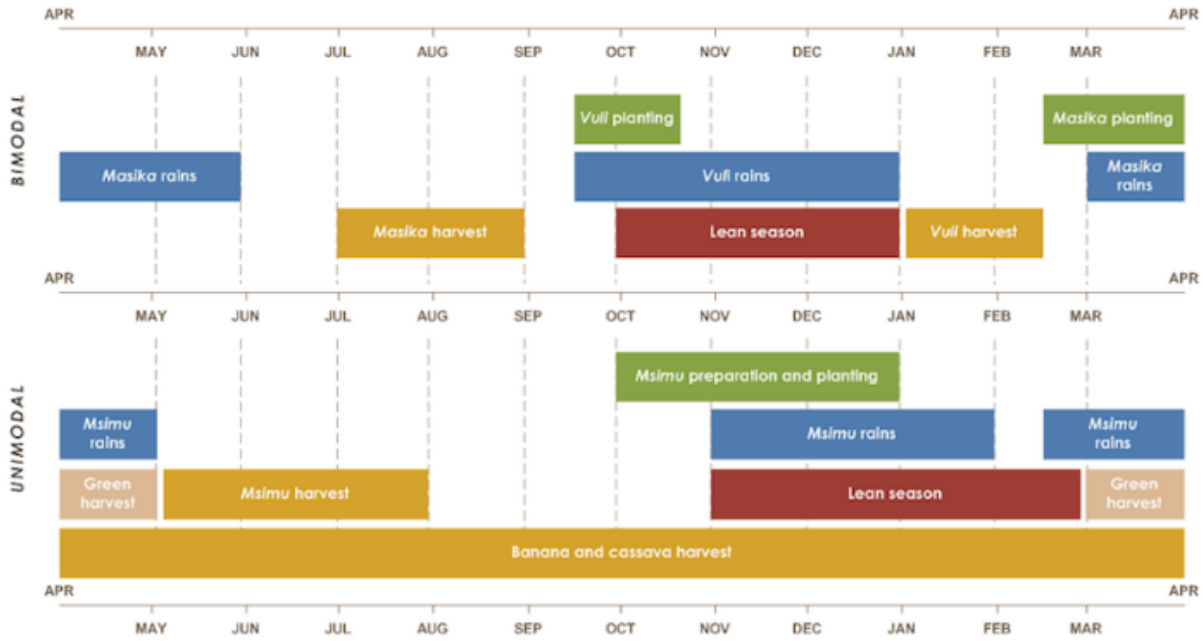


Figure 35: Seasonal calendar of a typical year (USAID/FEWSNET 2017)

Vulnerability of the agricultural sector

The outsized role of smallholder farmers in domestic production and the dominance of farming as a livelihood place both food systems and economic development on a weak footing.

Tanzania has the potential to improve agricultural yields per hectare by fourfold, however production to date has been hampered by the lack of modern inputs and techniques, access to credit and heavy reliance on rain for irrigation (Wolter 2008). Land rights are insecure and customary law and traditions around land tenure often prevent women from inheriting or otherwise acquiring land of their own. As women form the vast majority of the agricultural workforce, this represents a barrier to increased agricultural production (Cochrane & Souza 2015). The dominance of rain-fed agriculture means that smallholder farmers, and thereby the food supply and rural livelihoods, are vulnerable to changing climate.

The vulnerability of the smallholder agriculture sector is evident in the above challenges. Without sufficient investments, these factors may dampen food availability and severely limit the ability of poor rural households to advance economically.

The potential impact on access to nutrients of improved agricultural production and diversity at the household level was modelled in CotD with three different kitchen garden interventions. The first kitchen garden was composed of less nutrient-dense crops (cabbage, tomatoes and beans), the second of more nutrient-dense crops (iron fortified beans, amaranth leaves and orange-fleshed sweet potatoes), and the third model of the nutrient-dense crops plus small-scale egg production. The models assumed production of a small quantity of each crop that is consumed across family members and crops were modelled at a nominal cost to the household to account for the cost of agricultural inputs[17]. Across the 10 regions for which modelling was conducted, micronutrient-rich gardens with eggs led to the greatest decrease in the household cost of a nutritious diet (12 percent) followed by micronutrient-rich gardens only (eight percent), while the least effective intervention was micronutrient-poor gardens (two percent decrease in cost) (figure 36). Thus, small-scale agricultural

[17] Each crop provided up to one small serving (50g) per household member per day, at 20 percent of market price for the same food. For iron-fortified beans, the price was 25 percent of unfortified beans to also account for the increased cost of the seeds.

and gardening interventions should be carefully considered if nutrition outcomes are anticipated, as household nutrient intake is likely to improve only if the crops produced are selected with these needs in mind. Seasonal availability combined with limited post-harvest processing may also limit impact on household nutrient intake throughout the year.

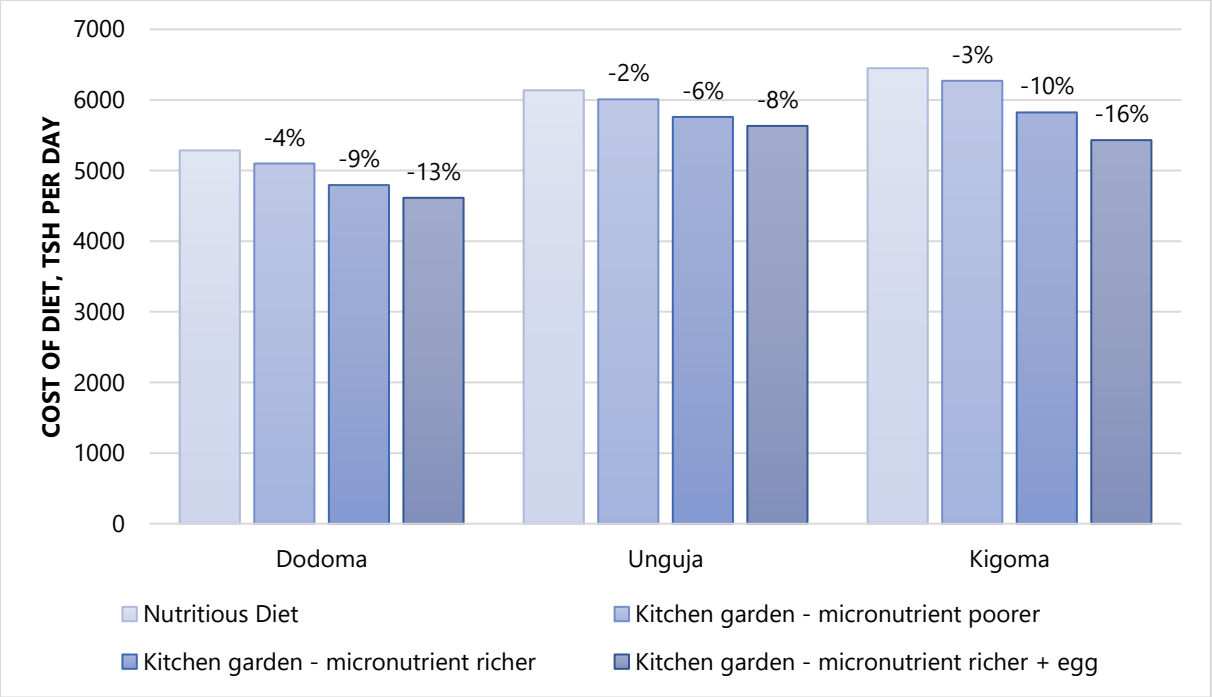


Figure 36: Average daily cost of a nutritious diet for a modelled household in selected regions, without and without kitchen garden interventions. Kitchen Garden A is composed of nutrient-poor crops (cabbage, tomatoes and beans), while Kitchen Garden B is composed of nutrient-dense crops (iron fortified beans, amaranth leaves and orange-fleshed sweet potatoes).

Access to nutritious foods

Key message 5: Markets are an important platform for improving access to nutrient-rich foods.

Although 73 percent of Tanzanians live in rural areas, less than half of these are estimated to live and work on smallholder farms, and ten percent of rural households are landless (Covarrubias et al, 2012, and Rapsomanikis, 2015). Thus while agriculture plays a large role in the national economy, and while own production can be an important source of nutrients, a large segment of the population will not benefit from interventions encouraging self-provisioning of nutritious foods. Indeed, most households obtain a significant proportion of their food through markets. In urban households, three-quarters (77 percent) of food is purchased through retail markets. Farming and rural households source an average of 60 percent of their energy intake from their own production, with the remainder (more than one third) mainly purchased on the market (figure 37) (World Food Programme 2013).

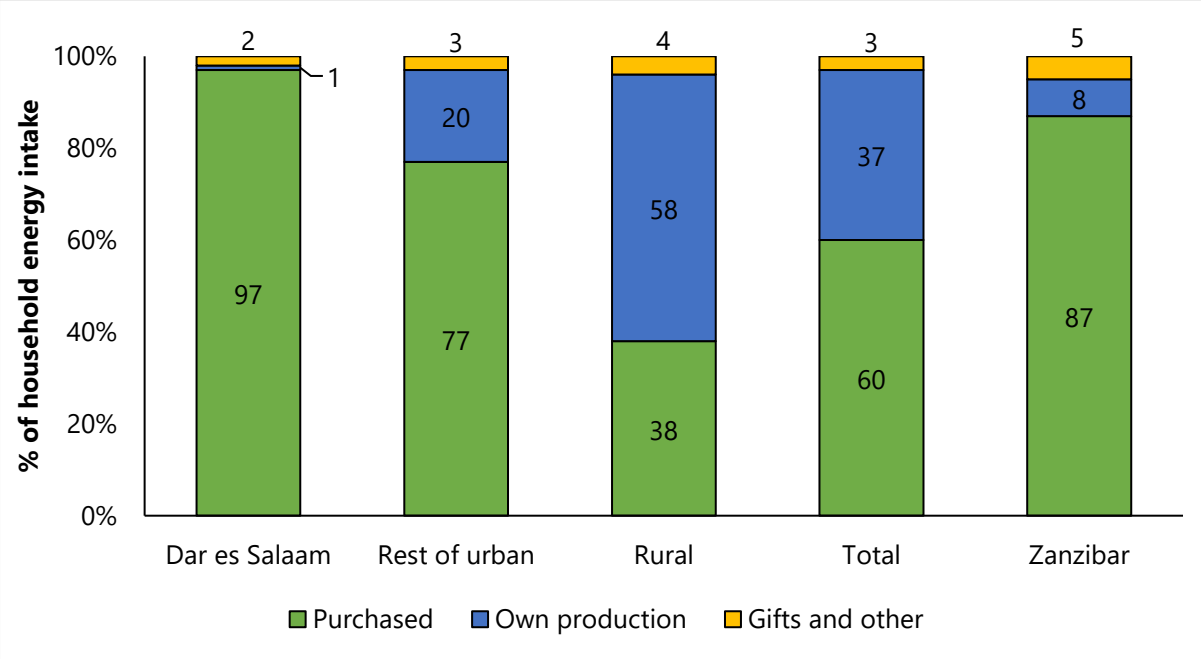


Figure 37: Sources of household energy intake, by location (WFP 2013)

Livelihood profiles of 78 zones defined in a FEWSNET analysis for the Tanzania Ministry of Agriculture Livestock and Fisheries (figure 38)[18] show that across zones, although proportions differ, poorer households tend to rely on market purchases for a greater percentage of their energy intake than wealthier households, who are able to source a greater proportion of food from their own production (Tanzania Ministry of Agriculture Livestock and Fisheries n.d.). While poorer households nearly always must purchase staple foods (often maize grain) to supplement what they grow themselves, better-off households more often purchase non-staple foods to obtain greater diversity.

[18] The process of defining livelihood zones was a collaboration between FEWSNET Tanzania and the Tanzanian Food Security Information Team, consisting of a review of secondary data, a series of workshops with representatives of government stakeholders who had expert knowledge of the areas, and short field visits.

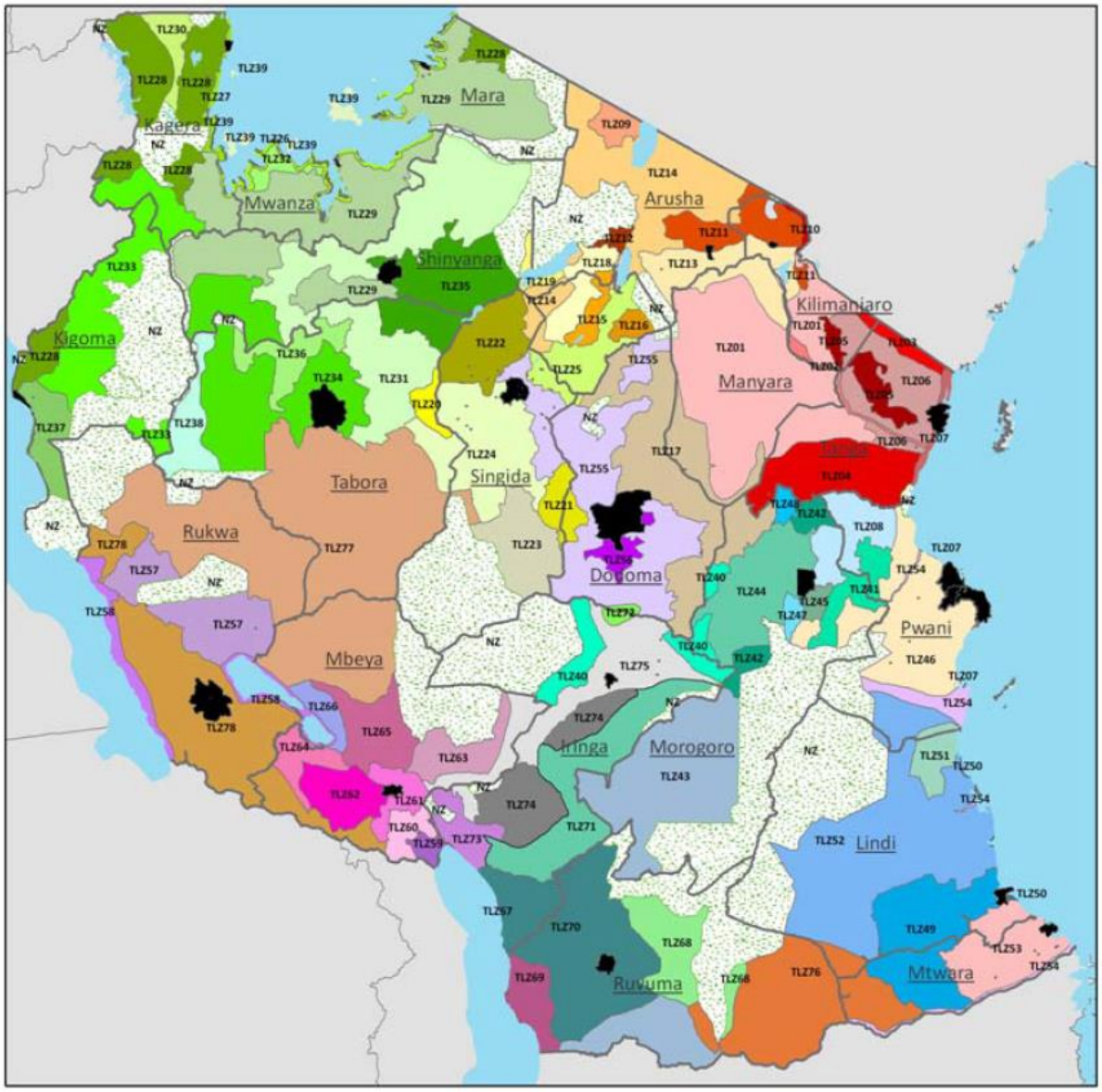


Figure 38: Tanzania livelihood zones (Tanzania Ministry of Agriculture Livestock and Fisheries n.d.)

An example of this in the West Simanjiro-Monduli agro-pastoral livelihood zone is shown below, where purchased food comprised more than half of minimum calorie requirements for the two poorer groups and only one third of requirements in the two wealthier groups[19] (figure 39). Household expenditure breakdowns further show that, out of the 40 percent of expenditure that very poor households directed to food purchases, approximately half was on staple foods (primarily maize grain). In the wealthiest households ("better off" in figure 39) less than 20 percent of expenditure was on food, with nearly all of that on non-staple foods; moreover, this group was able to meet all of their maize needs through own production, so even the food purchases categorized as staples were more nutritious items such as beans and dried fish, as well as oil. These patterns of sourcing and expenditure were largely reflected in all livelihood zones for which profiles were available (figure 41, below) (Tanzania Ministry of Agriculture Livestock and Fisheries n.d.).

[19] Food access as percentage of minimum energy requirements of 2100 kilocalories per person per day for a 12-month period.

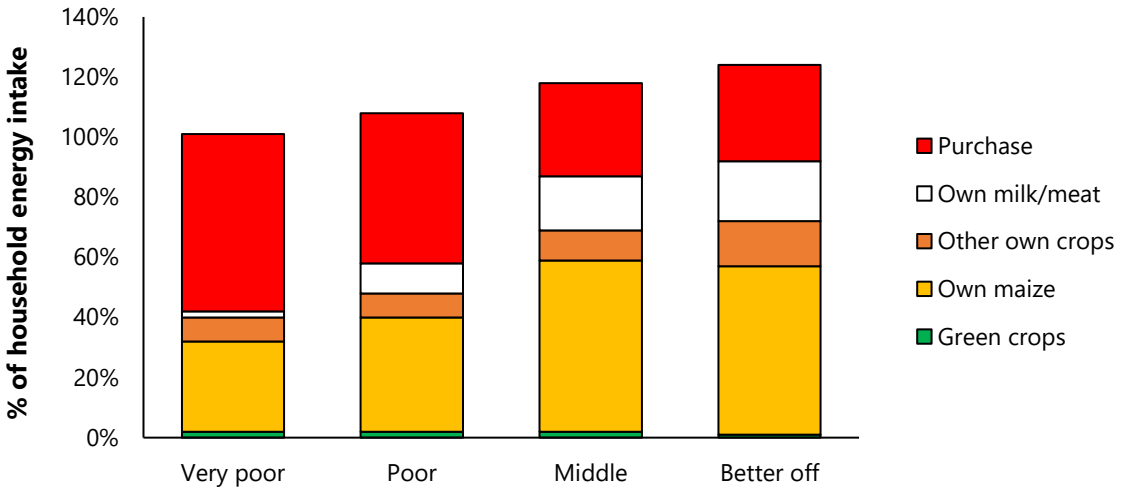


Figure 39: Food access expressed as a percentage of minimum food requirements, taken as an average food energy intake of 2100 kcal per person per day, in the West Simanjiro-Monduli agro-pastoral livelihood zone (Tanzania Ministry of Agriculture Livestock and Fisheries n.d.)

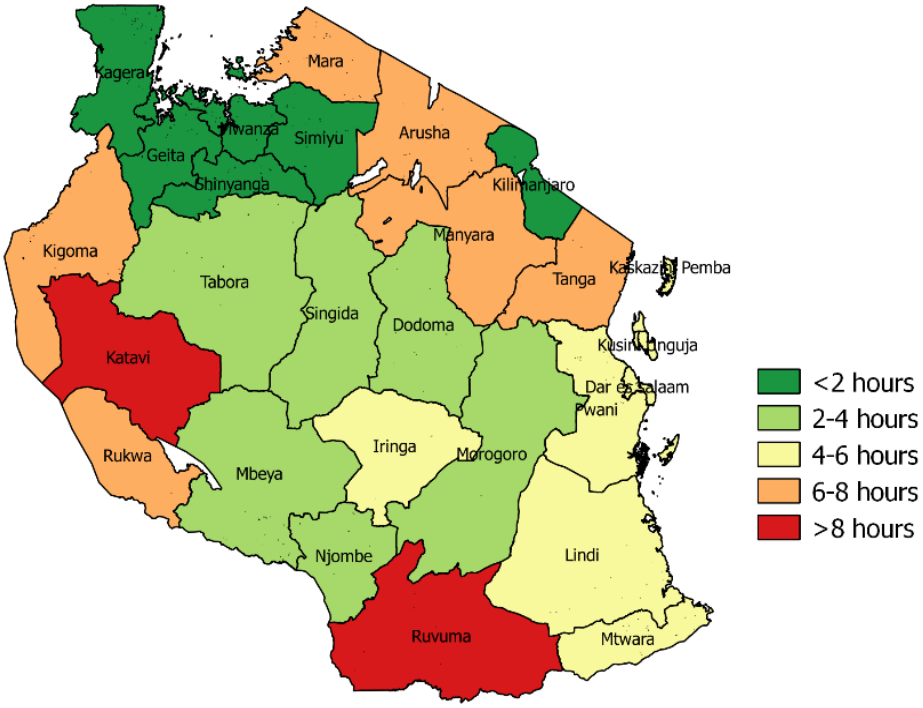


Figure 40: Average travel time to the nearest market, by region (Analysis based on Perfect & Majule, 2010)

Poor infrastructure also constrains food availability and physical accessibility. WFP's most recent Comprehensive Food Security and Vulnerability Analysis (CFSVA) estimated that less than a tenth of Tanzania's roads are paved, which impacts not only domestic distribution of but also physical access to markets (World Food Programme 2013). Another livelihood zones analysis, carried out by the Institute of Resource Assessment and FAO in 2010, found that travel time required to reach markets varied widely among livelihood zones, from 1–2 hours or less up to 8–24 hours (figure 40). Improvements in road infrastructure had decreased travel time in some areas, but seasonality continues to have an impact on market access as local roads are often rendered impassable due to flooding during rainy seasons (Perfect & Majule 2010).

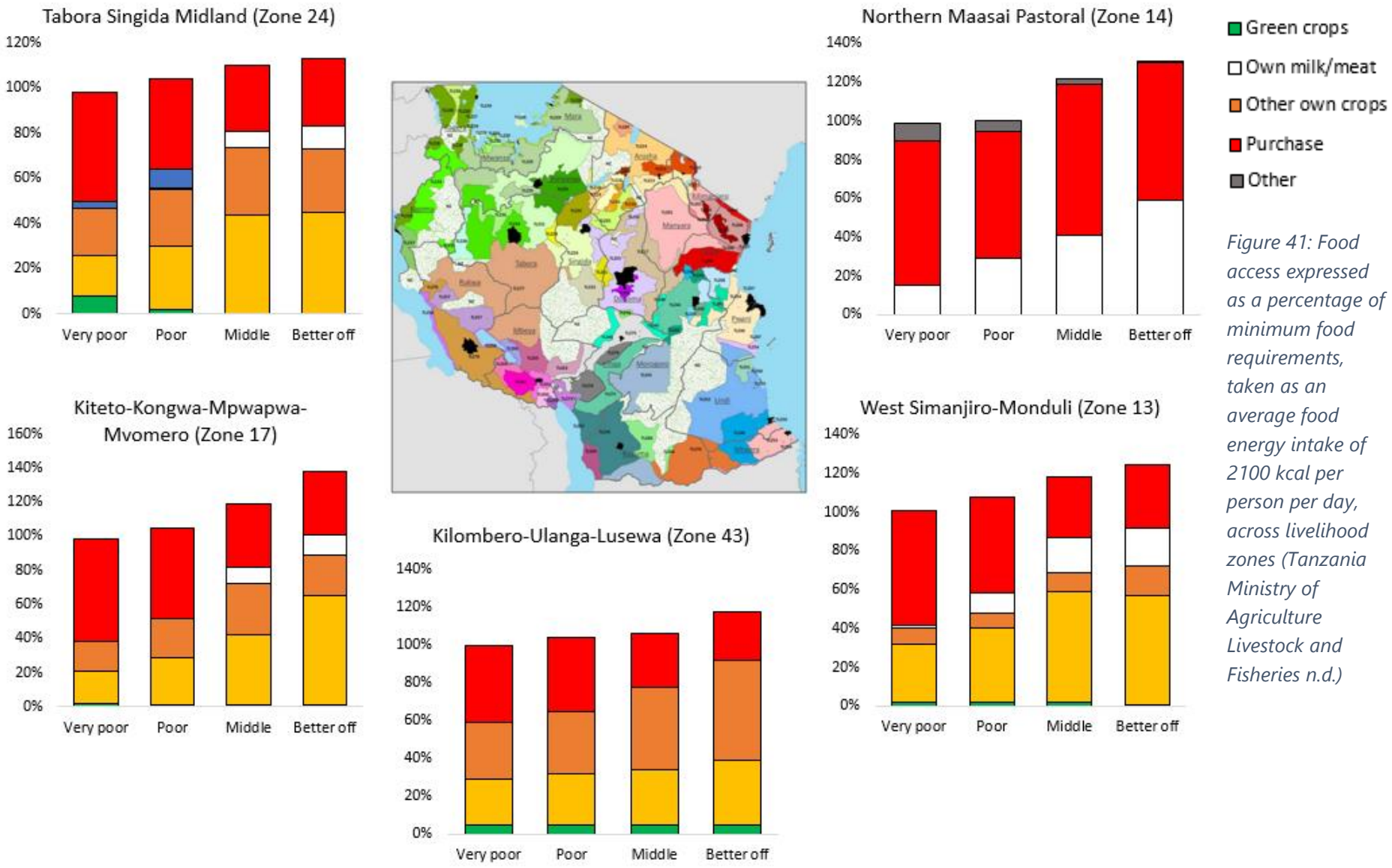


Figure 41: Food access expressed as a percentage of minimum food requirements, taken as an average food energy intake of 2100 kcal per person per day, across livelihood zones (Tanzania Ministry of Agriculture Livestock and Fisheries n.d.)

Some fortified foods are available on the market. However, with the exception of commercially-produced wheat, staple grains are almost always unfortified. The ARCH Project labelling study listed 26 commercially produced complementary foods as well as 17 commercial foods for general consumption commonly eaten by young children that were available on the market in Tanzania, of which a third were locally produced. The rest were imported primarily from the UK, Spain and Kenya and cost, on average, 12 times as much as the locally produced commercial complementary foods (Helen Keller International 2011). A list of the foods included in the ARCH research is included in Annex 2.

Key message 6: Diets that meet the nutrient needs of different household members are unaffordable for poor households.

As discussed above, a range of foods are available in markets across the country, but there are wide regional disparities in commodity prices (figure 42). In particular, market access to micronutrient-rich foods can be a challenge, as these foods are more perishable and market price data from NBS and OCGS show that they tend to be more expensive and to have especially variable prices. The largest price variations are seen in chicken, fish, yogurt and butter, while maize prices are quite steady. Maize is also generally the least expensive staple across regions and is on average 1.5 to 2 times cheaper than rice or wheat. Animal-source foods are also costly; legumes, which are often less than half the price of meat, may be a more accessible source of protein and other nutrients. Price variations from region to region likely reflect underlying factors, such as market structure, local supply chains, the degree to which households rely on markets (versus their own production) and physical access to markets.

In addition to disparities in the costs of foods by region, the ability of households to afford a nutritious diet varies by region and urban/rural location. Twenty-eight percent of the Tanzanian population was estimated to be living in poverty in 2011/12[20]. In rural areas, one-third of the population was living below the basic-needs poverty line, while in Dar es Salaam, the proportion was only four percent (National Bureau of Statistics & Ministry of Finance 2014).

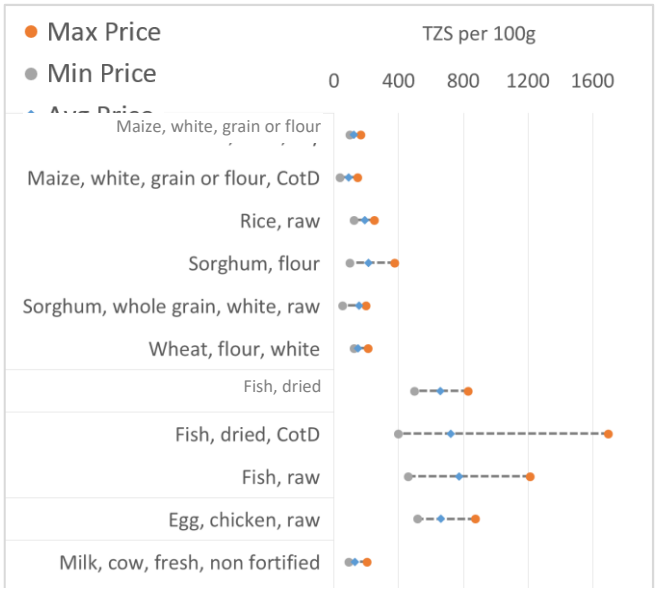


Figure 42: Price range (TSH per 100g) across regions for selected foods (NBS, 2016)

An estimated ten percent of the mainland population was found to be below the food poverty line[21], with slightly higher prevalence of food poverty in rural areas (National Bureau of Statistics & Ministry of Finance 2014). In Zanzibar, overall food poverty rates were comparable at 11 percent, but the rural-urban disparity was

[20] The basic needs poverty line was less than TSH 1,216 per adult equivalent per day.
[21] The food poverty line is an estimate of the cost of consuming 2,200 kilocalories per adult per day, based on consumption patterns and prices paid by the bottom 50 percent of the population in terms of real consumption. For 2010-11, the food poverty line was TSH 18,719 (World Food Programme 2013).

much greater (16 percent and five percent respectively) (Office of the Chief Government Statistician Zanzibar 2015). This suggests that the vast majority of households below the food poverty line are nutritionally at risk and highlights the discrepancy between the estimated cost to meet energy needs and the cost to meet nutrient requirements in most regions of Tanzania.

Nationally, the proportion of household expenditure that goes toward food is 56 percent, reaching up to 70 percent in the poorest households (National Bureau of Statistics & Ministry of Finance 2014). A food expenditure ratio at this level is generally considered to be high and indicative of vulnerability to shocks.

The CotD analysis found that, even without considering nutrient requirements of all household members, one-fifth (20 percent) of households nationally are unable to afford a diet that meets just their energy requirements. This proportion was highest in Mtwara, where more than 35 percent of households could not afford sufficient calories to meet their needs, followed by Lindi, Arusha and parts of Zanzibar (non-affordability of 30–35 percent) (figure 43).

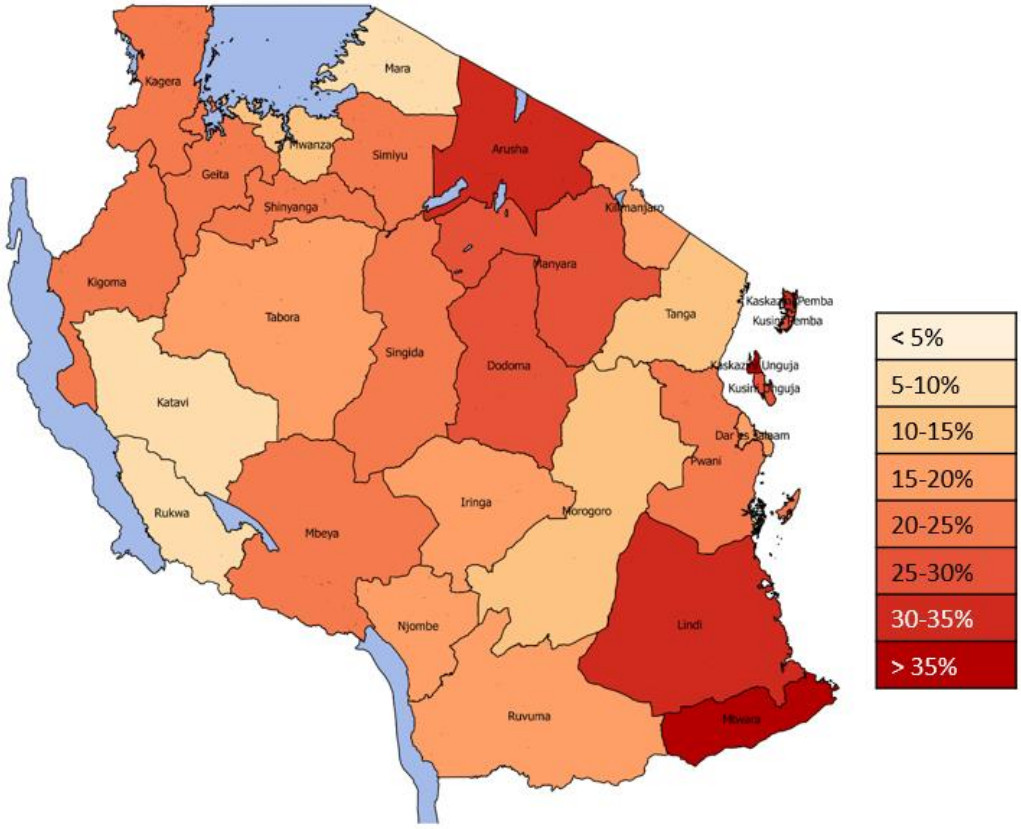


Figure 43: Percentage of households that cannot afford a diet that meets the energy requirements of all five members, by region

When the nutrient requirements of household members are added to their energy needs, 59 percent of households nationally are unable to afford a nutritious diet (figure 44). The inability to meet all nutrient needs was highest in regions in the south and the west, with non-affordability greater than 70 percent in Lindi, Mtwara and Kigoma and between 65–70 percent in Dodoma, Katavi and Rukwa.

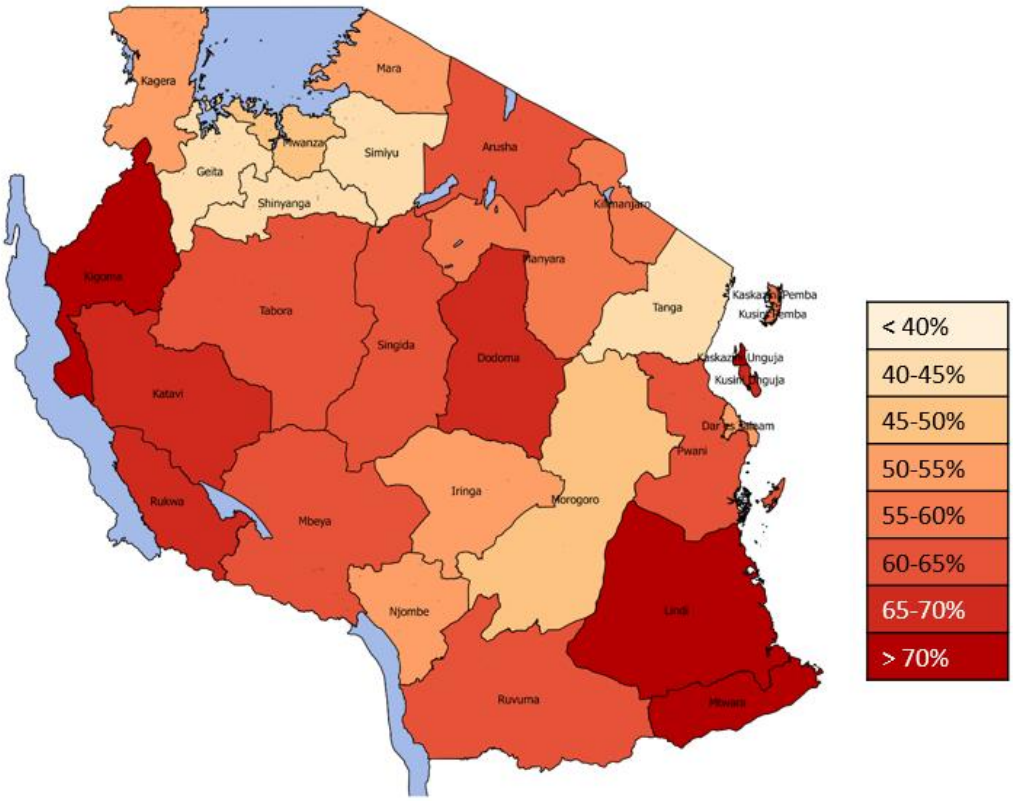


Figure 44: Percentage of households that cannot afford a diet that meets the nutrient requirements of all five members, by region

In times of stress, households may employ coping strategies to meet their food needs[22]. The 2011 CFSVA found over 40 percent of all households in Tanzania reported a coping mechanism over the past week[23], of which 15 percent had high coping scores. Use of coping strategies was most prevalent among households in the Lake zone (59 percent) which may reflect the higher incidences of food shortages and food insecurity in the bimodal part of the country (figure 45) (World Food Programme 2013). It may also suggest that some households were able to attain food secure status through the use of coping strategies.

[22] Households are asked to report use of the following strategies (from least to most severe) over the past week: 1) eating less preferred or cheaper foods, 2) limiting portion sizes, 3) reducing the number of meals per day, 4) restricting consumption by adults so children can eat, and 5) borrowing food or asking for help from family or friends.

[23] The 5 coping strategies (footnote above) are weighted by severity to form the Coping Strategy Index.

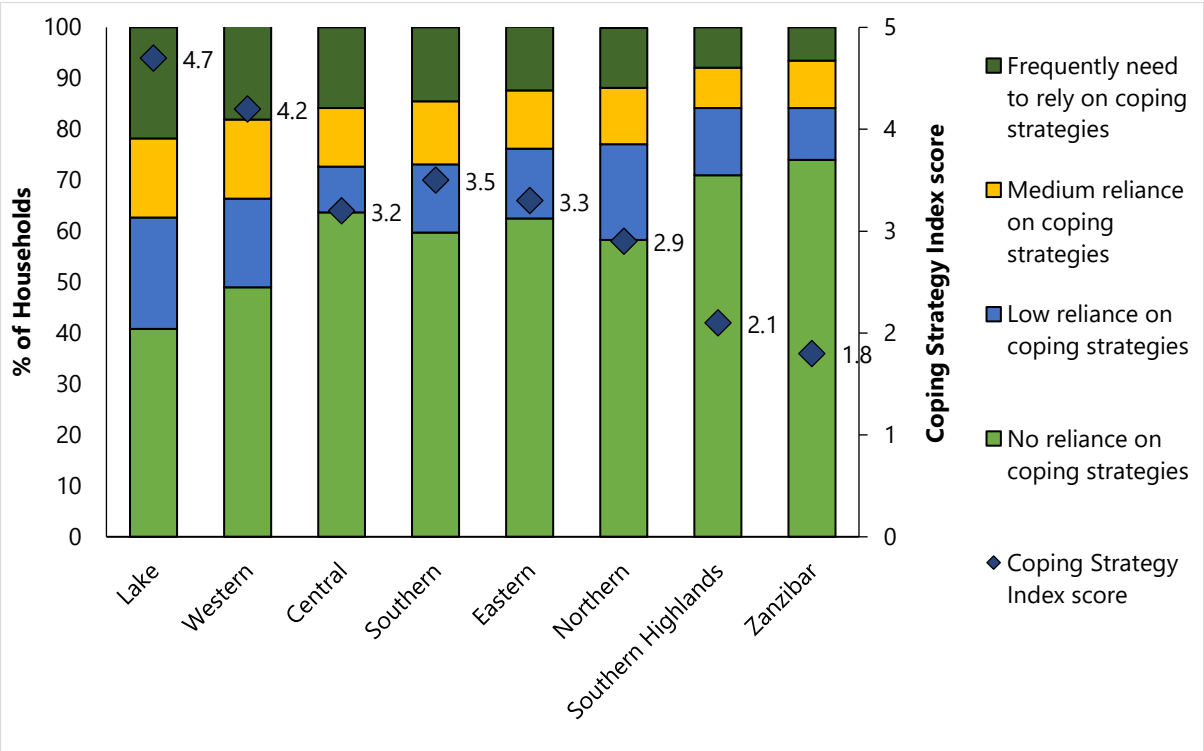


Figure 45: Household reliance on coping strategies and Coping Strategy Index, by zone (2010/11 (World Food Programme 2013)

Nutrient Intake

Key message 7: Infant and young child feeding practices are inadequate countrywide. Economic access and time are key barriers.

Breastfeeding

Nearly all infants and young children (98 percent) are breastfed early in life, most (93 percent) within 24 hours after birth but only half within the first hour (figure 46). Early initiation varied greatly by region, from 26 percent in Simiyu to 80 percent in Tanga (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016).

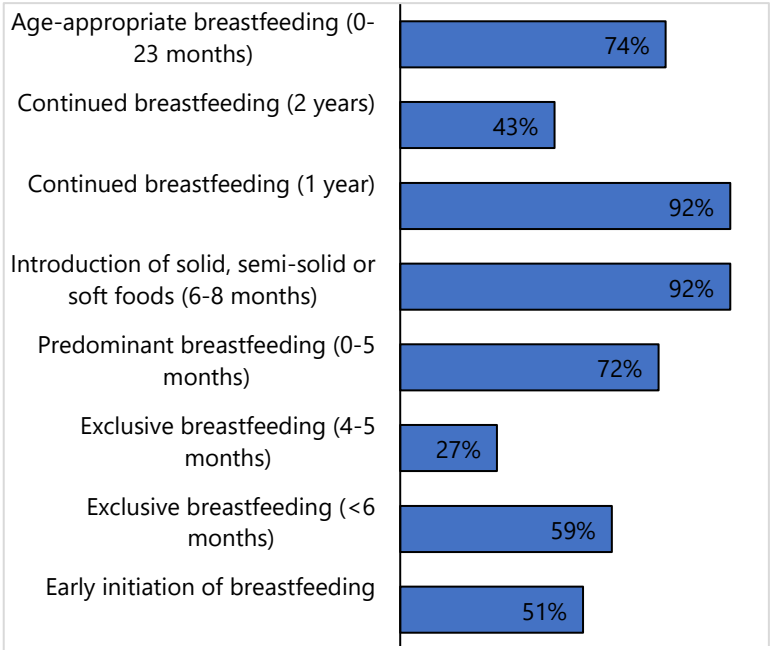


Figure 46: Percentage of children with different breastfeeding indicators (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016)

The rate of exclusive breastfeeding until six months of age has increased gradually over the past 25 years, from 26 percent in 1991 to 59 percent in 2015. Eighty-four percent of children are exclusively breastfed for the first month of life, however this decreases dramatically to 27 percent by 4–5 months of age. Nationally, the median duration of exclusive breastfeeding was 3.9 months and 4.6 months for predominant breastfeeding. Complementary feeding is often initiated before the recommended age of 6 months, with half (52 percent) of children 4–5 months receiving solid or semi-solid food (Ministry of Health, Community Development, Gender, Zanzibar, et al. 2016).

In the CotD models, the cost of a nutritious diet for a child 12–23 months was a small proportion of the overall household cost, as many key nutrient requirements are met by breastmilk at no monetary cost. A child who is not breastfed, or who does not receive enough breastmilk, would need higher intake of nutrient-dense foods, particularly animal source foods, to compensate. The costs of not breastfeeding a child 12–23 months of age were modelled using CotD, illustrating the difficulty of meeting nutrient needs for this child without breastmilk. When the child received a nutritious diet with only half of the recommended amount of breastmilk, as opposed to the full amount, the cost of the diet increased by 29 percent on average across the modelled regions. If the child was not breastfed at all, the cost of a nutritious diet increased by an average of 73 percent as compared to a child receiving adequate breastmilk (figure 47). In Kigoma, the cost increased by nearly 50 percent for a sub-optimally breastfed child and more than doubled for a child who was not breastfed at all, while in Unguja the cost increased less than 50 percent for a non-breastfed child.

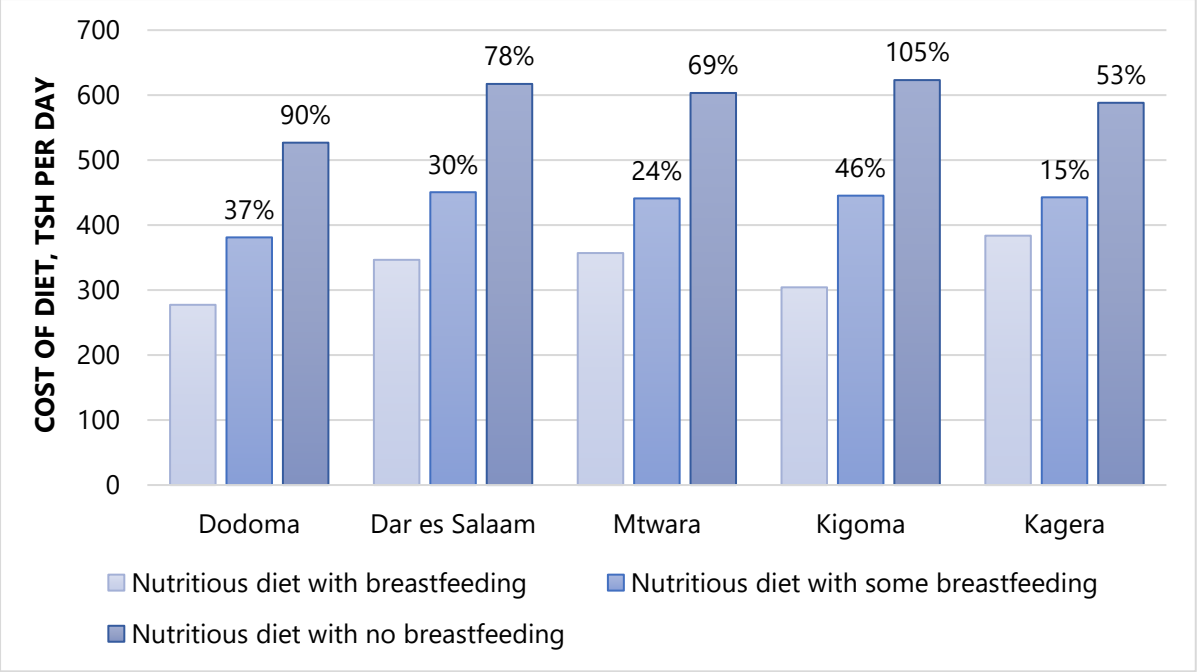


Figure 47: Average daily cost of a nutritious diet for a child 12–23 months with optimal breastfeeding, suboptimal breastfeeding (266g of breastmilk, half the recommended quantity) and no breastfeeding, in selected modelled regions

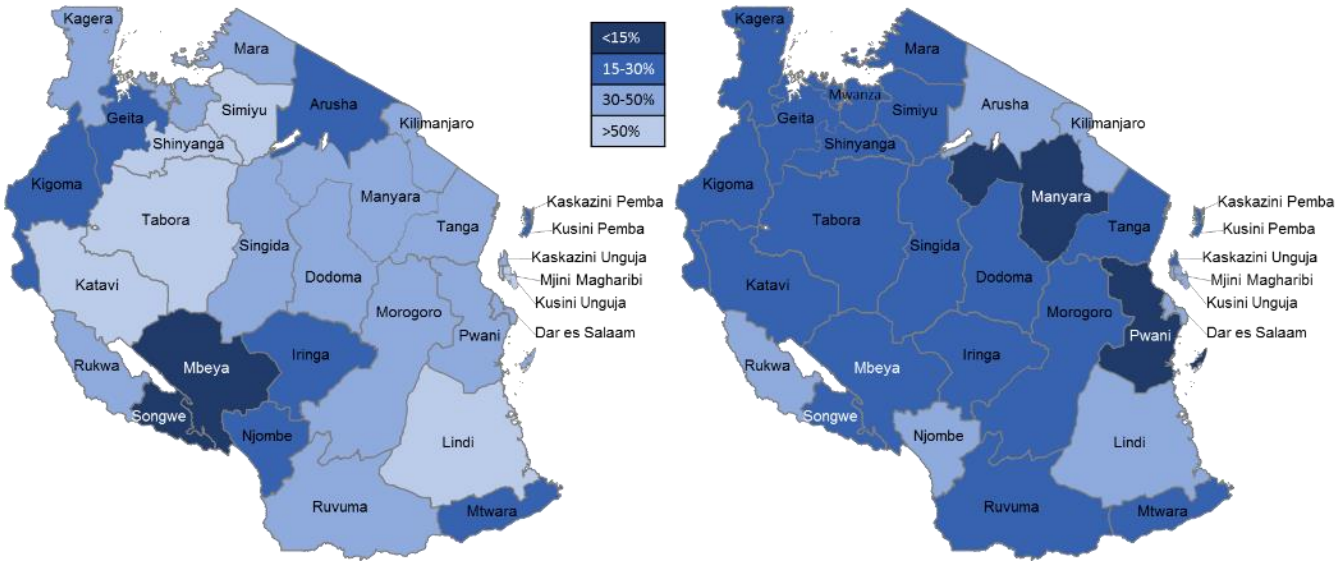
Complementary Feeding

As discussed previously, stunting continues to present a challenge in Tanzania. The breakdown of stunting prevalence by age shows that prevalence increases rapidly during the period when complementary feeding is initiated, between 6 months and 2 years of age, indicating that these practices are likely inadequate (see figure 11 in key message 1b, above).

Indicators of diet adequacy –minimum meal frequency, minimum dietary diversity and minimum acceptable diet – among children 6–23 months were low and varied depending on socio-demographic factors and whether or not the child was breastfed.

Nationally, only nine percent of children 6–23 months had a minimum acceptable diet (MAD), a composite indicator of both meal frequency and dietary diversity. Children in urban, wealthier and better educated households were more likely to have an acceptable diet, however in no group did MAD exceed 16 percent.

Overall, the attainment of minimum meal frequency was better than that of dietary diversity. Minimum meal frequency was poorest in Iringa, Njombe, Mbeya, Kigoma, Geita and Arusha regions. Tabora and Shinyanga reported the highest prevalence at above 70 percent (figure 48). The proportion of children meeting diversity thresholds was overall considerably lower than frequency and was poorest in Pwani and Zanzibar, where fewer than one in 10 children 6–23 months had a diet with adequate diversity (figure 49). Analysing the pattern of the two sub-components of MAD reveals an important catalyst for the improvement seen in these socioeconomic groups.



Figures 48 and 49: Minimum meal frequency (left), minimum dietary diversity (right) among children 6–23 months, by region (DHS, 2016)

Minimum dietary diversity was notably higher for children who lived in urban areas, wealthier households, with better educated mothers. In contrast, minimum meal frequency varied little across socioeconomic groups. The fact that dietary diversity increases steadily with income (and income-associated factors like education and urban location), but frequency does not, suggests that a key driver of minimum acceptable diet may be an income effect on dietary diversity (figure 50) (Ministry of Health, Community Development, Gender, Zanzibar, et al. 2016).

Non-breastfed children were more likely to meet minimum dietary diversity (35 percent versus 24 percent for breastfed), while breastfed children were far more likely to meet requirements for minimum meal frequency (43 percent versus 26 percent) and achieve MAD (ten percent versus four percent non-breastfed) (Ministry of Health, Community Development, Gender, Zanzibar, et al. 2016).

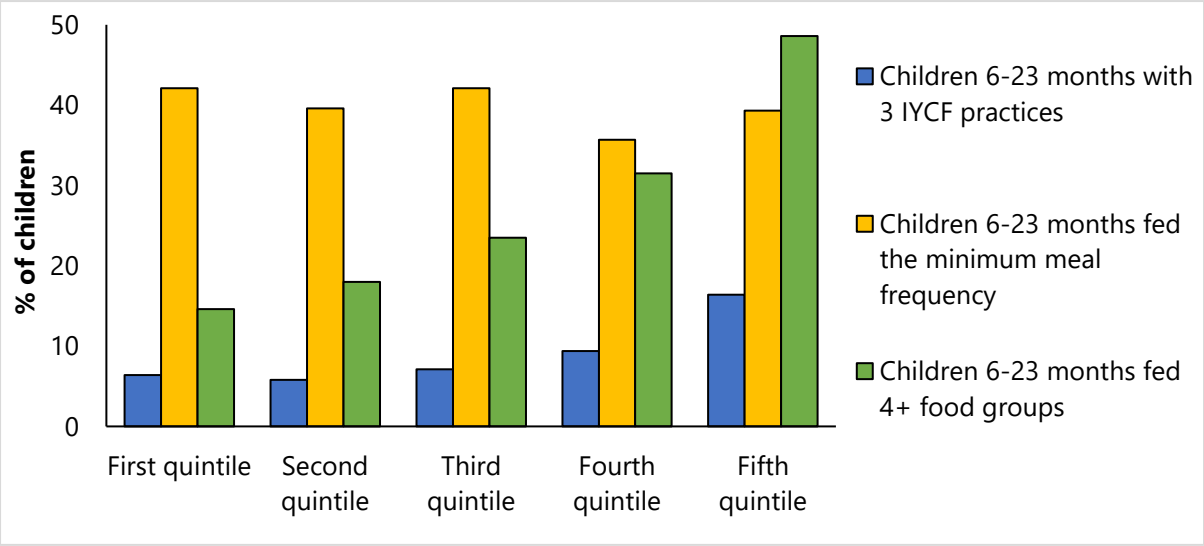


Figure 50: Minimum acceptable diet (3 IYCF practices), minimum meal frequency and minimum dietary diversity (4+ food groups) for children 6–23 months by household income quintile (DHS, 2016)

Nationally, the foods most commonly consumed by young children are made from grains and vitamin A-rich fruits and vegetables. Seventy-six percent of children 6–23 months consumed vitamin-A rich foods in the last 24 hours, and at least 50 percent of children in all regions ate these foods. Animal source foods, other fruits and vegetables, and legumes and nuts were consumed by less than 50 percent of children, however consumption of these foods was consistently higher in non-breastfed children. Almost no children received infant formula and less than 20 percent received milk, milk products, eggs or fortified baby foods (figure 51). The 2015 DHS notes that children 6–23 months often did not consume eggs, cheese, yogurt, or milk products. As discussed more below, consumption patterns and feeding practices vary across regions and ethnic groups (Ministry of Health, Community Development, Gender, Zanzibar, et al. 2016).

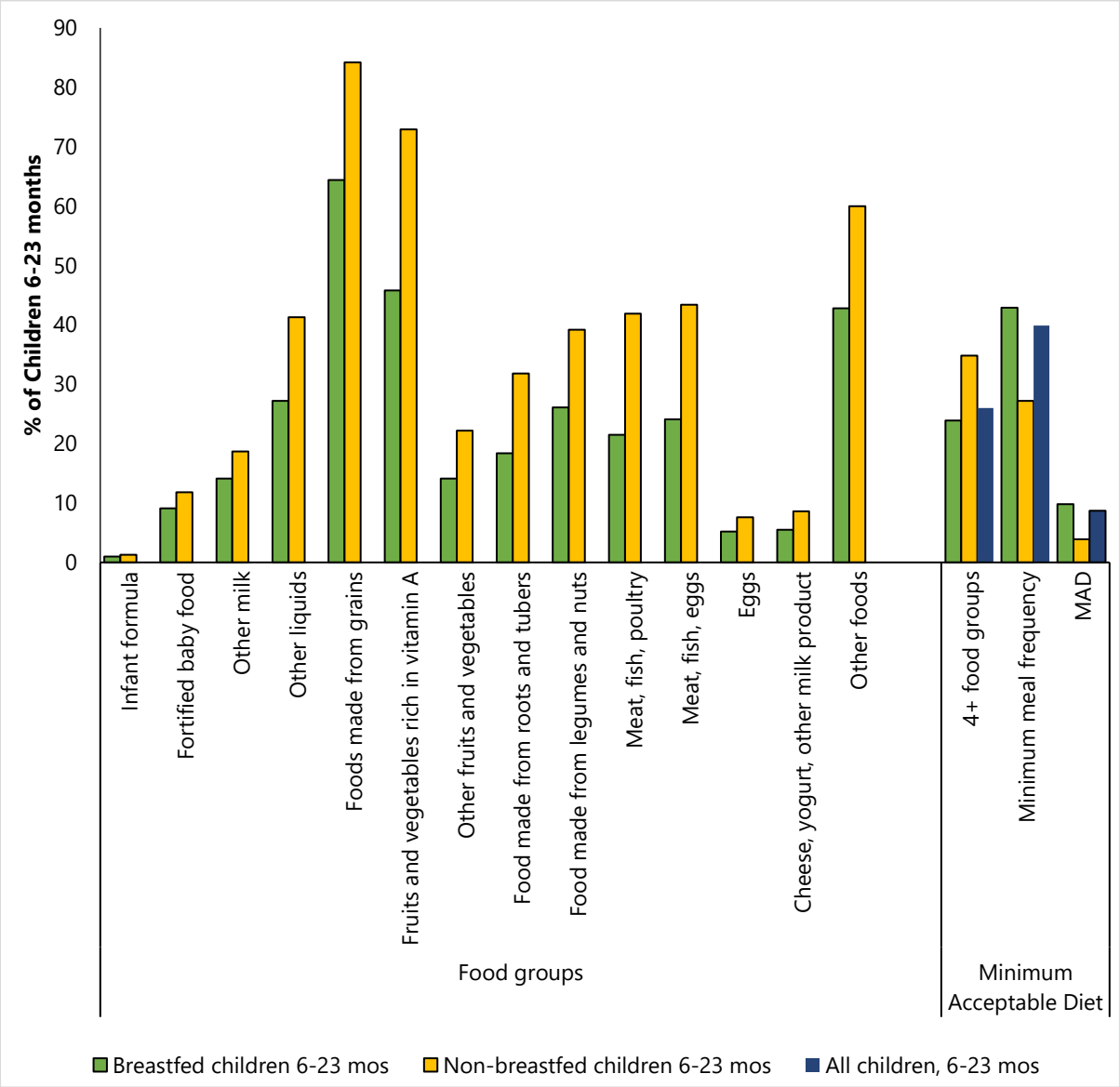


Figure 51: Food group consumption and minimum acceptable diet by breastfeeding status. Data points show percentage of children 6-23 months who received the food item in the last 24 hours before the survey (DHS, 2016).

A baseline study for the Maisha Bora project[24] in Simanjiro (Manyara) and Longido (Arusha) districts found that children under the age of five in these predominantly Maasai pastoral areas mostly ate the same as the rest of the household. Their food was prepared separately only one quarter (23 percent) of the time and fewer than half (44 percent) of the children ate from a separate plate; because children, particularly young children, have very high nutrient needs, it is often difficult to meet their requirements with only household foods and usually specialised nutritious foods (SNFs) are necessary. The most frequently consumed food groups in the past 24 hours were sources of carbohydrates (porridge or ugali, followed by maize) and of protein (milk or beans). Among the few children who had consumed fruits or vegetables, the most common were bananas, greens and oranges (Maliti et al. 2016). In these districts, the foods most commonly cited by respondents as not consumed by children under 5 years were meat and eggs, because of either traditions or resulting "problems" for the child (Maliti et al. 2016).

Formative research for the ASTUTE[25] project, carried out in five districts across the five project regions, similarly found that children under 6 months usually ate porridges of maize or cassava flour mixed with water and sugar or salt, but as they grow older they increasingly ate the same foods as the adults at household meal times; this commonly included ugali, sweet potatoes and green leafy vegetables (Remes et al. 2017). Reported barriers to frequent feeding or more appropriate feeding (including breastfeeding) in these districts included insufficient time to prepare special meals, fears that if children became accustomed to too much food they would be unable to cope during shortages and lack of knowledge (Remes et al. 2017). Men in particular were seen to be less informed than women, and respondents thus perceived that women had insufficient support for exclusive breastfeeding or appropriate complementary feeding (Remes et al. 2017).

Differences in the nutritional status and nutrient intake of children belonging to different ethnic groups have been investigated by several small studies and may be attributable partly to geographic or economic factors, rather than solely cultural ones. In a 24-hour recall across four ethnic groups, Sukuma children between the ages of 1–5 years were much more likely to have eaten fish, likely due to the proximity of many Sukuma villages to Lake Victoria. Similarly, higher fruit consumption among Meru children may be related to the favourable climate where they live or to better economic access. Maasai children had much higher consumption of cow's milk and lower consumption of ugali and other carbohydrate-based staples, which were consumed by virtually all children in the other ethnic groups surveyed; this can be attributed in part to the pastoral livelihoods of the Maasai (Lawson et al. 2014). Additional qualitative evidence is detailed in Annex 3.

Although childhood overweight/obesity remains low in Tanzania, consumption of inappropriate foods by young children may be a growing concern. A report on labelling of foods fed to infants and young children included 17 commercially produced foods for general consumption that are often fed to young children (in addition to 26 commercially produced complementary foods) that spanned eight categories including biscuits, cakes, candy, crisps, yogurt and soft drinks and other sweetened drinks. Although the study did not look at specific practices regarding particular snack foods that are fed to children or increasing consumption of these foods, it did note that this is increasingly a concern in Tanzania as in many other countries, and that caregivers may be misled by labelling on foods for general consumption that closely resembles that of complementary foods. Price and convenience may also play a role, as it was found that imported commercially produced foods for general consumption

[24] 921 household heads responded to a socioeconomic survey and anthropometric data was collected from 996 children under the age of 5.

[25] Addressing Stunting in Tanzania Early, in the regions of Mwanza (Sengerema district), Geita (Geita), Shinyanga (Shinyanga), Kagera (Bukoba) and Kigoma (Kigoma). The study had 379 randomly selected respondents.

that are often given to children are up to nine times less expensive than imported commercially produced complementary foods (Helen Keller International 2011).

As mentioned above, it is very difficult to meet the nutrient needs of young children without SNFs that are very nutrient-dense. Cost of the Diet was used to model the impact of two SNFs on the cost of a nutritious diet for a child 12–23 months of age. A small quantity lipid-based nutrient supplement (SQ-LNS) – usually a fortified peanut spread – and micronutrient powder (MNP) were both modelled, first at no cost (assuming either in-kind or voucher provision) and then at market price. When provided in-kind, MNPs decreased the average daily cost of a nutritious diet for the child by 19 percent across the modelled regions. In four regions, the reduction was greater than 25 percent (and up to 34 percent in Rukwa). The SQ-LNS given in-kind resulted in a decrease of at least one-third of the daily cost of a nutritious diet on average across the regions modelled, and 50 percent or more in Rukwa and Kigoma (figure 52).[26]

Given that in-kind provision is not always feasible, market availability of both SNFs was also modelled, with MNPs introduced at both full market price and with a 50 percent subsidy. While the SQ-LNS could still reduce the cost of meeting the child's nutrient needs when available on the market, the MNP did not always improve affordability – and, in some cases, actually increased the cost of the child's diet because the full market price of TSH 200 was actually two-thirds of the overall cost of a nutritious diet for the child and other foods available on the market were able to provide those nutrients at a lower price (figure 52). Thus in considering the potential effectiveness of future SNF interventions, price points will have to be carefully considered.

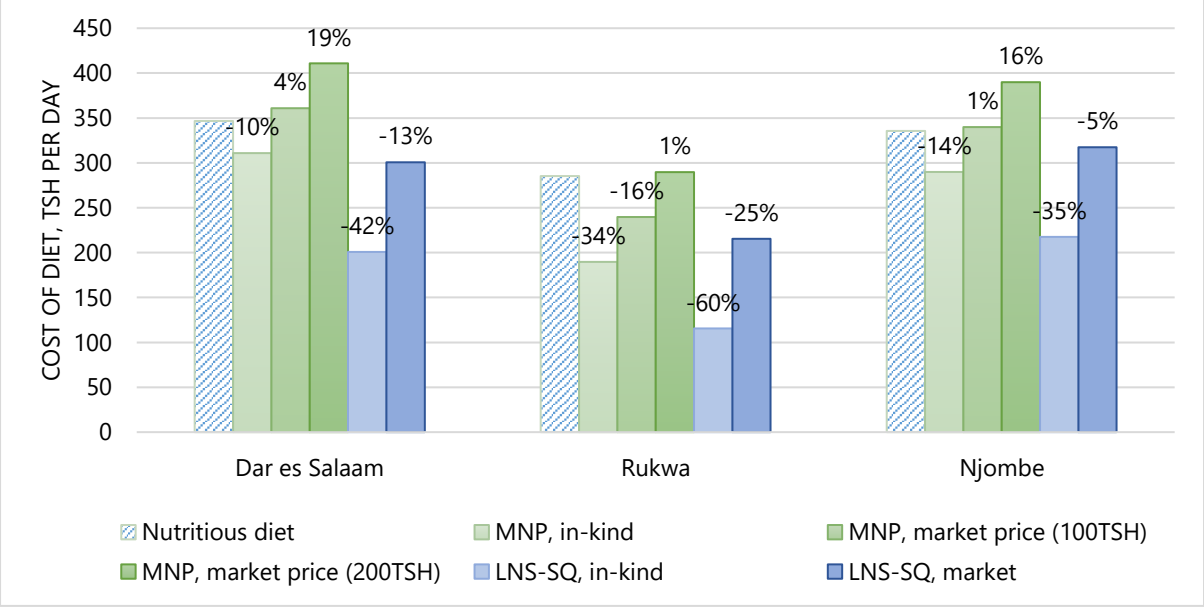


Figure 52: Average daily cost of a nutritious diet for a child 12–23 months, without and with a micronutrient powder or a specialized complementary food provided in-kind or through the market

Key message 8: The diets of women and adolescent girls are poor.

Good nutrient intake among women is important for their own nutritional status, as well as to ensure healthy pregnancies and good nutrition among their children. In Tanzania the nutritional status of

[26] In general, the greater effectiveness of SQ-LNS as compared to MNP in improving access to nutrients and decreasing the cost of a nutritious diet can be attributed to the fact that SQ-LNS contains both macronutrients and micronutrients and therefore also contributes to protein and energy requirements.

young children has been shown to have a close link to the nutritional status of their mothers, with stunted and wasted children more likely to have thin mothers and overweight children more likely to have overweight or obese mothers. Children of thin mothers are nearly 50 percent more likely to be stunted than children of overweight mothers (figure 53).

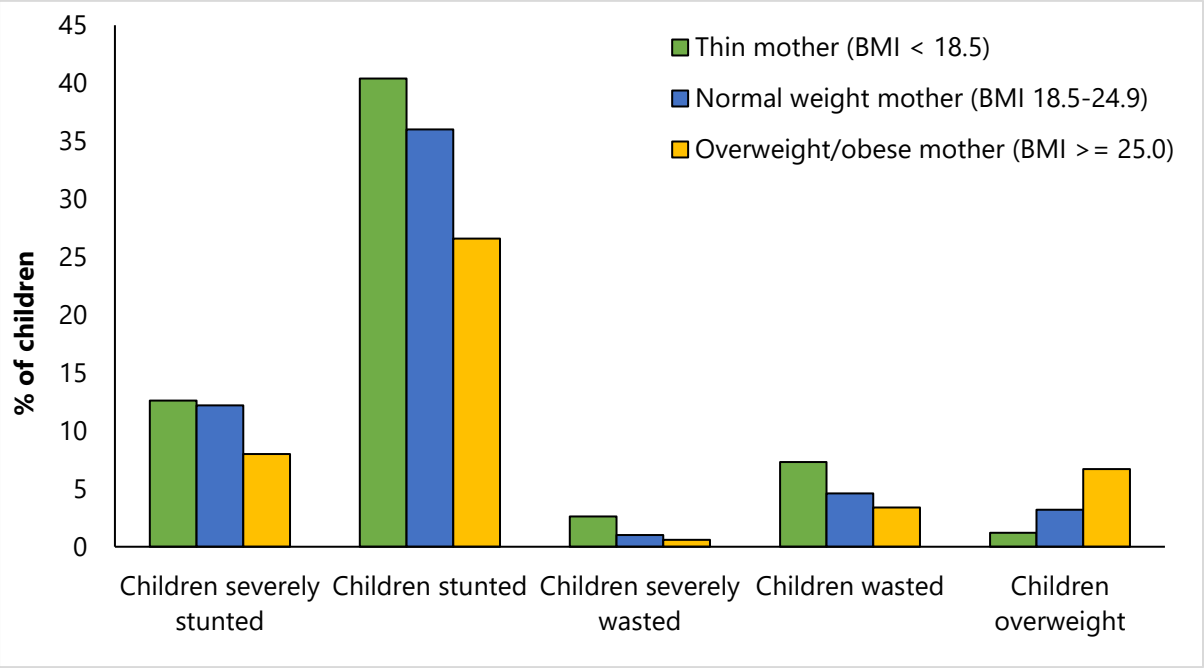


Figure 53: Nutritional status of children under 5 years, by nutritional status of mother (DHS, 2015)

In Arusha and Morogoro, a baseline survey for the Affordable Nutritious Foods for Women (ANF4W) [27] project reported that more than three-quarters of children achieved minimum dietary diversity, with over 70 percent dark leafy vegetables and over 60 percent consuming other vitamin A-rich foods. This roughly parallels consumption of different foods by women, suggesting that when foods are available to a household they are also fed to children (Smith & Kaishozi 2016).

In Arusha and Morogoro, the same study found that minimum dietary diversity for women (MDD-W) was met by three-quarters of women. Over 80 percent of women in both regions consumed dark leafy vegetables and over 75 percent consumed other foods rich in vitamin A, while 60–70 percent consumed meat or legumes (figure 54) (Smith & Kaishozi 2016).

[27] Sample size was 400 households (200 urban and 200 rural) with a woman of reproductive age (15-49 years).

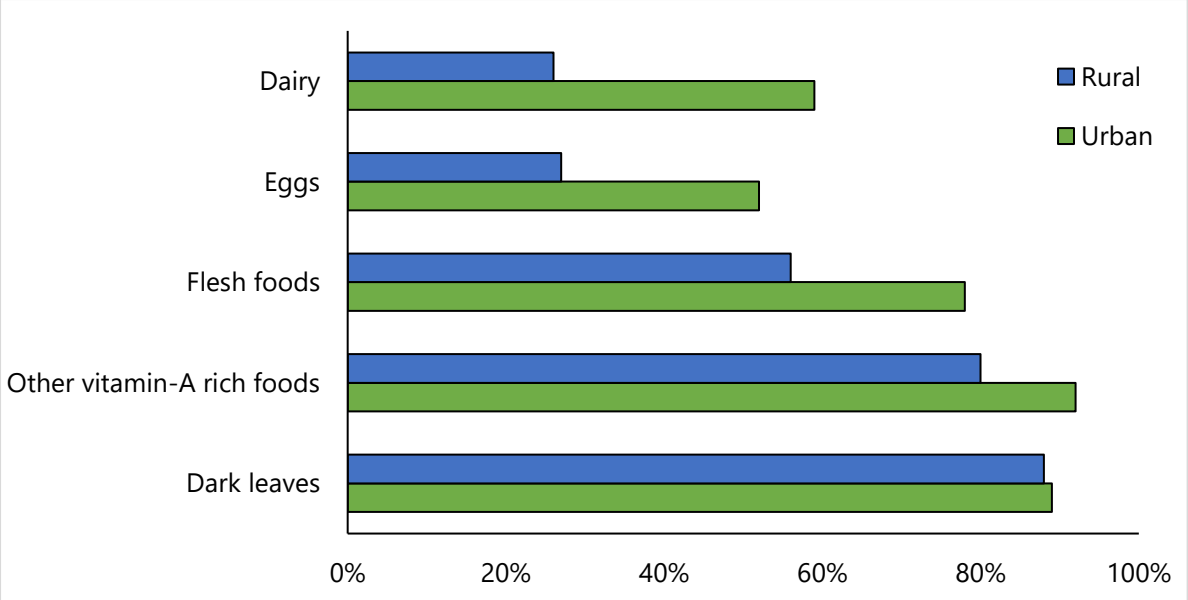
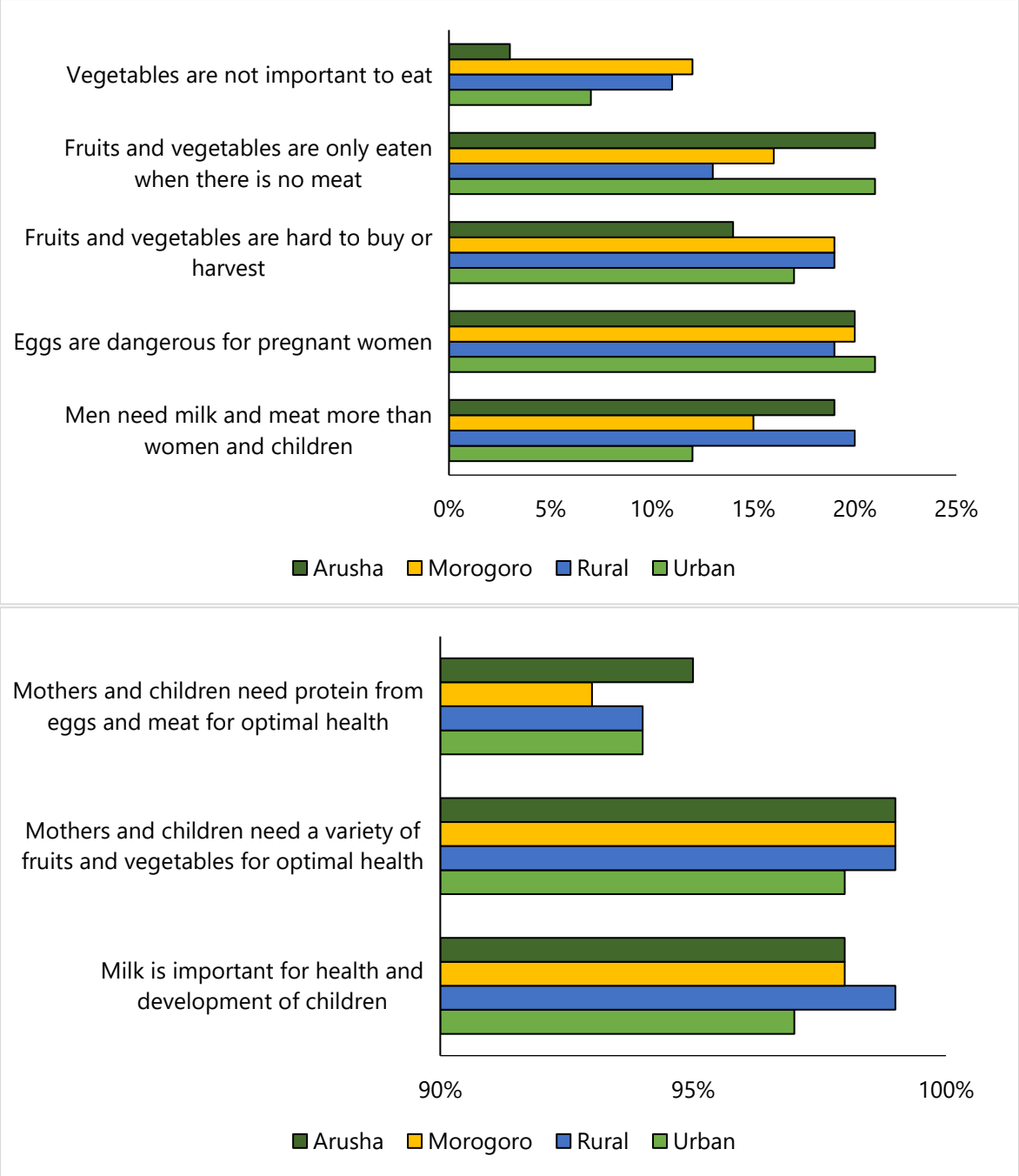


Figure 54: Women's consumption of different food groups in rural and urban areas (Smith & Kaishozi, 2016)

Although consumption of dairy products and eggs was found to be low, the ANF4W project baseline reported that nearly all respondents in the five implementation districts[28] in Arusha and Morogoro thought milk was important for children, and that fruits, vegetables and animal source foods were necessary for the health of mothers and children alike. The study concluded that in these regions consumption of animal products among women and children was likely due more to issues of access and prioritization than any cultural beliefs (figures 55–56) (Smith & Kaishozi 2016). The ASTUTE research also found that nutritious food was perceived to be expensive and therefore unaffordable, both for pregnant women and for young children (Remes et al. 2017).

[28] Districts: Mvomero, Kilombero, Morogoro Town Council, Babati Town Council, Arusha Town Council



Figures 55 and 56: Perceptions (top) and cultural beliefs (bottom) about consumption of key foods for target populations in Arusha and Morogoro, by region and urban/rural area (Smith & Kaishozi 2016)

The ASTUTE research found that women in the districts studied were unlikely to change their diets or habits during pregnancy (Remes et al. 2017). Respondents reported that this could be due to a desire to hide pregnancy for as long as possible, particularly unplanned pregnancies among adolescents, and to the belief that nutritious food is financially inaccessible (Remes et al. 2017). The practice of restricting intake to avoid a large baby or perceived difficult delivery was also reported to occur in the ASTUTE project districts (Remes et al. 2017). Moreover, women were expected to continue working as usual during pregnancy and some respondents believed that resting would lead to a difficult delivery while the "exercise" of physical labour was beneficial (Remes et al. 2017)

A very small study among Maasai women from the Ngorongoro Conservation Area found that women understood the importance of good nutrition during pregnancy, much like in the ANF4W baseline, but

that they also valued traditional practices (Lennox et al. 2017). The 12 women interviewed discussed restricting food intake during pregnancy to have a smaller baby and an easier delivery, and in particular not consuming certain dairy products, eggs, meat, or sweet foods. They reported that mothers-in-law and community elders monitor the diets of pregnant women to ensure that they adhere to the restrictions and taboos. Moreover, during pregnancy the women continued to eat last in the household as usual (first the man, then the children eat) and they actually increased their workloads in anticipation of their traditional three-month rest period postpartum. Despite this, and despite their preference for traditional birth practices, the women did indicate that good diets and sufficient rest were important during pregnancy (Lennox et al. 2017)

Social and behaviour change communication (SBCC) frequently targets husbands/fathers, mothers-in-law, siblings and other extended family as key influencers on feeding practices. ASTUTE reports that, in the five districts where formative research was carried out, men control household finances and therefore food choices and purchases, and that even when women are informed about nutritional needs during pregnancy and postpartum, men's lack of awareness may act as a barrier to adequate nutrient intake among women (Remes et al. 2017).

Despite the fact that women are often less prioritised for food intake within the household, lactating women and adolescent girls usually are the most expensive individuals in the five-person household used for CotD modelling (figure 57). Both of these individuals have high nutrient requirements, due to the lactating woman needing to produce breastmilk that contains the nutrients her child needs for adequate growth, and due to the adolescent undergoing rapid growth and development with the particular needs of menstruation. Together, the lactating woman and the adolescent girl comprise 60 percent of the cost of a nutritious diet for the five-person household. Individually, both have higher nutrient requirements than an adult man and therefore a higher cost for a nutritious diet, between TSH 1,600—1,700 per day for each of them.

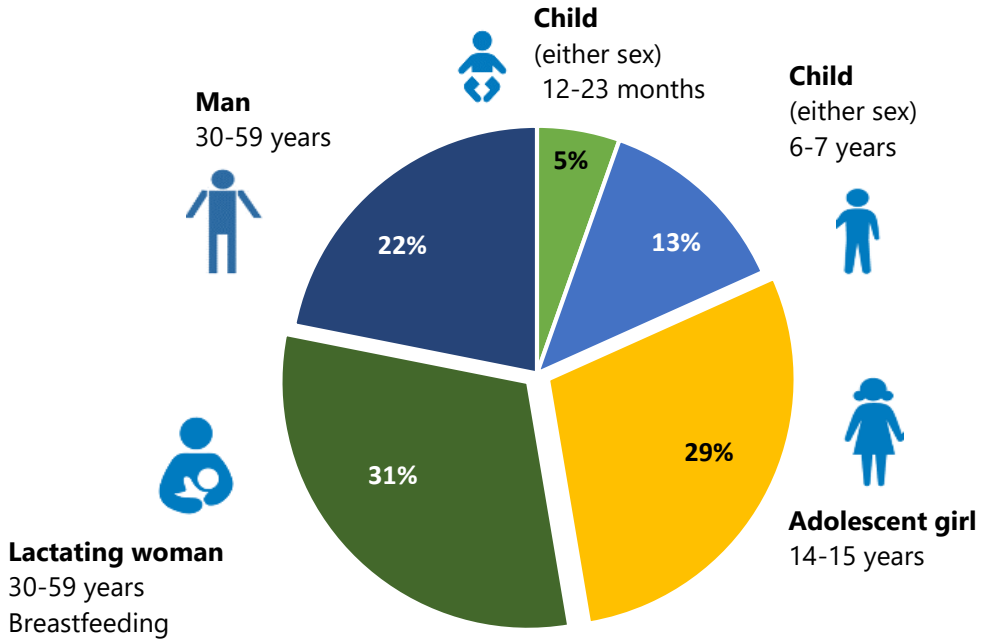


Figure 57: Percentage of the total cost of a nutritious diet for a five-person household, by household member

The nutritional vulnerability of adolescent girls is exacerbated by early pregnancy and childbearing, which effectively combines the high nutrient requirements of adolescence with those of pregnancy and lactation. This is a concern in Tanzania, as the 2015 DHS found that half of all women ages 20–49

had begun childbearing by the age of 20, and one quarter of adolescent girls aged 17 at the time of the survey had already given birth at least once (Ministry of Health, Community Development, Gender, Ministry of Health Zanzibar, et al. 2016). At the regional level, adolescent childbearing was highest in Tabora and Katavi, at more than 40 percent of girls age 15–19 (figure 58).

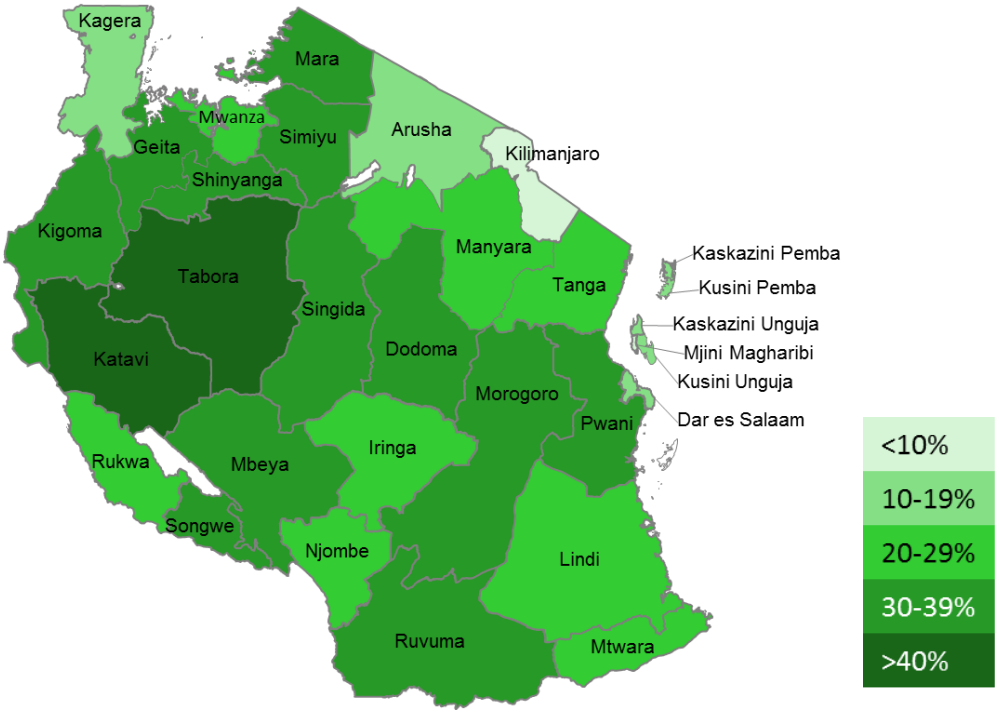


Figure 58: Percentage of adolescent girls ages 15-19 who have begun childbearing (currently pregnant or have already given birth) (DHS, 2016)

The increased nutrient needs and thus cost of meeting these needs for pregnant or lactating adolescents was demonstrated using CotD. When an adolescent girl is pregnant, the cost of a nutritious diet that meets her needs increases by seven percent, and when she is lactating it increases by 15 percent.

The impact of a multi-micronutrient tablet (MMT) on access to nutrients among adolescent girls and lactating women was modelled using CotD, with the MMT provided in-kind or with a voucher. In the regions modelled, the MMT led to on average a 30 percent reduction in the cost of a nutritious diet for the adolescent girl and a 22 percent reduction in the cost for the lactating woman (figure 59). In Rukwa, the reduction from MMT was as high as 50 percent for the adolescent girl and over 40 percent for the lactating woman. Along with a basic nutritious diet, the MMT's impact was also compared to the cost of a nutritious diet with fortified maize available on the market at the household level. The average decrease with fortified maize was ten percent for the adolescent girl and 18 percent for the lactating woman, but this encompassed a range of five percent or less for both the girl and the woman in six regions and three regions with an impact of more than 15 percent for the girl and at least 20 percent for the woman.

The MMT had, on average, an impact of 20 percentage points more than the fortified maize for the adolescent girl, but only 4 percentage points more for the lactating woman (figure 59). This highlights not only the specific nutrient needs of the adolescent girl, but more generally the importance of targeted interventions to meet the needs of specific household members.

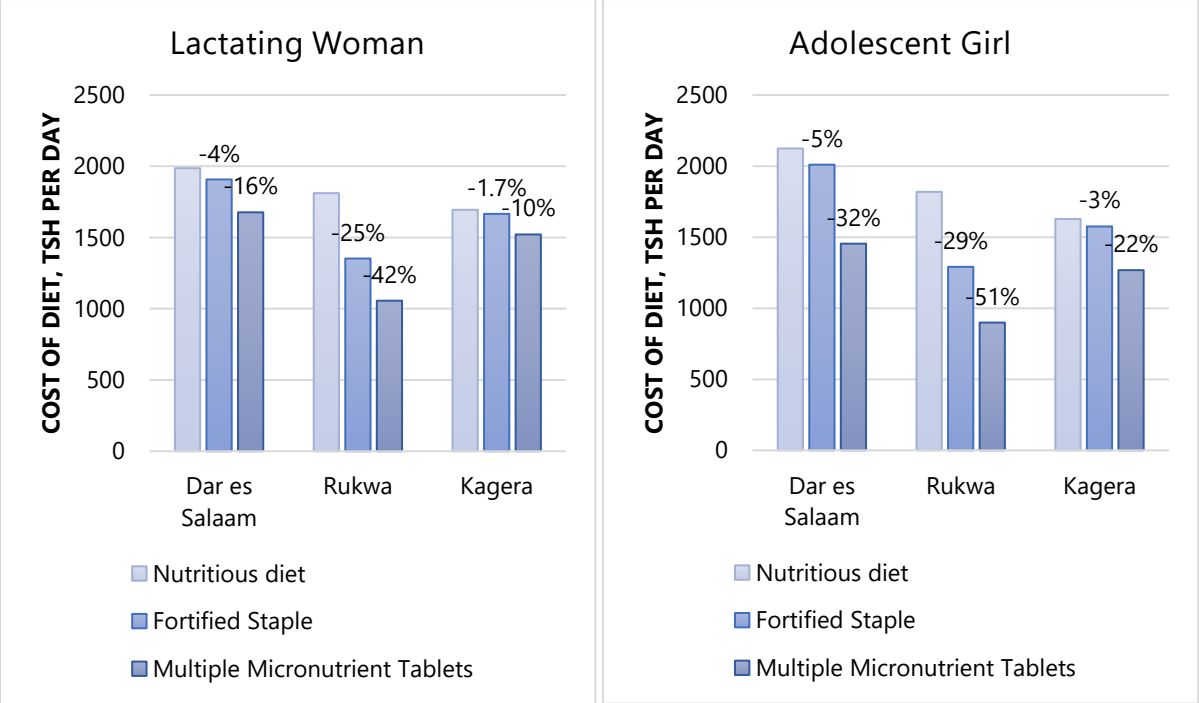


Figure 59: Average daily cost of a nutritious diet for an adolescent girl, a pregnant adolescent and a lactating adolescent

Key message 9: Context-specific interventions have great potential to improve the affordability of a nutritious diet.

In addition to individual interventions targeting either the household at large or one specific household member, interventions were combined into packages to model even greater possible impact. This package relies upon multiple sectors and systems that impact nutrition, including health, social protection and the private sector. Nutrition-specific interventions targeting the three most nutritionally vulnerable members of the household were combined with staple food fortification and a cash transfer that could be delivered by a social safety net to maximise the benefits to the family.

Without the cash transfer, the combination of SQ-LNS (in-kind) for the child under 2, MMT (in-kind) for the PLW and for the adolescent girl, and fortified maize (on the market) for the household was found to decrease the cost of a nutritious diet for the household by an average of 20 percent, ranging from 12–39 percent (Mtwara and Rukwa, respectively) across the regions modelled (figure 60).

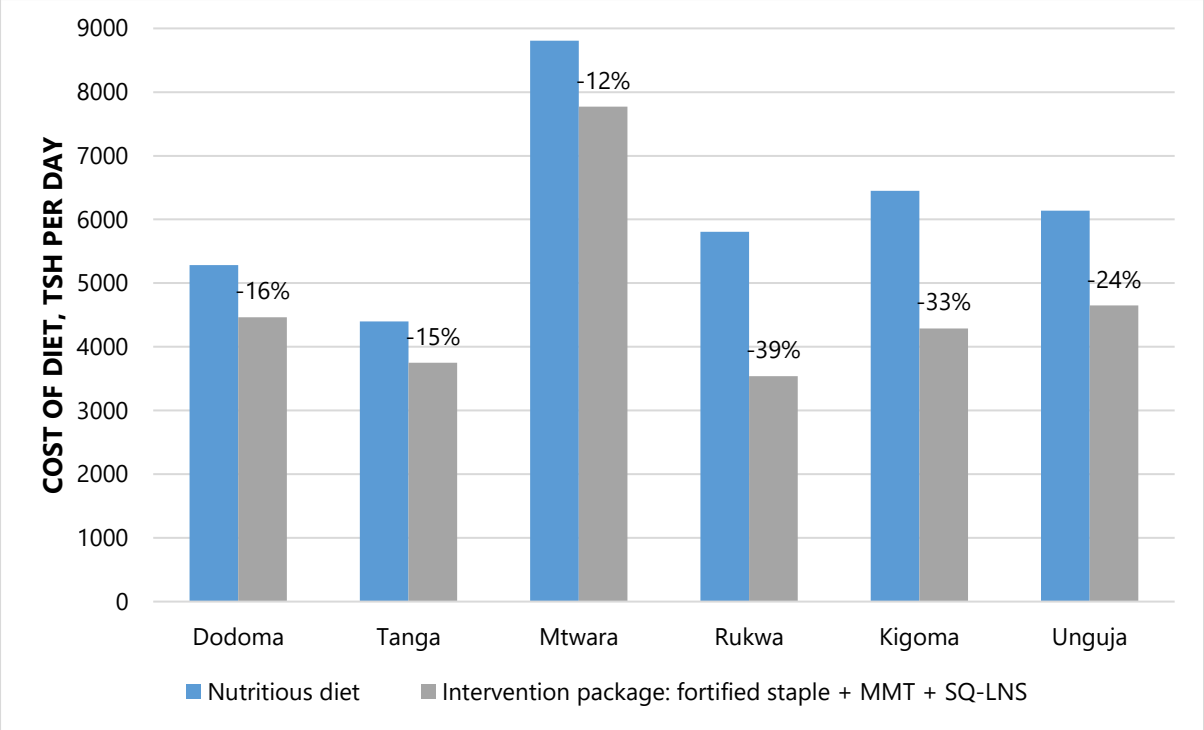


Figure 60: Average daily cost of a nutritious diet for the modelled five-person household, without and with a package of interventions for the household and vulnerable individuals

The package of combined interventions decreased non-affordability of a nutritious diet by, on average, 13 percentage points in the modelled regions. Although the impact was limited in some regions with high non-affordability such as Dodoma, where non-affordability of 66 percent decreased only to 59 percent with the package of interventions, the contribution of these nutrition-specific and nutrition-sensitive interventions was much greater in regions such as Kusini Unguja or Kigoma, where non-affordability dropped from 67 percent to 45 percent and from 79 percent to 60 percent respectively (figure 61).

In contrast, market availability of fortified staples and nutrient-dense kitchen gardens were less effective at improving the affordability of a nutritious diet (figure 61). Fortified staples purchased at market price resulted in a decrease in non-affordability of an average of 7 percentage points across the modelled regions. A kitchen garden decreased non-affordability by the same amount or less than fortified staples, only 3–10 percentage points across the regions. Despite the inclusion of nutrient-dense crops and eggs, small-scale home production likely does not yield the quantities of nutritious foods needed to significantly improve nutrient intake at the household level.

Besides improving access to nutrient-dense foods and supplements, increased economic access is another strategy that can improve the affordability of a nutritious diet through social protection mechanisms such as a cash transfer. Monthly cash transfers of TSH 25,000 and TSH 35,000 to the household were modelled and contrasted with the package of nutrition interventions described above. Across regions, the impact of the cash transfers in relation to the intervention package varied; in some regions, non-affordability decreased more with the package than with even the larger cash transfer (including Dar es Salaam, Kigoma, Rukwa and Kusini Unguja), while in other regions the added income was a more effective way to improve access to a nutritious diet (including in Tanga, Morogoro and Kagera) (figure 62). These differences likely relate to the availability (or lack thereof) of nutritious foods on local markets: where nutritious foods are available but expensive, a cash transfer can be put to good use, but if those foods are not available, nutrient needs must be met in the short-term through provision of specialised foods or supplements.

Finally, the intervention package was combined with the cash transfers to maximise the potential decrease in non-affordability of a nutritious diet. With both the larger cash transfer of TSH 35,000 and the package of nutrition interventions, non-affordability decreased by 28 percentage points on average across the regions modelled (figure 63). The greatest improvements were in Rukwa and Kusini Unguja, where non-affordability decreased from 67 percent to 21 percent and 22 percent, respectively.

Although modelling the impact of cash transfers highlights the barrier that economic access poses to adequate nutrient intake, it should be noted that the model relies upon two basic assumptions: 1) all of the cash provided is spent on food, and 2) cash is provided to all households that cannot afford a nutritious diet. The second assumption is especially important in contexts where the percentage of households who cannot afford a nutritious diet is higher than a government social protection scheme could be expected to cover. In contexts where nutritious foods are available, cash transfers may need to be accompanied by targeted SBCC interventions to raise awareness around these foods and the benefits of purchasing and consuming them.

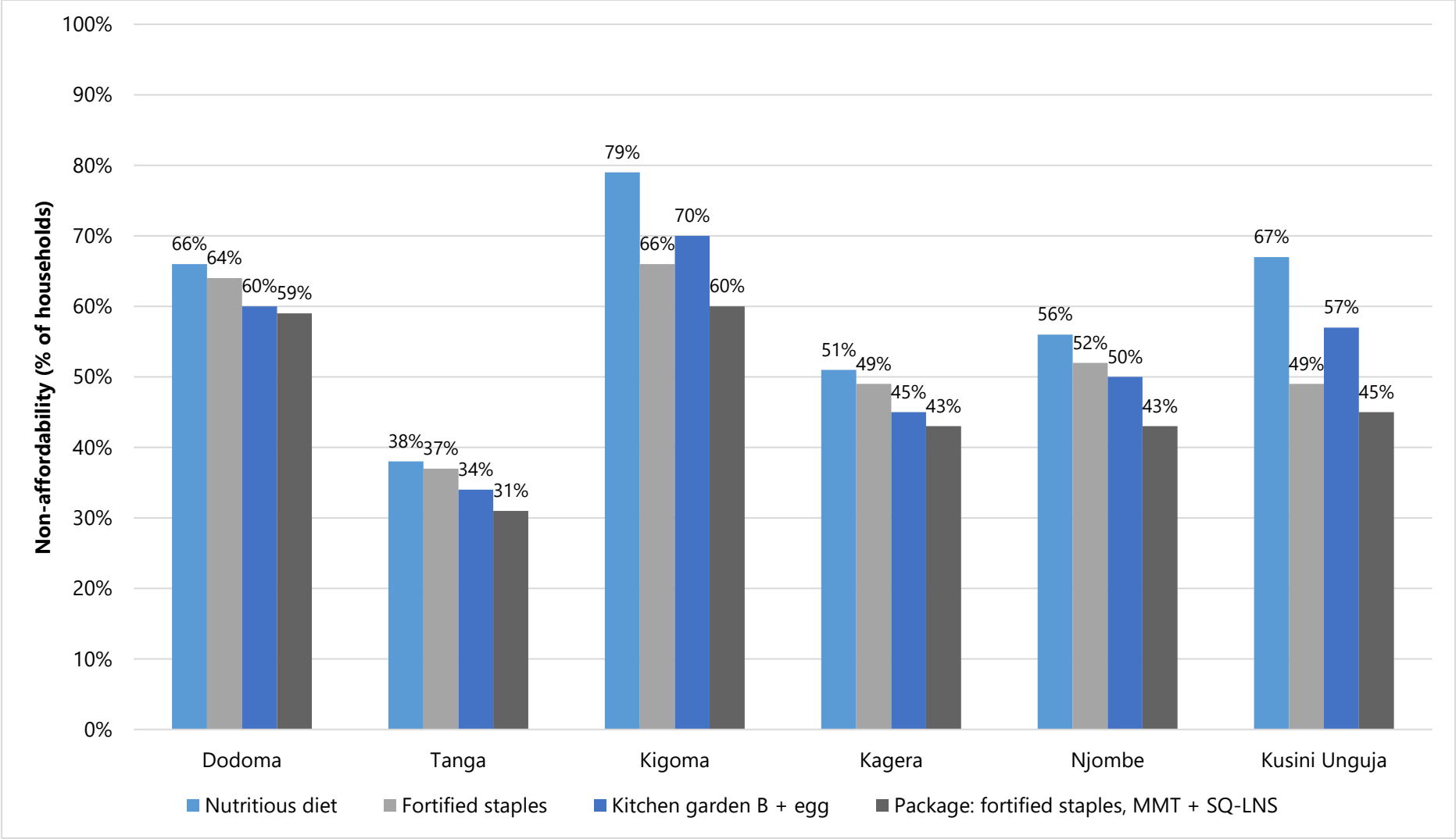


Figure 61: Percentage of households that cannot afford a nutritious diet in selected regions, without and with fortified staples purchased on the market, a kitchen garden with nutrient-dense crops and egg production, and a package of interventions combining fortified staples, MMTs and a small-quantity lipid nutrient supplement provided in-kind to the child 12–23 months of age.

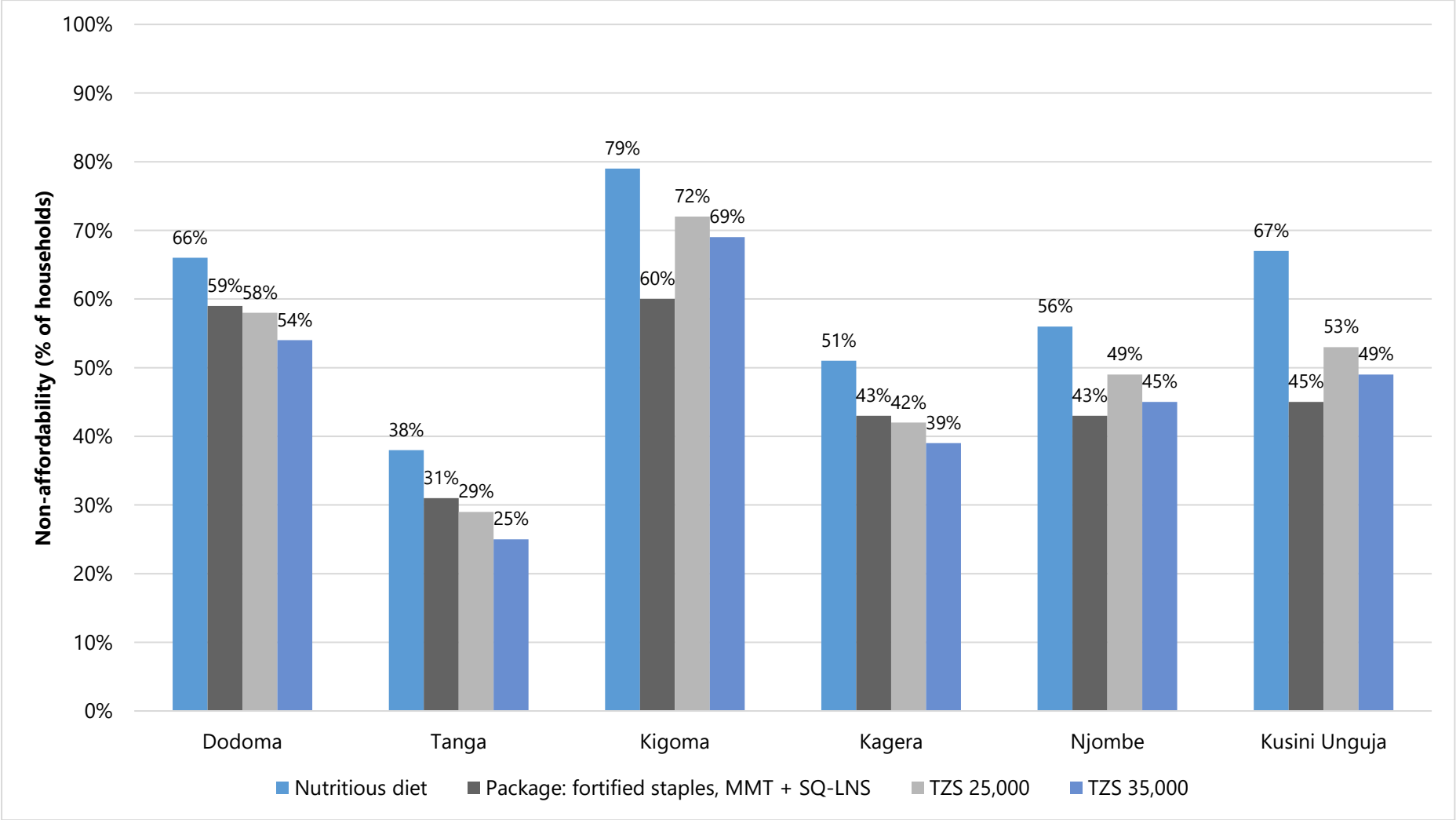


Figure 62: Percentage of households that cannot afford a nutritious diet in selected regions, without and with a package of interventions combining fortified staples, MMTs and a small-quantity lipid nutrient supplement provided in-kind to the child 12–23 months of age; and cash transfers to the household of TSH 25,000 or TSH 35,000 per month.

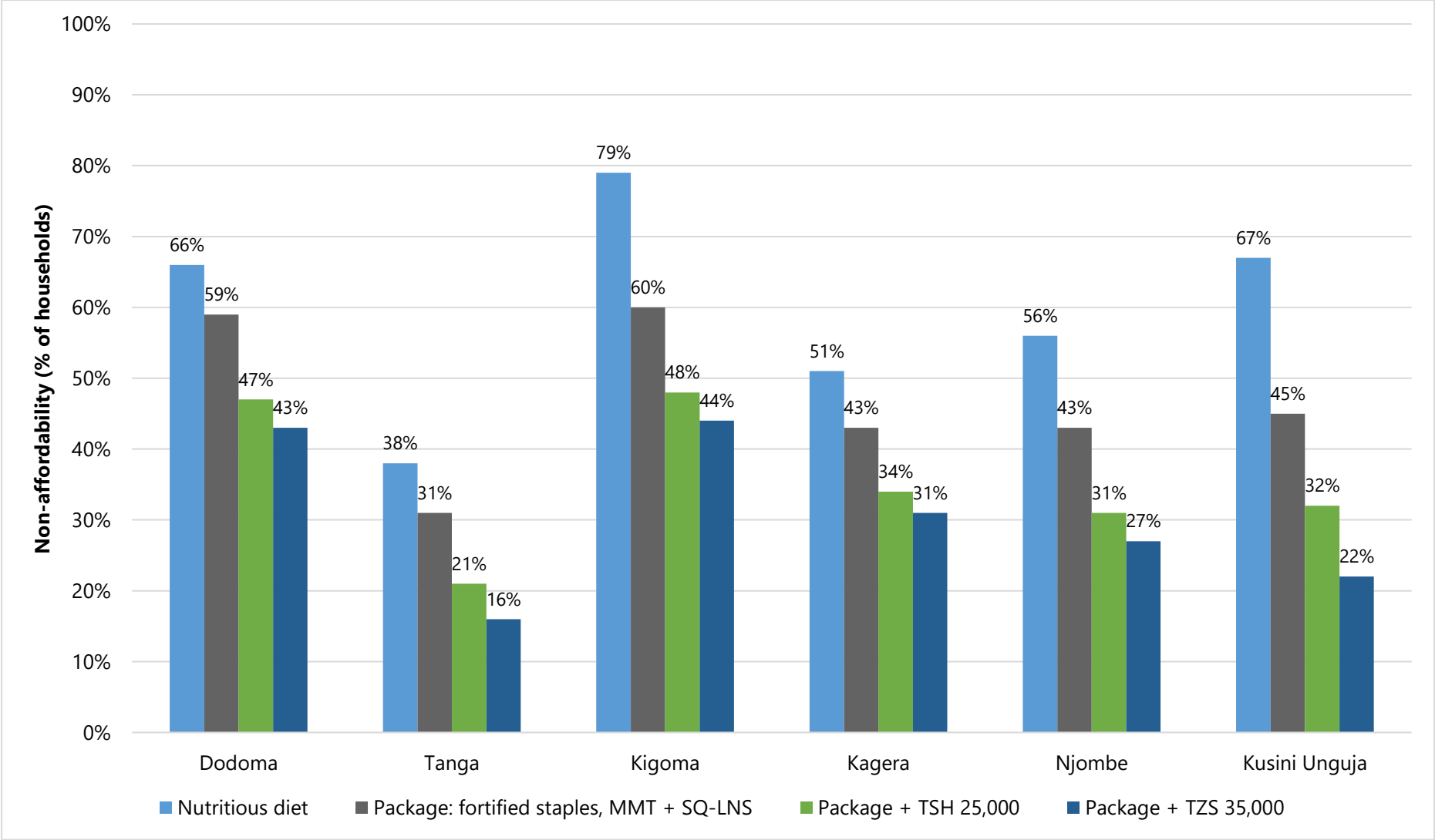


Figure 63: Percentage of households that cannot afford a nutritious diet in selected regions, without and with a package of interventions, and the package with cash transfers to the household of TSH 25,000 or TSH 35,000 per month.

Recommendations

The main findings of the analysis were shared and discussed with national stakeholders from different sectors of the government, UN agencies, development partners, NGOs and academia in August 2017. Working groups were formed to develop a prioritized set of recommendations based on these findings, which could contribute to improving dietary intake for the key target groups in Tanzania.

The following sectors and entry-points were identified for the formulation of complementary policy and programmatic strategies:

1) **Health**
2) **Social Protection**
3) **Social and Behaviour Change Communication (implementation by multiple sectors)**
4) **Agriculture**
5) **Food value chains: Private Sector and Fortification**

Health

A. **Support for exclusive breastfeeding for women in the formal sector:** The findings demonstrated that exclusive breastfeeding is low, particularly up to 4–5 months. The results also demonstrated the economic benefits of breastfeeding. In order to promote breastfeeding, mothers who are engaged in the formal employment sector need to have an environment that facilitates this through maternity leave (extend from 3 to 6 months) and breastfeeding-friendly work environments. Increasing rates of urbanisation and rural-urban migration highlight the need for strong workplace policies supporting breastfeeding.

   Key stakeholders: Ministry of Health, Ministry of Labour, private sector

   Key steps: Ministry of Labour and private sector champions to be engaged to start considering review of the national and company-specific maternity protection policies.

B. **Support for optimal infant feeding for women in the informal sector:** Women working in the domestic or informal environments often face barriers of time and economic access to proper breastfeeding and complementary feeding. Efforts to improve household economic status and promotion of income generating activities that are gender-sensitive should be implemented so as to reduce, rather than contribute to, women's workload. Comprehensive SBCC can then support the reallocation of time and domestic labour, in part towards improvement of care, breastfeeding and complementary feeding practices. Cost of the Diet analysis has also shown the additional economic benefits to the household of adequate breastfeeding, which is the cheapest way to meet the nutrient requirements of young children. This is especially important for poorer households, whose members are more likely to be engaged in informal sector employment.

   Key stakeholders: Ministry of Health, Ministry of labour and Tanzania Food and Nutrition Centre

   Key steps: Work with district nutrition officers to organise community engagements on breastfeeding, targeting key influencers, i.e. men and grandmothers. Additionally, work with existing community structures through the local government authorities to mobilise and target men and grandmothers with key IYCF messages, as they are as key influencers on women's breastfeeding decisions.

C. **Promote appropriate food-based approaches for complementary feeding, pregnant and lactating women, adolescents and other nutritionally vulnerable groups:** The analysis showed that complementary feeding practices are inadequate nation-wide. Key drivers include economic access to nutrients, availability of nutritious and/or fortified foods and lack of awareness of good complementary feeding practices. In order to improve consumption in the home it is important to encourage households to grow nutrient-dense foods and appropriately prepare nutrient dense foods, including animal products, for key target groups. Agriculture needs to work with health to ensure that households have the inputs and knowledge they need to produce these foods. SBCC is required to create demand to produce these foods, as well as to prepare and consume them appropriately. Linked to NMNAP thematic areas 1 and 5.

Key Stakeholders: Ministry of Health, Ministry of Agriculture, research institutions and development partners.

Key Steps: Put this focus to the thematic working groups of the NMNAP. Propose and implement a strategy for the scale up of nutrition sensitive agriculture at the community level. Advocate for the scale up of the SBCC kit utilisation. Look into reducing the cost of producing and using the SBCC kit. Promote inter-sectoral coordination on MIYCAN messaging.

Social Protection

A. **Support upcoming redesign of the Productive Social Safety Net (PSSN) to strengthen nutrition-sensitive components:** Economic access to an adequately nutritious diet is a struggle for almost 60 percent of households across the country. Using the results of the FNG analysis to inform the upcoming development of the new social protection strategy could improve the ability of TASAF beneficiaries to meet their nutrient needs.

Key information provided by FNG includes:

a. the cost of meeting nutrient requirements *(to evaluate adequacy of transfer value);*

b. the proportion of households that cannot afford to meet their nutrient needs based on their current food expenditure (*estimate the proportion of households that need income support and propose selection criteria);*

c. cost-efficient options to reduce cost of meeting nutrient requirements, especially for key vulnerable groups *(consider adding an in-kind / voucher option for specific nutritious foods for key target groups)*; and

d. the need for complementary SBCC messages to ensure optimal choices for nutrition within a household's means.

Key stakeholders: Tanzania Social Action Fund, Prime Minister's Office, Tanzania Food and Nutrition Centre, President's Office–Regional and Local Government

Key steps are to:

- identify the composition of the team that is developing the new strategy (particularly government officials involved);
- use FNG results to inform TASAF and stakeholders, particularly to affirm the importance of current conditional cash transfers in helping families to access nutritious diets as well as to develop ways for the new design to be even more nutrition-sensitive; and
- develop a specific document on social protection using the FNG analysis to inform the continuing design process.

B. **Increase awareness and knowledge about the importance of adequately nutritious diets:** Pay points that are currently used for messaging on compliance with conditions of TASAF cash transfers can be leveraged for SBCC interventions.

   Key stakeholders: Tanzania Food and Nutrition Centre, Ministry of Health, Tanzania Social Action Fund, Prime Minister's Office, President's Office–Regional and Local Government

   Key steps: Identify additional pilot zones where TASAF pay points can be used to introduce SBCC interventions about nutrition and adequately nutritious diets. Identify existing government tools and large-scale SBCC programmes that are already ongoing in order to coordinate future efforts.

C. **Improve coordination and connection between social protection programmes and the nutrition sector:** In addition to TASAF, a number of NGO social protection programmes exist, and would benefit from improved coordination mechanisms. The national multi-sectoral technical working group for nutrition, in which TASAF participates, would provide a good platform for encouraging strong working relationships between social protection and nutrition.

   Key stakeholders: Tanzania Food and Nutrition Centre, Tanzania Social Action Fund, Prime Minister's Office, President's Office–Regional and Local Government and actors at the decentralised level

   Key steps: Organize, possibly at the decentralised level – zone or district – to bring together nutrition stakeholders to target TASAF beneficiaries and those households who are eligible but not yet covered under the PSSN

Social and Behaviour Change Communication

A. **Engage men and women to sharing decision-making responsibilities and household workloads:** IYCF is inadequate, contributing to high rates of undernutrition even in areas with good geographic availability of and access to a range of foods. Increasingly, women are responsible for both household and caring duties and income generating activities outside of the home, with the result that they have insufficient time to prepare appropriate foods and feed young children, and that children are with other family members or caregivers while their mothers are out. Knowledge of appropriate practices may also be lacking among caregivers. Community-level SBCC and education interventions should be implemented through existing platforms including radio, mobile technology, social media, theatre groups and existing TASAF cash transfer points.

   Key Stakeholders: Community leaders, religious leaders, local government, community-based organisations, village health committees, community health workers, agricultural extension workers and dance and theatre groups

   Key Steps: The Prime Minister's Office should ensure that implementation of SBCC around this messaging is in the President's Office–Regional and Local Government nutrition unit's work plan and in council work plans. The nutrition officer at the council level will be responsible for supervising implementation of this messaging in villages in her district.

B. **Promote increased dietary diversity at the household level:** In many areas, consumption of locally available and diverse foods is low, and increased awareness about the importance of dietary diversity could contribute to improved nutritional status. Community-level SBCC and education interventions should be implemented through existing platforms including radio, mobile technology social media, theatre groups and existing TASAF cash transfer points.

   Key stakeholders: Community leaders, religious leaders, local government, community-based organisations, village health committees, community health workers, agricultural extension workers and dance and theatre groups

Key steps: President's Office–Regional and Local Government should support district nutrition officers and council nutritionists to include SBCC interventions about the importance of dietary diversity in their council comprehensive health plans.

C. **Food prohibitions may negatively impact the nutritional status of the most vulnerable household members:** Further research is required to better understand food restrictions and how to effectively design messaging around them. However, small-scale evidence and insights from stakeholders suggest that women and children may consume animal-source foods less frequently than men do. Increased awareness of the importance of a diversified diet for all household members, and in particular the high nutrient requirements at different stages of the life cycle, is needed to promote improved consumption, especially among pregnant and lactating women, adolescent girls and young children.

   Key stakeholders: Community leaders, religious leaders, local government, community-based organisations, village health committees, community health workers, agricultural extension workers and dance and theatre groups

   Key steps: Community-level SBCC and education interventions should be implemented through existing platforms including village health committees, community health workers, mobile technology, radio, social media, theatre groups and existing TASAF cash transfer points.

D. **Promotion of nutritious and age-appropriate foods:** Given the increasing rates of overweight and obesity among women and the concern about future impacts on children, strong SBCC will be key to minimizing the double burden of malnutrition in Tanzania. In addition to policy and regulatory measures to ensure the appropriate labelling of foods marketed toward young children (i.e., clear distinctions between age-appropriate, nutrient-dense complementary foods and snack foods for general consumption), community-level interventions are needed to increase understanding and awareness among caregivers regarding nutritious food choices for young children. SBCC campaigns implemented through existing local platforms could be combined with cooking demonstrations in order to simultaneously encourage consumption of nutrient-dense and age-appropriate foods and to discourage giving snack foods with high energy content and low nutrient content to young children.

   Key stakeholders: Community leaders, religious leaders, local government, community-based organisations, village health committees, community health workers, agricultural extension workers and dance and theatre groups

   Key steps: Community-level SBCC and education interventions should be implemented through existing platforms including village health committees, community health workers, mobile technology, radio, social media, theatre groups and existing TASAF cash transfer points

E. **Preparation of children's food to maximise nutrient intake:** Small-scale studies have found that young children often consume the same foods as the rest of the household and that their food is not usually prepared separately or put on a different plate. Because young children require very nutrient-dense food to meet their high requirements, it is very difficult to meet their needs through household foods; usually, special fortified foods are necessary. As such, increased awareness among caregivers is crucial to improving the nutritional status of young children through separate preparation of foods that meet their nutrient needs and/or addition of micronutrient supplements to family foods. SBCC campaigns implemented through existing local platforms could be combined with cooking demonstrations to improve understanding of foods and how to best prepare them to meet requirements of young children.

   Key stakeholders: Community leaders, religious leaders, local government, community-based organisations, village health committees, community health workers, agricultural extension workers and dance and theatre groups

Key steps: Community-level SBCC and education interventions should be implemented through existing platforms including village health committees, community health workers, mobile technology, radio, social media, theatre groups and existing TASAF cash transfer points.

Agriculture

A. **Linking agricultural stakeholders with nutrition:** How to better engage this sector that might not have direct interest in nutrition but plays a central role in improving dietary intake.

B. **Climate-smart agriculture and nutrition:** Agriculture should consider the impact of climate change and how this will impact the availability of crops in the future. Climate-smart agriculture tends to focus on crops that are able to withstand droughts and other shocks, but also needs to begin considering the nutrient value of hardy crops. Farmers should have access to inputs, technology and training on growing methods to produce crops that will be able to withstand climate change and thus be viable in the future.

C. **Value Chain considerations to ensure a stable supply of safe, nutritious foods:** Increase production of micronutrient rich foods, through horticulture (vegetables, fruits), small livestock and through bio-fortification. The rural poor have low dietary diversity, so improving their own production of micronutrient rich foods could help improve their dietary intake.

D. **Promote diversified home gardening of micronutrient-rich foods for improved household nutrition:** Rural poor have low dietary diversity, so improving their own production of micronutrient rich foods could improve their dietary intake, as this is an important source of food for most Tanzanian households. Cost of the Diet modelling results demonstrate that access to nutrients is better in a household that grows crops that are richer in micronutrients as compared to a household that grows micronutrient-poorer crops. Inclusion of bio-fortified crops and small livestock rearing can produce additional gains.

   Agricultural extension initiatives should incorporate messaging related to the choices of crops and their potential impact on household nutrient intake. Since women compose the majority of smallholder farmers and are also responsible for the bulk of food preparation, women should be considered a key target group for this type of messaging.

   Access to inputs and technologies, in particular seeds, fertilizers, irrigation and credit, should be available, possibly through private sector consortia that specialise in catering to the needs of smallholders.

   Key Stakeholders: Private sector (seed companies) and Government (Ministry of Agriculture), development partners and non-governmental organisations

   Key Steps: Need to increase the distribution of vines and seeds to grow bio-fortified crops such as iron-rich beans, orange flesh sweet potato, pro-vitamin A maize. This could be done by providing tax exemptions to the private sector to produce and distribute seeds. Subsidies should be provided to research institutions to further research into bio-fortification. Agricultural Extension workers should help to stimulate demand for and knowledge of bio-fortified crops and micronutrient rich foods.

Food Value Chains – Private Sector and Fortification

A. **Increase consumption of adequately fortified foods:** In Tanzania the consumption of fortified foods is low and availability of fortified maize flour is limited. Fortification of staple foods can help to improve access to nutrients for the general population and the results from FNG showed how effective this could be helping to improve accessibility. This links to NMNAP thematic area 2.

Key Steps: Review food fortification regulations. Enforce the regulations through TFDA and local councils to ensure quality control and quality assurance. There is already a tax exemption in force for the premix, but more could be done to incentivise millers to take this approach, in particular through education and training of millers. Awareness needs to be raised of the benefits of fortification among both millers and consumers. There should be a focus on engaging both large and medium scale millers. In addition to this, other vehicles for fortification should be considered such as sugar.

Key Stakeholders: Government, private sector (particularly millers), non-governmental organisations and development partners

B. **Develop and produce locally fortified complementary foods for sale in markets:** These foods provide a cost-effective way to improve access to required nutrients for young children (6–23 months) and complement the nutrients obtained from breastfeeding and the children's share in the family diet, especially when the family diet is largely based on staple foods and has limited diversity.

Key Stakeholders: Ministry of Health, Ministry of Trade, Private sector (Scaling Up Nutrition Business Network) and Tanzania Food and Nutrition Centre

Key steps: Review and strengthen standards for safe nutritious fortified complementary foods and complementary food supplements for 6–23-month-old children and guidance on its appropriate promotion. Develop strategies to stimulate supply (production and distribution, including through markets) and demand (marketing as well as ensuring access for the poorest, e.g. vouchers / in-kind distribution linked to social protection schemes).

C. **Improve use and distribution of Micronutrient Powders (MNP) for children 6–59 months:** It is important to ensure children have nutrient dense foods and MNP can be used to home fortify complementary foods.

Key Stakeholders: Private sector and Government (especially Ministry of Health), development partners and non-governmental organisations

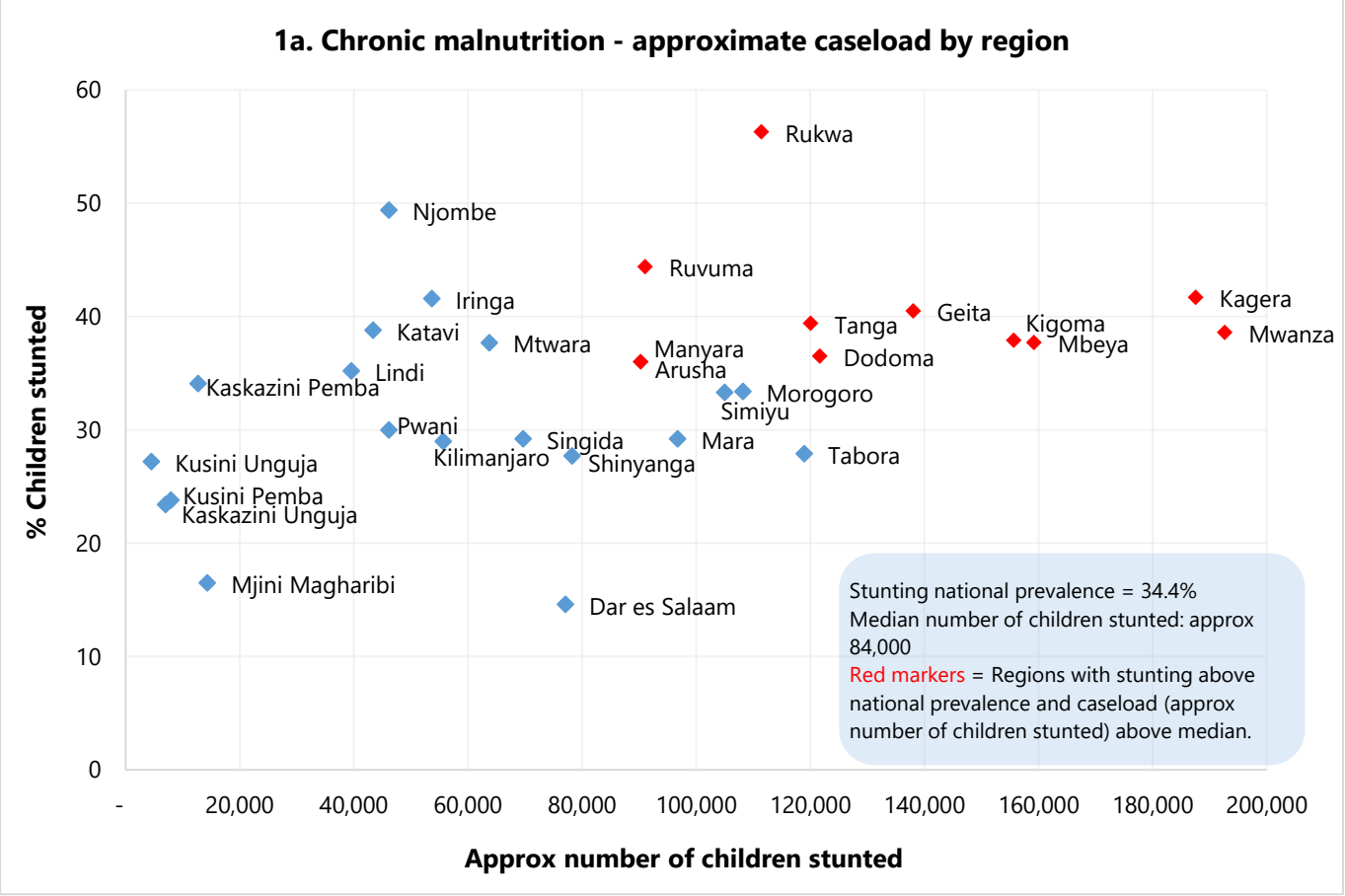
Key Steps: Improve demand from consumers and raise awareness through SBCC (delivered through community health workers) to ensure compliance. Need collaboration between public and private sector on demand creation strategies. Price segmentation could help to stimulate demand by selling it at a lower price for the poorest (can be by region or by providing vouchers through social protection schemes). In addition to demand it is important ensure there is supply. One possible way to ensuring this is to include MNPs in the list of essential medicine list. Another way is to distribute it through market channels. A strong monitoring system is required.

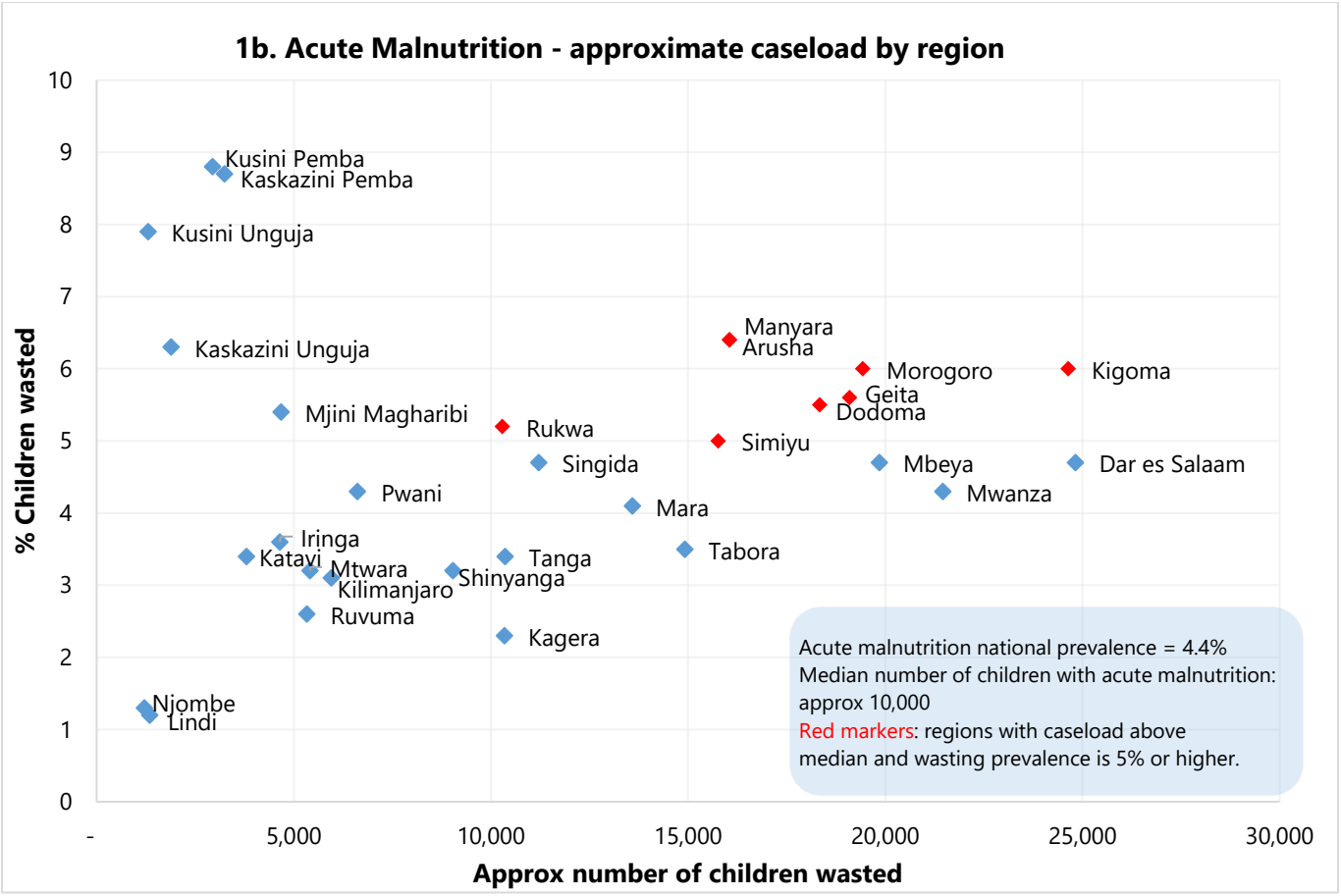
Annex 1

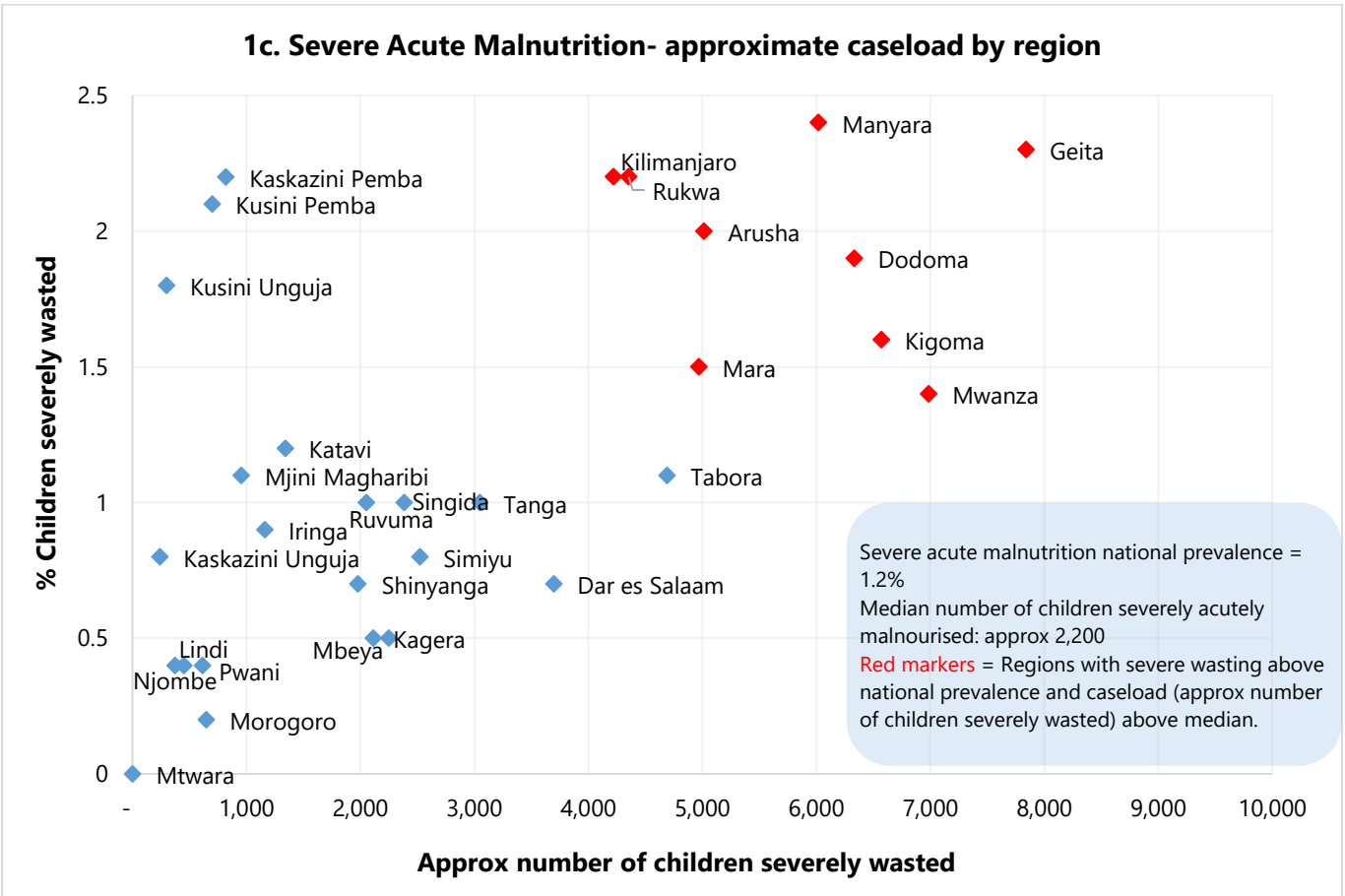
Annex 1a-c: Malnutrition caseload estimates

Approximate caseloads by region for chronic malnutrition (1a), acute malnutrition (WHZ <-2.0, 1b) and severe acute malnutrition (WHZ <-3.0, 1c) were calculated using the regional prevalence of each type of malnutrition (as per 2015 DHS survey) and the most recent estimate of population by region. Population data is sourced from the census 2012, which provides a total population figure and the proportion of population aged 0–4 years. The figures presented here are only approximate due to a number of factors, including the mismatch in data collection years for population census and DHS survey, the influence of high population growth rates and the inclusion of children 0–5 months in population data.

Red markers indicate regions where malnutrition prevalence is above national prevalence (or international thresholds) and estimated number of children affected is above the median.




1b. Acute Malnutrition - approximate caseload by region
% Children wasted
Approx number of children wasted
Kusini Pemba
Kaskazini Pemba
Kusini Unguja
Kaskazini Unguja
Mjini Magharibi
Pwani
Iringa
Katavi
Mtwara
Kilimanjaro
Ruvuma
Njombe
Lindi
Rukwa
Singida
Tanga
Shinyanga
Kagera
Manyara
Arusha
Morogoro
Geita
Dodoma
Simiyu
Mara
Tabora
Kigoma
Mbeya
Mwanza
Dar es Salaam
Acute malnutrition national prevalence = 4.4%
Median number of children with acute malnutrition: approx 10,000
Red markers: regions with caseload above median and wasting prevalence is 5% or higher.


1c. Severe Acute Malnutrition- approximate caseload by region
% Children severely wasted
Approx number of children severely wasted
Kaskazini Pemba
Kusini Pemba
Kusini Unguja
Katavi
Mjini Magharibi
Iringa
Kaskazini Unguja
Njombe
Lindi
Pwani
Morogoro
Mtwara
Singida
Ruvuma
Tanga
Shinyanga
Simiyu
Mbeya
Kagera
Dar es Salaam
Manyara
Geita
Kilimanjaro
Rukwa
Arusha
Dodoma
Kigoma
Mara
Mwanza
Tabora
Severe acute malnutrition national prevalence = 1.2%
Median number of children severely acutely malnourised: approx 2,200
Red markers = Regions with severe wasting above national prevalence and caseload (approx number of children severely wasted) above median.

Annex 2

Commercially produced complementary foods included in the ARCH labelling study

- Pronutro (Bokomo Foods)
- Cerelac (Nestle Kenya)
- Cerelac (Nestle Spain)
- Cow & Gate Breakfast
- Heinz Breakfast
- Cow & Gate Sunny Start
- Power Flour ltd. Baby porridge flour
- Uji Lulu (Roselyn Natural Foods)
- Unga wa lishe (Marine food supply)
- Lishe uji (extra power foods products)
- Felix lishe (CRM Investment LTD)
- Joshua Products porridge flour
- Heinz Farley's – Africa and ME, England
- Nguvu (powder)
- Afri Youth Pride (Afri-Youth Development Services)
- Belle Hollandaise (Friesland Foods)
- Bota (Matabe Group Ltd)
- Purity (Tiger Consumer Brands Ltd)

Annex 3

Selected IYCF behaviours as practiced by specific ethnic groups or in geographic areas

	Maasai	Wachagga	Bena	Luguru	Zanzibar	Igunga district
Early BF	*	*	No: mothers traditionally separated after birth, BF begins a few days later (Mwaseba et al. 2016)	No: colostrum and first breast milk believed to be too "hot" and harmful to the child (Mwaseba et al. 2016)	*	*
Exclusive BF	Yes (Mwaseba et al. 2016)	No	No	No		Yes (Mwaseba et al. 2016)
Foods consumed by children	- Milk and products consumed by all groups, recommended for young children (Lyana & Manimbulu 2014)	- Pre-lacteal feed (herbal) - Colostrum consumed (Lyana & Manimbulu 2014)	- Traditional pre-lacteal food: soft porridge of bamboo juice, maize flour, bee honey, pumpkin seeds, fed by mother-in-law with a finger - Milk consumption limited - Traditional herbs differ by clan (Mwaseba et al. 2016)	- Breastmilk believed to be insufficient, so child is given small amounts of soft ugali from the first day - Plain maize porridge commonly consumed - Milk consumption limited (Mwaseba et al. 2016)	Inadequate practice of "responsive feeding": children do not get enough nutrients because they are given food and left to feed on their own (Kinabo 2014)	Colostrum discarded, believed to be bad because it looks yellow, sticky and dirty (Mwaseba et al. 2016)
Practices during pregnancy and postpartum	- Pregnant women eat liver & kidney - Postpartum women eat liquid fat for cleansing, sugar water	- Before BF mother-in-law gives mother ground herb seeds to prevent ascariasis	- Postpartum mothers eat soft ugali and green vegetables with pumpkin seeds and ground cannabis	*	*	*

	for energy, fresh blood & milk, porridge with blood, soup with herbs (Lyana & Manimbulu 2014)	- While umbilical stump is attached women consume millet porridge, sour milk, cow blood (no meat) (Lyana & Manimbulu 2014)	seeds and flour for energy and increased milk supply - Belief that woman is unclean after delivery (Mwaseba et al. 2016)			
Other traditional practices	- Blood consumed after blood loss (childbirth, circumcision) Wild fruits and roots consumed by women & children (Lyana & Manimbulu 2014)	- Visitors bring gifts for new baby & mother: women bring milk or millet, men bring meat or honey (Lyana & Manimbulu 2014)	*	- Paternal grandmother or grandfather feeds the child ugali, confirming membership in that clan - After the first ugali, a second ugali is prepared with indigenous herbs - 7 days after birth, maternal grandmother feeds the child porridge (maize flour, yam, cassava, banana & African eggplant) (Mwaseba et al. 2016)	*	*

*Blank cells indicate that the secondary sources identified did not contain information on that practice in that region or group.

Annex 4

Cost of the Diet Analysis

Introduction

The Cost of the Diet[29] (CotD) is a method and software developed by Save the Children UK to better understand the extent to which poverty affects nutritional status. The aim of the tool is to estimate the amount, combination, and cost of local foods that are needed to provide individuals or households with their average needs for energy and their recommended intakes of protein, fat and micronutrients through the use of linear programming optimisation.

As part of the Fill the Nutrient Gap process in Tanzania, a Cost of the Diet analysis was conducted to understand the cost, composition, and affordability of nutritious diets in Tanzania, and provide a tool to model potential context-specific interventions to improving access to nutrients.

This Annex acts as a supplement to the Fill the Nutrient Gap report and describes the methodology and full results of the Cost of Diet analysis in Tanzania.

Methodology

In order to understand the cost of a nutritious diet, a Cost of the Diet analysis was conducted for all regions of mainland Tanzania (excluding Songwe[30]) and Zanzibar. The Cost of the Diet is a linear optimization software package developed by Save the Children which calculates the cost and composition of the least expensive diet that meets dietary recommendations for a given household for three macronutrients (kilocalories, protein, fat) and 13 vitamins and minerals (vitamins A, C, B1, B2, B3, B5, B6, B12, folic acid, calcium, iron, magnesium, zinc).

The key user input required for the Cost of the Diet software is market price data for a wide variety of foods. In Tanzania this market price data was shared by the National Bureau of Statistics (NBS, mainland) and the Office of the Chief General Statistician (OCGS, Zanzibar), who each collect consumer price data on a monthly basis for construction of the consumer price index. In each region, this price data is collected from several urban markets for over 100 unique food items.

Two databases are integrated within the software: nutrient requirements for profiles of 237 different individuals (accounting for age, sex, and activity level) and the nutrient composition of over 3500 foods[31]. The software performs a linear optimization,[32] the aim of which is to minimize the cost of the diet whilst maximising nutrient requirements for the individuals or household, and adhering to portion sizes, food frequency constraints, and upper limits for energy and certain micronutrients. The software also identifies "limiting nutrients" – nutrients whose requirements are more difficult to fulfil, either because the nutrient is not widely available in the foods found at market, the foods that contain these nutrients are more expensive, or both.

[29] See *https://www.heacod.org/en-gb/Pages/AboutCotD.aspx* for more details.
[30] Songwe region was formed in 2016 and thus is not represented in NBS price data collection for that year.
[31] Nutrient composition of foods is obtained from standard food composition tables. Full details on the underlying parameters of the Cost of the Diet software can be found at: https://www.heacod.org/en-gb/Pages/AboutCotD.aspx
[32] "Linear programming is a mathematical method that is used to determine the best possible outcome or solution from a given set of parameters or list of requirements, which are represented in the form of linear relationships. It is most often used in computer modeling or simulation in order to find the best solution in allocating finite resources such as money, energy, manpower, machine resources, time, space and many other variables. In most cases, the "best outcome" needed from linear programming is maximum profit or lowest cost". (*Technopedia.com*)

For the Tanzania Cost of the Diet analysis, market prices from urban and peri-urban markets for July 2016 were inputted by region into the CotD software. July was chosen as it represents a non-lean season month in both bimodal and unimodal rainfall areas of mainland. Across all regions, a total of 85 food items were included for entry in the CotD software, with a range of 46 to 67 items for which prices were available in each region. The foods included represent all major food groups. The full list of food items and their minimum, maximum, and average prices are available in Reference Table 4.1.

Household composition, which can be customized in the software, was chosen to represent the average household size of five members (as per the Tanzania Demographic and Health Survey 2015/16 and Household Budget Survey 2011/12) and include individuals who represent specific target groups that are relevant to the 1,000 days. Thus, the household used in calculating the Cost of the Diet in Tanzania consisted of a 12-23month old child, a lactating adult woman, an adolescent girl, as well as a child aged 6-7 years and an adult man. The household composition was kept constant across all regions for this analysis.

The Cost of the Diet software calculates a nutritious diet, called "NUT", in which the software is unrestricted to compose the diet based on any foods available. For children under two, the software defaults to providing to optimal breastmilk intake by age at no cost.

In order to adjust this diet for local staple preferences, the World Food Programme approach to CotD analysis centres on a "Staple-adjusted Nutritious Diet" (SNUT). The SNUT diet (hereafter referred to as a "nutritious diet") includes at least one serving per day of the main local staple(s) for all household members. For regions with more than one staple, the child 12-23 months receives one serving per day only of the primary staple (maize or rice).

Staple food preferences for each region of Tanzania were determined through compilation of published research and key informant interviews and can be viewed in Reference Table 4.2. Staple foods available at market were assumed to be unfortified. For most regions of mainland, the staple was determined to be maize, occasionally accompanied by cassava, rice, or plantain. For Zanzibar, the staple was rice. For the child under two, optimal breastfeeding levels are assumed, and the software is free to choose any remaining foods to complement the diet to meet nutrient requirements.

This Cost of the Diet analysis was conducted using software version 2.2.96 Beta.

Food Availability

As NBS/OCGS food price monitoring is based on standardized commodity lists, the data does not reflect an exhaustive picture of availability – the standardized list does not necessarily capture all foods present in a given market, nor does the absence of a food from the list necessarily mean it was not available. Nonetheless, examination of NBS and OCGS price monitoring data provides a good indication that there is a wide availability of a variety of food items in urban and peri-urban markets across all regions of Tanzania.

On average, the CotD food list for each region contained 58 unique items, with a range of 46 (Njombe) to 67 (Dar es Salaam). In each region, at least three key staple foods (maize, rice, and wheat), and several varieties of legumes, roots/tubers, meat, vegetables and fruits were available. Milk, eggs, and dried fish were available in all regions, while fresh fish was available in most. While cooking oil of some type was available in all regions, data for 13 regions contained a price for only one variety of oil; it is unclear whether this indicates that there is limited variety on offer at markets or if price data was not collected for other varieties.

Food price data is not captured in rural markets, where food availability and/or prices are likely to be different from urban and peri-urban markets.

Food Price Variability

Significant variation in prices between regions was evident across most food groups, as seen in Reference Table 4.3. Prices for roots and tubers tended to be lower and more stable across regions, followed to some degree by vegetables and fruits. Chicken, fish, yogurt, and butter were among the items with the largest price variability. Among staple grains, maize tended to be the least expensive option, and prices were generally fairly steady across regions. Even so, the price of raw maize grains was more than 3.5 times higher in Singida and Morogoro than Geita. Rice and wheat cost on average 1.5-2 times more than maize grains.

Predictably, meat was among the highest priced food groups, more than twice as high on average as legumes. In very few regions meat could be obtained for less than 4,000 TSH per kilogram, and this was usually only for less desirable cuts.

Cost of the Diet Results

Composition of Nutritious Diets

The calculation of Cost of the Diet for 26 regions of Tanzania shows that it is possible to meet all nutrient needs of all individuals in the modelled household using foods that are available in the market.

As shown in Table 4.1, the nutritious diets calculated by the software are composed of between 7 to 11 foods (including breastmilk) from 5 to 8 food groups. Although the individual foods chosen differ somewhat from region to region, the general composition is similar – all diets contain at least one grain (most contained at least two), at least one type of bean/legume, green leafy vegetables, an oil or source of fat, and a small amount of animal-source products. Amaranth leaf (local name 'mchicha') is the only item that appears in the nutritious diet for every region. This is due to the very low cost of amaranth leaves (at an average price of 105 TSH per 100g it is one of the cheapest vegetables in most regions) and its very high nutrient density, in particular for iron.

Animal source foods appear in every diet, as they are essential to meeting requirements for vitamin B12 in particular. Beef liver was selected in all of the regions where it was available. For the six regions where beef liver was not available, the software instead chose dried fish and, in the case of Unguja, fresh fish was also selected. Very few diets contained eggs, while yoghurt and/or milk were added to diets for about half of the mainland regions.

There was little variety in the vegetables and fruits chosen. Vegetable servings were mainly provided through amaranth leaves, while coconut was the main fruit chosen. Coconut was likely selected as it is a significantly less expensive source of fat than cooking oil.

***Table 4.1**: Composition of household nutritious diets for each region as optimized through Cost of the Diet software. The diet meets nutrient requirements for all individuals in a household and includes at least one portion per day of the main staple food(s) for each individual. The optimal intake of breast milk is automatically included for the child under two. An "X" with green shading indicates a food item that was selected by the software to be included in the nutritious diet. An "S" with grey shading indicates this is the staple food assigned to each region.*

		Northern			Eastern			Southern			Southern Highlands			South West Highlands			Central			Western			Lake			Zanzibar		
Food Group	**Food item**	**Arusha**	**Kilimanjaro**	**Tanga**	**Morogoro**	**Pwani**	**DES**	**Lindi**	**Mtwara**	**Ruvuma**	**Iringa**	**Njombe**	**Mbeya**	**Rukwa**	**Katavi**	**Dodoma**	**Singida**	**Manyara**	**Tabora**	**Kigoma**	**Shinyanga**	**Kagera**	**Mwanza**	**Mara**	**Simiyu**	**Geita**	**Unguja**	**Pemba**
Grains	**Maize, flour, dry**																									X	X
	Maize, white, grain or flour	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		
	Millet, flour																										X
	Rice, raw						S				X											X				S	S
	Sorghum, whole grain, white,		X		X		X										X		X			X			X			
	Wheat, flour, white	X	X	X	X	X	X	X	X	X	X	X	X			X		X			X		X			X	X	X
Roots & Tubers	**Cassava, flour**								S											X		X		S				
	Cassava, raw					S		S																				
Legumes & Nuts	**Bean, kidney, dried, raw**	X			X	X	X	X	X	X	X	X	X	X	X	X			X		X				X	X	X	X
	Cowpea, uncooked																											X
	Groundnut, shelled, dried, raw	X		X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X			X	X	
	Lentil, dried, raw		X	X		X	X		X						X			X		X			X	X	X			
	Soybean, raw	X			X	X	X				X			X	X	X	X	X				X	X	X			X	X
Meat	**Beef, liver, raw**	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X	X		X		
Fish	**Fish, dried**											X		X						X					X		X	X
	Fish, sardine, raw																										X	
Egg	**Egg, chicken, raw**								X			X								X								
Dairy	**Milk, cow, fresh, unfortified**											X		X											X			
	Yoghurt, whole milk, plain			X					X					X	X		X	X	X	X				X		X		
Vegetables	**Carrot, raw**											X	X	X						X								
	Eggplant, raw		X																		X		X		X			
	Leaf, amaranth, raw	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Plantain, ripe, raw		S																			S						
Fruits	**Avocado, pulp**																			X								
	Coconut, milk		X	X			X	X	X		X		X						X								X	X
	Tomato, red, ripe, raw					X																			X			
Oils & Fats	**Oil, cottonseed**			X	X	X	X									X	X					X	X	X	X	X		
	Oil, sesame	X																										
	Oil, sunflower		X							X	X	X		X	X			X	X		X							
	Breast milk	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Total number of foods (including breastmilk)		*8*	*9*	*9*	*9*	*9*	*11*	*7*	*10*	*7*	*10*	*9*	*8*	*10*	*9*	*8*	*8*	*9*	*9*	*10*	*8*	*9*	*9*	*7*	*10*	*8*	*10*	*10*

Groundnuts were another commonly chosen item and are present in the diets of most regions. Cassava was the only food from the roots and tubers group selected, though in 4 of these 6 regions cassava is assigned as the staple food.

Cost of Nutritious Diets

For the model five-person household in Tanzania, the average daily cost of a diet that meets all nutrient requirements, is composed of foods purchased at market price, and includes at least one serving of staple foods is TSH 5,550. This is nearly twice as expensive as a diet that meets only energy needs for the same household (Figure 4.1).

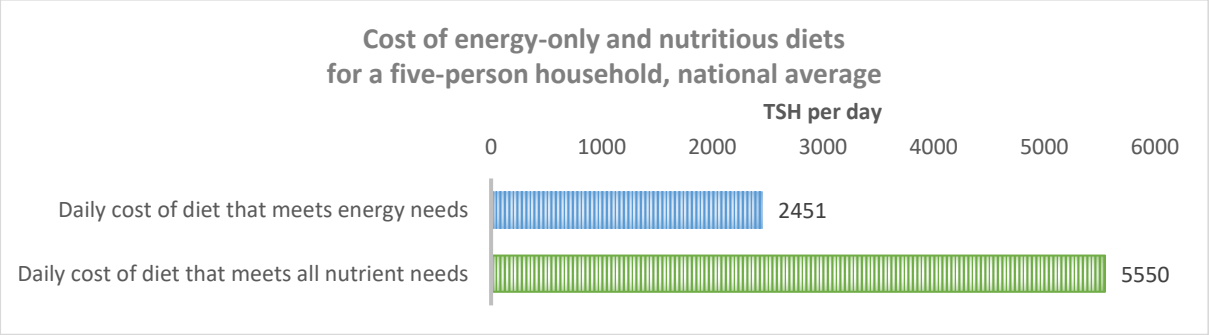


***Figure 4.1**: Average daily cost of an energy only diet and a nutritious diet for a five-person household.*

Within the household, the lowest cost diet is that of the breastfed child 12-23 months, and the most expensive are the diets of the lactating woman and adolescent girl. At TSH 1,600-1,700 each, together the diets for these two individuals comprise 60% of the cost for the entire household. Costs for each individual and region can be seen in Table 4.2 and Figures 4.2 and 4.3.

Household member	National average daily cost of nutritious diet, TSH	% of total household cost
Child, 12-23 months	300	5%
Lactating woman	1,708	31%
Adolescent girl	1,612	29%
Child, 6-7 years	715	13%
Adult man	1,214	22%
Entire household	**5,550**	-

***Table 4.2**: Average daily cost of a nutritious diet per household member, and percentage of total household cost by individual*

As seen in Figure 4.3, there is considerable variation in household cost of diet between regions, ranging from TSH 3,772 in Geita to TSH 8, 809 in Mtwara. Both Pwani and Dar es Salaam diets were also calculated above TSH 6,500 per day for a household. The high cost of diet in Mtwara is driven by the absence of price data available for cassava,

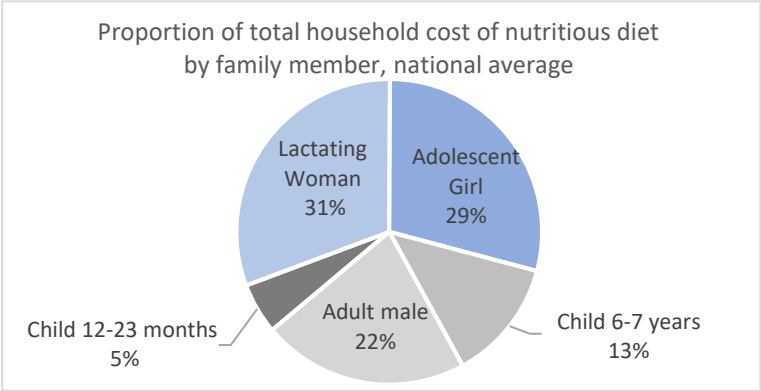
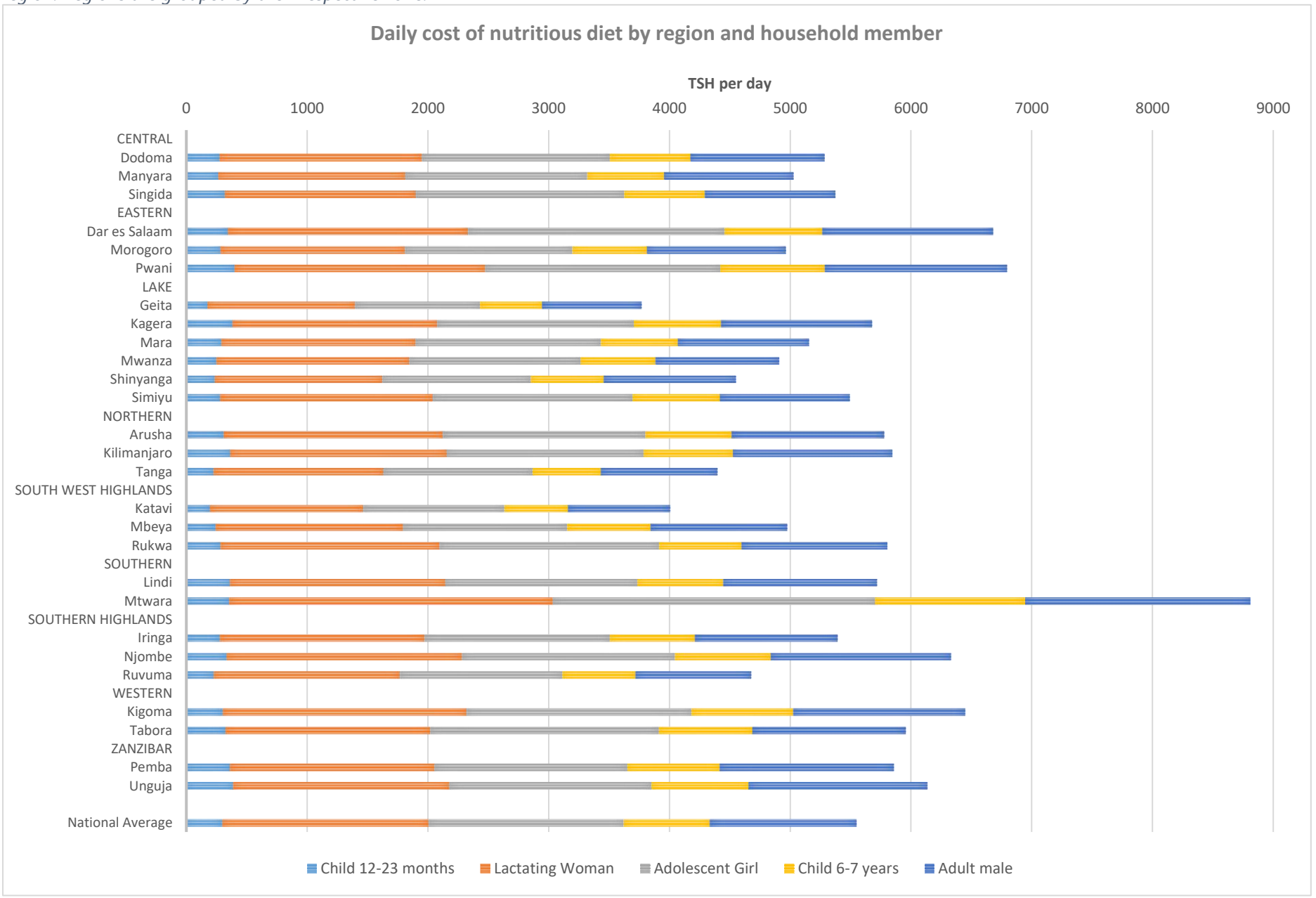


***Figure 4.2**: Percentage of total household cost of a nutritious diet, by individual*

***FIGURE 4.3**: Cost of a nutritious diet in 26 regions of Tanzania, for a household composed of five individuals: a child 12-23 months, a lactating woman, an adolescent girl, a child 6-7 years, and an adult man. Each coloured bar represents the cost of each individual in the household. Total length of bar represents cost of entire five-person household in each region. Regions are grouped by their respective zone.*



the staple food. Instead cassava flour is chosen by the software, which in most regions is about double the price of unprocessed cassava.

The cost to meet nutrient requirements for the lactating woman and adolescent girl are considerably higher than the cost to meet nutrient requirements for an adult male in every region of Tanzania. On mainland Tanzania, the average daily cost of diet for the lactating woman (TSH 1,708) is 43% higher than the adult man. Similarly, in mainland regions it costs on average TSH 1,612 to meet nutrient needs of an adolescent girl, representing an average increase of 35% over the cost for an adult male.

The cost of a nutritious diet in Zanzibar is also higher for lactating women and adolescent girls as compared to adult males, though the overall difference is not as high as mainland. This is due to the fact that the cost of the man's diet is about 20% higher in Zanzibar as compared to mainland, whereas the cost for the lactating woman and adolescent girl are similar.

The cost of a nutritious diet for the child under two generally commands a smaller proportion of the household's overall cost, due to the fact that much of the key nutrient requirements are being met by breastmilk at no cost (assuming optimal intake). In Tanzania, the average cost for complementary foods to complete the diet of the child under two is TSH 300 per day. The cheapest diet was calculated in Geita (TSH 179) and the most expensive were in Pwani, Unguja and Kagera (TSH 383-400). This represents on average about 5% of total household food cost

As per **Table 4.3**, breastfeeding at optimal levels for a child 12-23 months is able to provide significant proportions of important macro- and micronutrients. In situations where breast milk intake is not optimal, the cost to meet nutrient needs of the child under two increases, in particular due to the need for animal source foods to compensate for the lack of breastmilk.

Nutrient	% Reference nutrient intake (RNI) provided by breastmilk
Energy	38.1%
Protein	41.2%
Fat	68.7%
Vitamin A	66.5%
Vitamin C	70.9%
Vitamin B1	22.3%
Vitamin B2	37.2%
Niacin	38.4%
Pantothenic acid	47.9%
Vitamin B6	9.9%
Folic acid	30.1%
Vitamin B12	57.3%
Calcium	29.8%
Iron	0%
Magnesium	31.0%
Zinc	15.6%

***Table 4.3**: Nutrients provided by optimal intake of breastmilk for a child 12-23 months (532g) Source: Cost of the Diet*

The balance of average household diet costs were that of the school-age child and the adult man, at 13% and 22% of the total. The child's diet cost on average TSH 716, while the man's cost TSH 1,214.

Nutrient Access and Availability

The Cost of the Diet software is able to highlight foods available in local markets that are good, inexpensive sources of nutrients. It can also identify nutrients for which requirements are difficult to meet, usually because the foods that contain them are expensive or scarce, or both.

Important sources of nutrients

Several foods that are accessible in local markets and rich in important micronutrients can be identified in the Tanzania Cost of the Diet. The most important of these is amaranth leaves (mchicha).

Amaranth leaves, which cost on average TSH 105 per 100g, are among the lowest cost vegetables available in the majority of regions. As the only food selected in every region, amaranth leaves are revealed as a key dietary source of iron, calcium, zinc, vitamin A and folic acid for the child under 2, lactating woman, and adolescent girl. It is the single biggest contributor of dietary iron in the CotD

analysis. The provision of dietary iron is particularly important given the high cost of meat and low supplementation coverage.

However, the analysis reveals that in order to reach this level of nutrient intake from amaranth leaves, the quantity consumed on a daily basis must be high. This is likely to be in excess of current consumption patterns and is due, in part, to the lower bio-availability of non-heme iron. In addition, the software accounts for the nutrient content of raw amaranth leaves, which can diminish after cooking.

In each region, beans and legumes were chosen as a key component of the nutritious diets. The variety chosen depended mostly on which was the least expensive. Given the high cost of meat and scarcity of fortified grains, beans are an important and inexpensive source of protein, B vitamins (especially folic acid), zinc, and iron in Tanzanian retail markets.

Beef liver is widely available in Tanzanian markets, and is included in the nutritious diets for all regions where it was found. Vitamin B12 is only available in the diet through animal-source or fortified foods, and beef liver is a particularly concentrated source. It is also selected in many regions for its high iron content.

Beef liver is one of the more expensive cuts of meat in most markets, however only very small quantities need to be consumed. At the household level, the software incorporates a small portion of beef liver in the diet to complement an otherwise balanced plant-based diet. The bulk of this quantity, though, is distributed to the lactating woman and adolescent girl (in particular to meet their higher iron requirements), with less needed in the diets of the man, school-age child, and child under two.

While only small quantities may be required to incorporate in the diet, at an average cost of TSH 8100 per kilogram, the purchase of only a small amount of beef liver could represent a significant cost for poorer households. Moreover, for many nutrient-dense foods it might not be possible to purchase such small amounts at the market, which could pose an even greater economic obstacle to poor households.

Limiting Nutrients

While a diet that meets all nutrient requirements composed of foods available on the market is achievable in Tanzania, some nutrient requirements, in particular for key target groups within the 1,000 day period, are more challenging to meet. These "limiting" nutrients are encountered during the CotD analysis when the nutrient is found in foods that are expensive, when food sources of that nutrient are limited in availability, or both. These tend to drive up diet costs in the CotD, as the software is forced to choose more expensive options to fulfil an individual's RNI.

An analysis of limiting nutrients was carried out for the nutritious diets of the child under two, adolescent girl, and lactating woman. Results can be viewed in Table 4.4. Across regions, some significant commonalties in difficulty accessing several nutrients were evident.

The most common limiting nutrients identified were iron and pantothenic acid, for which requirements were difficult to meet for all three target individuals in nearly every region.

Iron

Iron was identified as a limiting nutrient for children under two, lactating women, and adolescent girls in nearly every region of Tanzania. The food list includes many animal and plant sources of iron, the latter of which are considerably less expensive but have lower bioavailability.

The main non-heme sources of iron - amaranth leaves, maize, and beans – were among the least expensive foods available in the market, however they were generally needed in large quantities, in particular for the lactating woman and adolescent girl, which drove up the cost of the diet. These three foods accounted for the bulk of iron in most regions. Due to their much higher cost, meats were not selected by the software as the primary source of iron in any region.

Pantothenic Acid (Vitamin B5)

Requirements for pantothenic acid (vitamin B5) were also difficult to achieve for the lactating woman, adolescent girl, and child under two. For the lactating woman and the adolescent girl, pantothenic acid was a limiting nutrient country-wide. For the child under two, pantothenic acid was limiting in all except four regions (both regions of Zanzibar, Kilimanjaro and Kagera).

While pantothenic acid is available in a wide variety of foods, the key dietary sources in the Tanzania CotD were all plant-based: maize (and other staples) beans, lentils, and amaranth leaves. Aside from mushrooms and fortified products (which are not included in the price monitoring data used for this analysis and not readily available across the country), animal-source foods, such as organ meats, eggs, and milk, are some of the richest sources of pantothenic acid. However as previously discussed, these animal-source foods are often considerably more expensive.

Zinc

In all but four regions (Pwani, Singida, Rukwa and Tabora), zinc was considered a limiting nutrient for the child under two. The main sources of zinc selected were amaranth, kidney beans, and soy beans. Richer animal sources, like beef, are available but expensive. The lack of availability of fortified grains is likely to also affect ability to inexpensively obtain appropriate levels of zinc in the child under two's diet.

Vitamin B12

Predictably, given the high cost of animal-source foods, vitamin B12 is a limiting nutrient in many part of Tanzania, though there is notable variation across regions. In the majority of regions (20), the diet for the child under two is marked by a limitation on vitamin B12. For the lactating woman and the adolescent girl, Vitamin B12 is a limiting nutrient in fewer regions than the child under two (10 and 9 regions respectively).

In seven regions –Kigoma, Njombe, Rukwa, Simiyu, Tanga, Unguja, and Pemba – vitamin B12 is a limiting nutrient for all three target individuals. Except for Tanga, these regions do not have beef liver in the food list, highlighting its critical role in the diet in meeting vitamin B12 requirements. Another seven regions – Dar es Salaam, Dodoma, Singida, Manyara, Mara, Mtwara, and Tabora - report no limitations on meeting vitamin B12 requirements for any of the three individuals.

In addition to possible lack of availability in some regions, the main driving factor of the limitations on vitamin B12 is again the high price of animal-source foods.

***Table 4.4**: Limiting nutrients in nutritious diets calculated in all regions for child 12-23 months, lactating woman and adolescent girl.*

Zone	Region	Target group	Limiting Nutrients											
			Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic acid	Vitamin B6	Folic acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Central	Dodoma	Child 12-23 months						X				X	X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
	Singida	Child 12-23 months						X				X	X		
		Lactating Woman		X				X					X		
		Adolescent girl						X					X		
	Manyara	Child 12-23 months						X				X	X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
Eastern	Morogoro	Child 12-23 months						X			X		X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
	Pwani	Child 12-23 months						X			X		X		
		Lactating Woman						X				X	X		
		Adolescent girl						X					X		
	Dar es Salaam	Child 12-23 months						X				X	X		X
		Lactating Woman						X				X	X		
		Adolescent girl						X					X		
Lake	Shinyanga	Child 12-23 months						X			X		X		X
		Lactating Woman						X			X		X		
		Adolescent girl						X					X		
	Kagera	Child 12-23 months									X				X
		Lactating Woman						X				X	X		
		Adolescent girl						X					X		
	Mwanza	Child 12-23 months						X			X		X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
	Mara	Child 12-23 months						X					X		X
		Lactating Woman						X				X	X		
		Adolescent girl						X					X		
	Simiyu	Child 12-23 months						X			X		X		X
		Lactating Woman						X			X		X		
		Adolescent girl						X			X		X		
	Geita	Child 12-23 months						X			X				X
		Lactating Woman						X			X		X		
		Adolescent girl						X					X		
Northern	Arusha	Child 12-23 months						X			X		X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
	Kilimanjaro	Child 12-23 months									X		X		X
		Lactating Woman						X			X		X		
		Adolescent girl						X					X		
	Tanga	Child 12-23 months						X			X		X		X

Zone	Region	Target group	Limiting Nutrients												
			Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic acid	Vitamin B6	Folic acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
		Lactating Woman						X			X		X		
		Adolescent girl						X			X		X		
South West Highlands	Mbeya	Child 12-23 months						X			X		X		X
		Lactating Woman						X					X		
		Adolescent girl						X			X		X		
	Rukwa	Child 12-23 months						X			X		X		
		Lactating Woman						X			X		X		
		Adolescent girl						X			X		X		
	Katavi	Child 12-23 months						X			X		X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
Southern	Lindi	Child 12-23 months						X			X				X
		Lactating Woman						X					X		
		Adolescent girl						X			X		X		
	Mtwara	Child 12-23 months						X				X	X		X
		Lactating Woman						X				X	X		
		Adolescent girl						X					X		
Southern Highlands	Ruvuma	Child 12-23 months						X			X		X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
	Iringa	Child 12-23 months						X			X		X		X
		Lactating Woman						X					X		
		Adolescent girl						X					X		
	Njombe	Child 12-23 months						X			X		X		X
		Lactating Woman						X			X		X		
		Adolescent girl						X			X		X		
Western	Tabora	Child 12-23 months						X				X	X		
		Lactating Woman						X				X	X		
		Adolescent girl						X					X		
	Kigoma	Child 12-23 months						X			X		X		X
		Lactating Woman						X			X		X		
		Adolescent girl						X			X		X		
Zanzibar	Unguja	Child 12-23 months									X				X
		Lactating Woman						X			X		X		
		Adolescent girl						X			X		X		
	Pemba	Child 12-23 months			X						X		X		X
		Lactating Woman						X			X		X		
		Adolescent girl			X			X			X		X		

Other micronutrients

In six regions (Pwani, Mtwara, Tabora, Mara, Kagera, and Dar es Salaam) the lactating woman's diet encounters a limitation for calcium. Calcium is also a limiting nutrient for the child under two in six regions (Dodoma, Singida, Manyara, Dar es Salaam, Mtwara and Tabora).

Notably, folic acid and vitamin A are not found to be limiting nutrients in the foods available in Tanzanian retail markets.

Affordability of Nutritious Diets

Rationale

In order to better understand barriers to accessing nutritious diets, the absolute cost of a diet must be combined with information on household incomes or expenditures to understand whether diets are affordable to households of varying economic means.

The issue of affordability is especially pertinent in Tanzania, due to significant levels of poverty and high proportions of household food expenditure. Official estimates of poverty from 2011/12 indicate that 28.2% of the population are living in basic-needs poverty and 9.7% of the population are considered food poor (Household Budget Survey of 2011/12). Nationally, 56 percent of household expenditure goes toward food, but this can reach up to 70 percent in the poorest households (National Bureau of Statistics & Ministry of Finance 2014) – such food expenditure ratios are indicative of vulnerability to shocks. Diets are also not diversified, with staple grains forming the majority of the typical food basket[33]. Thus, in the majority of households, it is likely that food expenditure comprises the majority of overall household expenditure and it is primarily geared towards meeting energy needs rather than to purchase a fully nutritious diet for all members of the household.

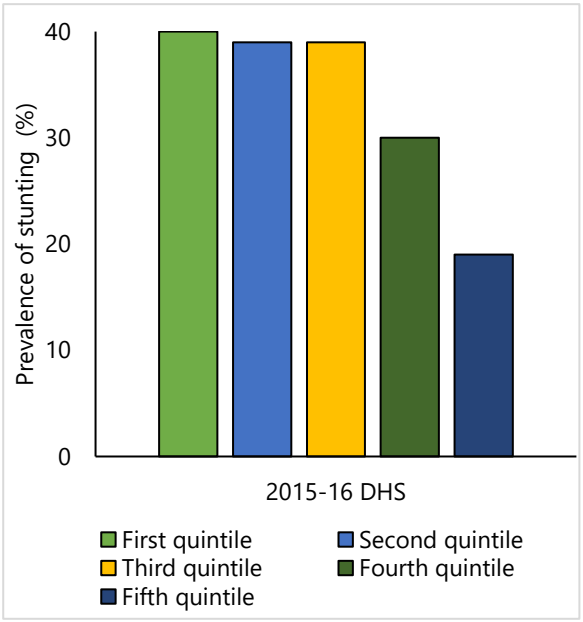


Figure 4.4: *Stunting prevalence in children 6-59 months by wealth quintile. (DHS 2015-16)*

In addition, the DHS 2015/16 shows that children living in households that are categorized in the first, second, and third quintile (bottom 60% in terms of income) all have a fairly equal chance of being stunted (Figure 4.4). A child's risk of being stunted does not begin to decrease until a household's economic status is considerably improved. This trend further suggests that examining economic barriers to nutrition may be relevant and significant in the Tanzania context.

Methodology

[33] See Fill the Nutrient Gap Key Message 3

In order to estimate the proportion of the population that could afford a nutritious diet, data from the National Panel Survey (NPS 2012-2013) was used to approximate food expenditure. The total sample size of the data set is 3,265 households, clustered in 409 Enumeration Areas (2,063 households in rural areas and 1,202 urban areas) across Tanzania and Zanzibar. Whilst the sample was designed to be statistically significant for Dar es Salaam, other urban areas on mainland Tanzania, rural mainland Tanzania, and Zanzibar, it was still possible to extract curves for each region to give an approximation of the regional variation in affordability. Regions of Geita, Katavi, Simiyu and Songwe are not included in the data set as they were not yet created at the time, and thus are not part of the affordability analysis.

In the National Panel Survey questionnaire, households were asked to report on the type and quantity of the foods that they consumed per week, how much each food item cost, and the total quantity of food produced at home. In order to estimate a monetary value of the food produced at home, the average amount spent on each market-sourced food item was calculated per gram and multiplied by the amount produced. This figure was then added to the value of foods purchased to derive a monetised food expenditure for each household. Food expenditure curves were then extracted for each region and assessed against the nutritious diet cost to estimate affordability.

For each region, this analysis provides an estimate of the proportion of households that could afford a given diet based on the cost of diet, as calculated through the CotD and regional household food expenditure curves.

Results

Across all regions of Tanzania, it is estimated that on average about 22% of households could not afford a diet that meets only energy needs, ranging from 8% in Rukwa to 45% in Kaskazini Unguja (Figure 4.5). Approximately 59% of households could not afford a diet that meets full nutrient needs, ranging from 39% in Tanga to 85% in both Mtwara and Kigoma. The proportion of households that could not afford nutritious diets was also very high in Lindi and Kaskazini Unguja, at more than 75%.

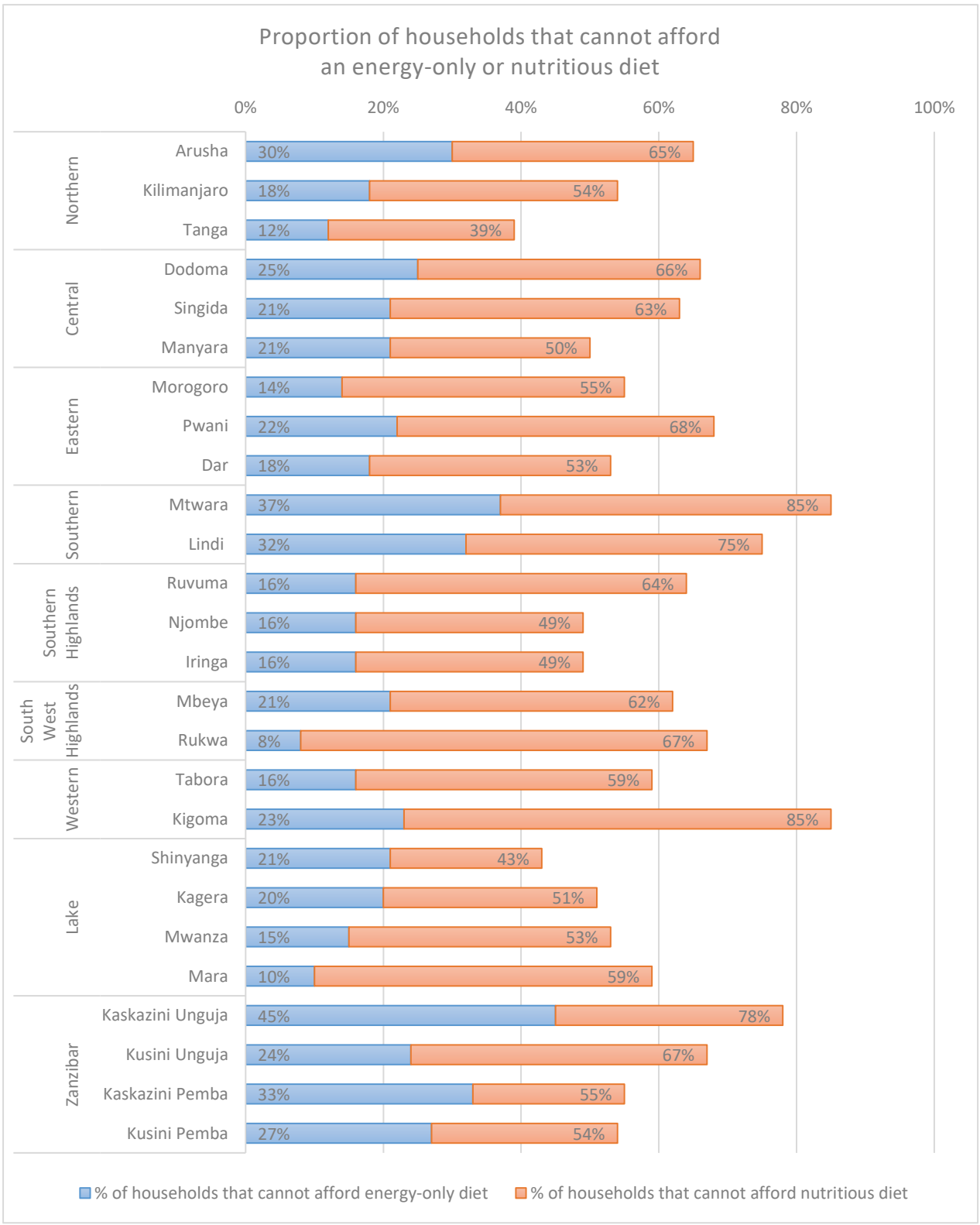
On average, nutritious diets are more than double (2.36) the cost of a diet that only meets energy needs. The ratio is highest in Rukwa, where a nutritious diet costs 3.6 times more than the cost of the energy only diet. Rukwa also has the lowest proportion of households that cannot afford energy-only diets (8%), suggesting that the cost of staple foods is low relative to incomes in this region, while the cost of nutritious foods is considerably higher.

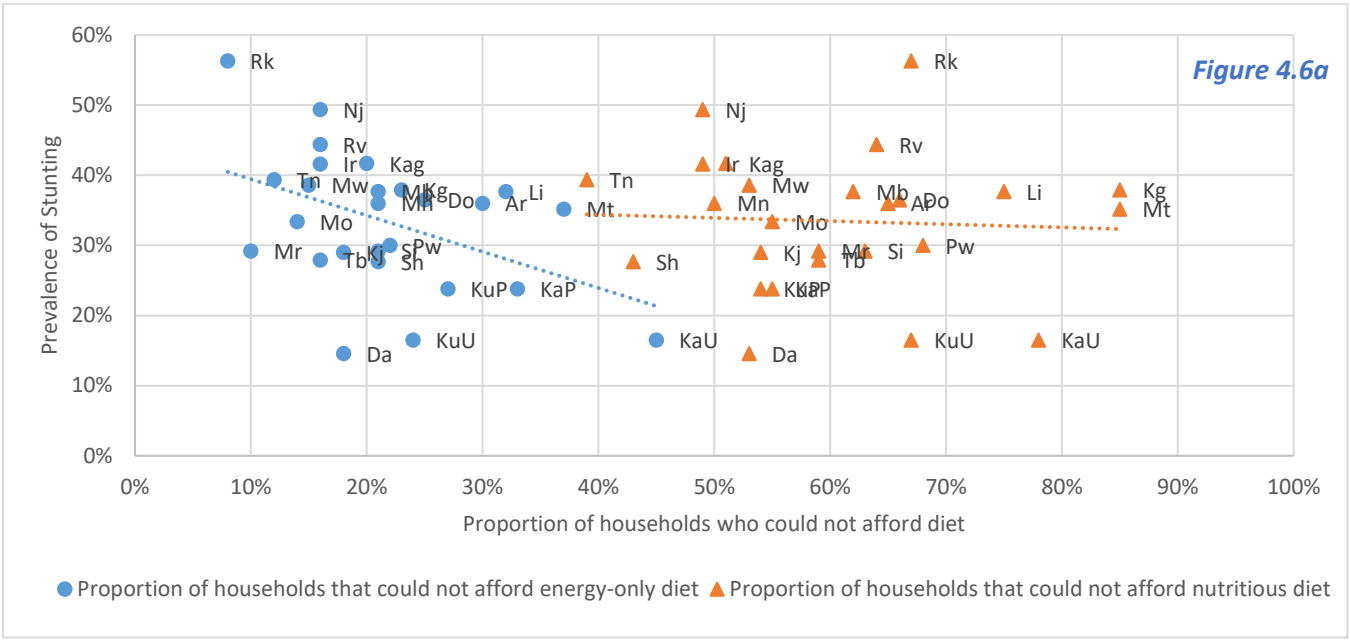
A key consideration is whether the cost or affordability of a nutritious diet is linked to nutrition outcomes. While no relationship was observed between the inability to afford a nutritious diet on its own and stunting prevalence by region (DHS 2015/16), this analysis found a small negative linear relationship between stunting prevalence and the proportion of households who could not afford the energy-only diet (Figure 4.6a). This suggests that where economic access to caloric energy is easier (i.e. energy-only diets are affordable to more of the population), nutrition outcomes may tend to be poorer. The same pattern was observed when examining the cost of the diets (Figure 4.6b)

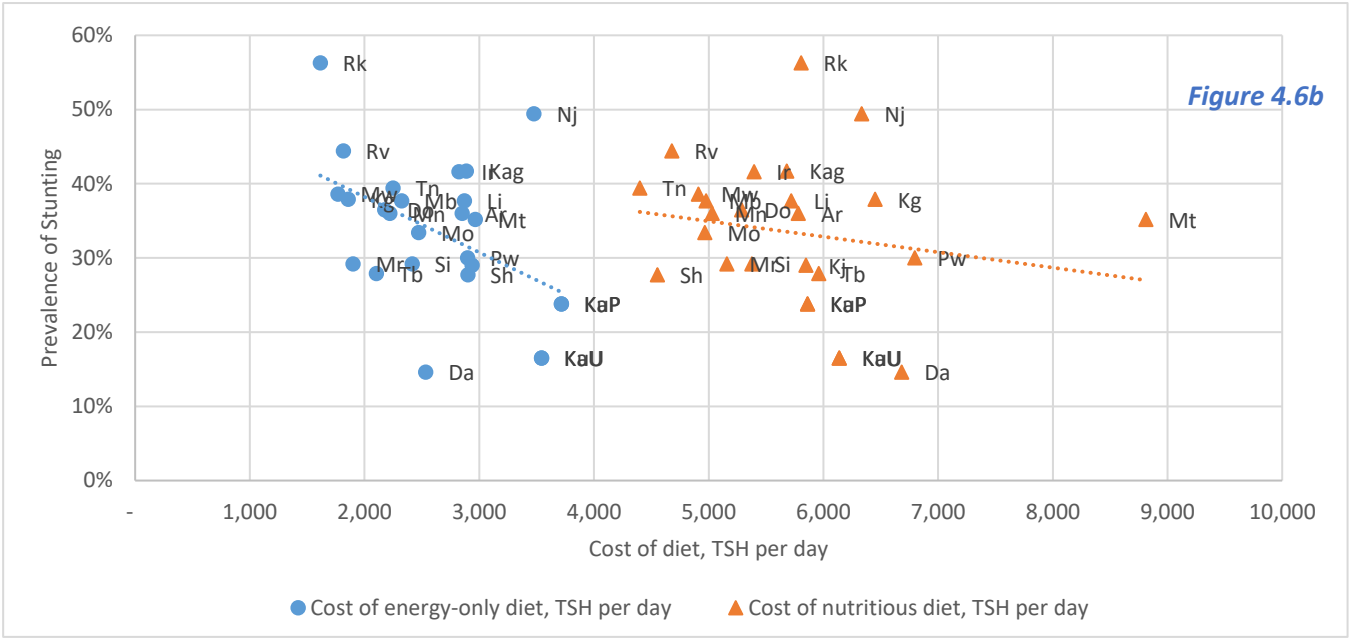
Further, a small positive relationship was noted when comparing stunting prevalence and the ratio of the cost of nutritious diets to the cost of energy-only diets (Figure 4.7). In regions where the nutritious diet was many times more expensive than the energy-only diet, stunting prevalence tended to be a bit higher. This effect was stronger in regions where the ratio was greater than two, suggesting a possible threshold whereby when the cost of nutritious diets increases to more than twice as expensive as energy-only diets, it may serve as a stronger driver of malnutrition.

Altogether, this implies that the most important aspect of economic access to nutritious diets is not the absolute cost of the nutritious diet, but whether that nutritious diet is affordable based on local incomes and relative to energy-only diets, and the relative ratio of costs between staple foods and nutritious foods. A larger ratio, which signals that nutritious diets are several times more expensive than energy-only diets, could drive economic decisions at household level towards a more energy-based diet and limit access to nutritious foods.

***Figure 4.5**: The proportion of households in each region that cannot afford an energy-only diet (blue bars) and that cannot afford a nutritious diet (blue + orange bar) based on the cost of each respective diet and average income curves by decile for each region.*







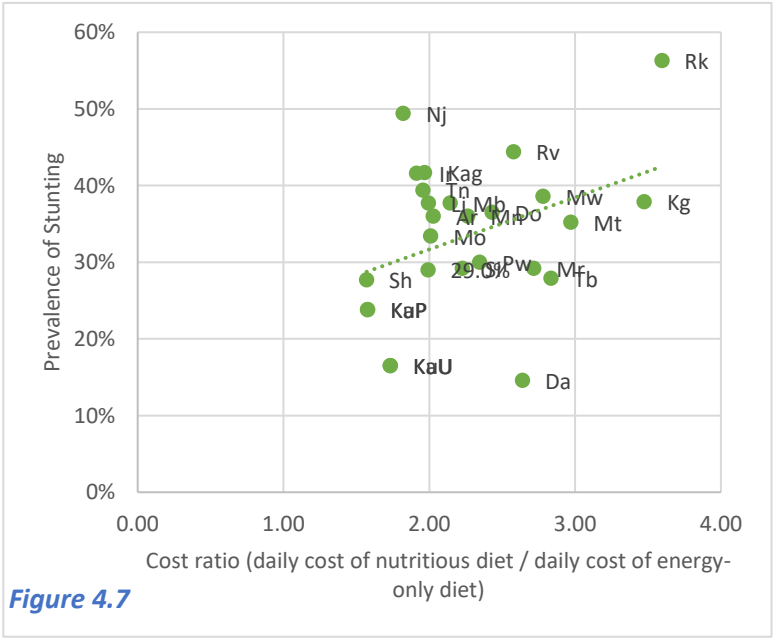


Figure 4.7

***Figure 4.6a-b**: Correlation of prevalence of stunting by region and (a) the proportion of households that cannot afford an energy-only diet (blue) or nutritious diet (orange), (b) the cost of an energy-only diet (blue) and nutritious diet (orange).*

***Figure 4.7**: Correlation of prevalence of stunting by region and cost ratio of a nutritious diet to energy-only diet.*

Data labels: Arusha (Ar); Dar es Salaam (Da); Dodoma (Do); Iringa (Ir); Kagera (Kag); Kaskazini Pemba (KaP); Kaskazini Unguja (KaU); Kigoma (Kg); Kilimanjaro (Kj); Kusini Pemba (KuP); Kusini Unguja (KuU); Lindi (Li); Manyara (Mn); Mara (Mr); Mbeya (Mb); Morogoro (Mo); Mtwara (Mt); Mwanza (Mw); Njombe (Nj); Pwani (Pw); Rukwa (Rk); Ruvuma (Rv); Shinyanga (Sh); Singida (Si); Tabora (Tb); Tanga (Tn)

Cost of the Diet Intervention Modelling

With the majority of Tanzanian households unable to afford a nutritious diet, a modelling exercise was conducted with Cost of the Diet software in order to examine how diet affordability could be improved. A number of nutrition interventions, identified through stakeholder consultation and secondary data analysis, were introduced into the calculated nutritious diet in 10 regions[34] of Tanzania.

The interventions selected, along with target groups and modality, can be seen in Table 4.5. The ten regions were chosen to be representative of every zone in Tanzania. Within each zone, the region with the highest prevalence of stunting was chosen, as addressing stunting is a key priority in Tanzania's National Multi-sectoral Nutrition Action Plan. Dar es Salaam region was added to ensure the largest population centre was included.

The objective of the modelling exercise is to evaluate the impact of a given intervention (or package of interventions) on cost of the diet for households and/or target individuals, with a view to supporting decision making on effective and efficient nutrition policy and programmes, especially targeted to the 1,000 day period.

Results

Target group: Child under two

The impact on the daily cost of diet of both household-level and individually targeted interventions were modelled for the child under two. Results can be seen in Figures 4.8a-8b.

The introduction of fortified staple foods (rice for Unguja, maize for all other regions) at market prices resulted in a reduction in the cost of diet for the child under two in all 10 regions as compared to the nutritious diet. The magnitude of this decrease varied from a 5-11% reduction of the daily diet cost in Dodoma, Tanga, Morogoro, Dar es Salaam, Mtwara, and Njombe to reductions of 24-29% in Rukwa, Kigoma, Kagera, and Unguja.

Home fortification using micronutrient powders (MNPs) were modelled using both an in-kind and market-based platform. For the latter, the model tested MNPs at both full market price and a subsidized price. In-kind provision of MNPs proved to be the more effective intervention to decrease cost of a nutritious diet, with reductions of at least 11% of daily cost found in each region. In four regions, the cost to meet a nutritious diet decreased substantially by 25% or more. Provision of MNPs through the market showed mixed results. At a subsidized price, the cost of a nutritious diet decreased moderately in half of the regions, and increased slightly in the other half. At full market price, there were no regions demonstrating a meaningful reduction in cost, and in five regions, the cost of a nutritious diet increased by 17-32%.

The next model tested the inclusion of specially fortified complementary food in the diet of the child under two. In this model, the child received a 20g portion of a small quantity lipid-based nutrient supplement (LNS-SQ), similar to peanut-based Nutributter, either at market price or provided in-kind. In-kind provision of LNS-SQ had the largest impact on the cost of a nutritious

[34] Regions included in the modelling exercise: Dodoma, Tanga, Morogoro, Mtwara, Rukwa, Kigoma, Kagera, Njombe, Unguja, and Dar es Salaam.

***Table 4.5**: Tanzania Cost of the Diet intervention modelling parameters.*

	Type of Intervention Modelled	Target group	Modality	Model Description
A	**Staple food fortification**	Household	Market	*Mainland*: Fortified maize provided to each household member, at least one portion per day, in all mainland regions. Maize fortified with iron, zinc, vitamin B12, and folate according to national standards, using mid-point value between max and min. Fortified maize is priced per national guidelines at 20TSH per kg higher than market price of unfortified maize.
				Zanzibar: Fortified rice provided to each household member, at least one portion per day, in Unguja. Rice fortified with vitamins A, B1, B6, B12, niacin, iron, zinc, and folate according to specifications provided by WFP Food Safety. Fortified rice is priced at market price of rice + 2%
B	**Micronutrient Powder**	Child under two	In-kind Market	One half sachet per day of micronutrient powder included in the diet of the child 12-23 months in all modelling regions. Nutrient composition based on World Food Programme standard specifications. Three modalities: in-kind distribution (TSH 0), subsidized market price (TSH 100 per sachet) or full market price (TSH 200 per sachet).
C	**Specialized Complementary Food (LNS-SQ)**	Child under two	In-kind Market	One 20g serving per day of specialized lipid-based complementary food included in the diet of the child 12-23 months. Nutrient composition based on specifications for Nutributter. Two modalities: in-kind distribution and market-based (priced at TSH 200 per 20g serving).
D	**Multiple Micronutrient Tablet**	Lactating woman Adolescent girl	In-kind	One Multiple Micronutrient Tablet per day included in the diet of the lactating woman and adolescent girl. Nutrient composition based on UNICEF product number S1580100. In-kind distribution.
E	**Kitchen Gardens**	Household	Combination	Provides up to one small serving of home-grown crops into the diet of each household member. Three scenarios: A) Micronutrient-poorer crops: cabbage, tomato, beans B) Micronutrient-richer crops: amaranth, orange-flesh sweet potato, FeBeans (biofortfied with higher iron content) C) Micronutrient-richer crops plus egg: same as B but with egg production Portion sizes based on standard portions for each food in the CotD software, but not exceeding 50g per person per day. To account for cost of agricultural inputs, a nominal price for each food was assigned at 20% of average market price for each of the foods in that region.
F	**Intervention Package** Staple food fortification Multiple Micronutrient Tablets Specialized Complementary Food (LNS-SQ)	Household Lactating woman Adolescent girl Child under two	Combination	The following are included in the diet: Household: Fortified staple provided to the household as per model A above. Child under two: LNS-SQ provided in-kind to child 12-23 as per model C above. Lactating Woman and Adolescent Girl: Multiple Micronutrient Tablets as per model D above.

diet for a child under two, with an average reduction of 44%. In two regions, Kigoma and Rukwa, this intervention reduced the cost of a nutritious diet by more than half. At market price, cost reductions were noted in most regions but were less dramatic as compared to in-kind provision at an average of 12%.

Kitchen gardens are an important source of food for much of the Tanzanian population and nutrition-sensitive approaches to small-scale home production may yield benefits in terms of access to less expensive nutritious diets. The change in the cost of a nutritious diet were compared based on three possible home production scenarios: i) micronutrient poorer crops, ii) micronutrient richer crops, and iii) micronutrient richer crops with eggs. For the child under two, the cost of a nutritious diet was reduced in all three scenarios in all regions, however the impact varied by scenario. With micronutrient poorer crops, the cost of diet decreased by an average of 6%. With micronutrient richer crops, the decrease was higher at 22%. And when egg production was added to the micronutrient rich crops, the average reduction in the cost of a nutritious diet was the highest, at 28%.

The greater impact on the micronutrient richer kitchen gardens is mainly attributable to the ability to access cheaper sources of iron (from the biofortified beans) and vitamin B12 from eggs.

Target group: Lactating woman

For the lactating woman, the introduction of fortified maize at the household level resulted in a reduction in the cost of diet by a few percentage points in most regions (see Figure 4.9). However, in Rukwa, Kigoma, and Unguja, the impact was considerably higher (20-25% reduction). These are three of the regions that do not have beef liver available in the food list, so dietary requirements for vitamin B12 must be completed using dried fish (or fresh fish in Unguja), a much more expensive alternative. The fortified staple maize/rice allows the modelled lactating woman to meet her vitamin B12 requirements while alleviating the very high cost of fish in these regions.

Incorporating a multiple micronutrient tablet (MMT) into the balanced diet of a lactating woman has the potential to reduce the daily cost of diet by 10-42%. The greatest improvement is found in Rukwa, Kigoma, and Unguja, due to the aforementioned limitation on vitamin B12 sources.

Access to nutrients through kitchen gardens was most beneficial to lactating women when micronutrient-richer crops were chosen and combined with egg production. This resulted in average reduction in the cost of diet by 11% for the lactating woman. Without the egg production, the micronutrient richer kitchen garden resulted in a 7% decline in cost of diet, while the micronutrient poorer diet only reduced the cost by about 2%.

Target group: Adolescent girl

Overall, the modelling results for the adolescent girl (Figure 4.10) and the lactating woman are similar.

The introduction of fortified staple grains into the diet lowers the cost of a nutritious diet for the adolescent girl by an average of 10% across all regions. Again, the largest reductions in cost are seen in Kigoma, Rukwa, and Unguja, where the same limitation on vitamin B12 affects both the lactating woman and adolescent girl.

Adding a multiple micronutrient tablet to a balanced diet of unfortified food for the adolescent girl dramatically improves her access to nutrients, resulting in a diet that averages 29% less expensive. In Rukwa, the cost is cut in half.

Results from the kitchen garden models were consistent with that of the lactating woman, with cost reductions of 2% for the micronutrient poorer option, 8% for the micronutrient richer option, and 12% when eggs are added to the micronutrient richer garden.

Household

Modelling staple food fortification for a five-person household resulted in a small decrease of about 4% in the cost of a nutritious diet in most regions (Figure 4.11). In Rukwa, Kigoma, and Unguja, the effect was stronger, with the steeper reductions in household cost driven primarily by the decrease in cost for the lactating woman's and adolescent girl's diets.

Access to a kitchen garden benefitted all household members, evidenced by a decrease in cost of a nutritious diet for all household members, though, in line with previous results, the impact was greatest when micronutrient richer crops were combined with egg production (average of -12%). Without the eggs, the reduction is cost averaged 8%. The micronutrient poorer kitchen garden decreased the cost by only 2%.

A layered intervention model, where market purchase of fortified maize for the household is combined with in-kind provision of LNS-SQ for the child under two and MMTs for the lactating woman and adolescent girl resulted in the least expensive nutritious diet in all regions. A model household receiving this package of interventions reduced their cost of a nutritious diet by one-fifth on average.

Affordability at household level

While individual interventions have varying effects on the cost of a nutritious diet, it is also possible to estimate the change in affordability of the nutritious diet at household level after a given intervention is applied. This includes both the nutrition-specific and nutrition-sensitive interventions already modelled, as well as cash transfers[35]. Figure 4.11 shows the results of this analysis for each region.

The introduction of fortified staples and micronutrient-richer kitchen gardens with egg production had a similar overall impact of the affordability of the diet. Both interventions reduced the proportion of households that could not afford a nutritious diet by about 7 percentage points. In the case of fortified staples, a few regions (Rukwa, Kigoma, and Unguja) had reductions well above the average. For the kitchen garden intervention, the regional results varied little, from 6 to 10 percentage points.

The package of interventions (fortified staples, MMT for lactating woman and adolescent girl, and LNS-SQ for the child under two) had a greater impact on the affordability of the diet. On average, the package resulted in an improvement of about 13 percentage points. In all regions but one, the improvement in affordability for the intervention package was better than that of fortified staples or kitchen gardens alone.

The effect of the introduction of a cash transfer – which could simulate support from a social safety net or simply a boost in income at household level – varied somewhat depending on the amount provided. With a cash transfer of TSH 25,000 per month, the proportion of households who could not afford the nutritious diet decreased by 9 points. When that cash transfer increased to TSH 35,000 per month, the proportion not able to afford dropped by 13 points.

However, while the average impact of the larger cash transfer is about equivalent to the intervention package (also a 13-point drop) the results at regional level vary considerably. The larger cash transfer was more effective than the intervention package at improving affordability in only four regions, less

[35] For the purposes of modelling, it is assumed that all the cash is spent on nutritious foods.

effective in another four regions, and equivalent in two. This pattern is attributable to the underlying market characteristics in each region – where nutritious foods are available but expensive, the added cash is more useful. Where key nutritious foods are not available, the specialized nutritious products and fortified foods in the intervention package are better able to provide the specific nutrients needed to complete the nutritious diet.

The last set of interventions modelled, which combined the package of nutrition interventions with a cash transfer, were the most effective at improving the affordability of a nutritious diet. When a household receives the full package of nutrition interventions plus an additional TSH 35,000 per month, the average proportion of households who cannot afford a nutritious diet reduced from 59% to 33%. This represents a drop of 28 points. The most dramatic improvements were in Rukwa and Unguja, where the proportion of households who could not afford the diet reduced more than 40 points from over 60% to about 21%. All but one region saw an improvement of at least 20 points.

Discussion

Overall, the results of the modelling exercise serve to highlight the value of targeting and planning nutrition interventions carefully and provide a useful starting point from which such interventions can be evaluated.

Staple food fortification is a key population level nutrition intervention and has well-documented and wide-ranging benefits. However, since large-scale staple food fortification is not optimized for the individual nutrient needs of women, adolescent girls, and young children, the intervention is not able to provide enough key nutrients to those target groups to meaningfully drive down the cost of a nutritious diet for the household. Nonetheless, household level staple fortification is a useful and viable vehicle for population level micronutrient coverage, in particular because it does not mandate major changes in dietary habits.

Similarly, kitchen gardens provide a low cost and convenient source of micronutrients that can support greater diversity of household diets, but again it is difficult to grow the variety, type, and quantity of micronutrient-rich foods to supplement market purchases that will meet the needs of pregnant and lactating women, adolescent girls, and children under two throughout the year.

Because the diets of the lactating woman and adolescent girl command a disproportionately larger share of the overall cost for the household due to their high nutrient requirements, interventions that are targeted at these two individuals generally produce the largest impact on household cost. Thus any intervention that seeks to reduce the cost of a nutritious diet must ensure these women and girls in particular are able to access targeted interventions that will meet their needs.

A child under two also has unique nutrient requirements. The greater impact on cost of diet found in both the MNP and LNS-SQ models can be attributed to the fact that they are specially formulated to meet the micronutrient requirements of a child 6-23 months. The additional improvements in the LNS-SQ model are due to the fact that this product also contributes to protein and energy requirements. In these models, MNPs and LNS-SQ supplemented a diet mainly consisting of breast milk and family foods of cereals, legumes, and vegetables. The relative impact of these interventions varied considerably based on their cost to the consumer.

A layered intervention model in which a household that can complement a balanced diet with the purchase of fortified staple food, and where the women, girls, and children under two are able to avail of targeted supplements would be able to meet the needs of all household members for a lower cost. When a cash transfer is added to this intervention package, the household is better able to avail of targeted nutrition interventions and reduce economic barriers to good nutrition. When nutrition-

specific interventions are combined with cash transfers, the proportion of households who could not afford a nutritious diet improves dramatically, dropping to just 33% from 59%.

These findings emphasize that with careful consideration, both nutrition-specific and nutrition sensitive interventions have potential to improve access to nutrients. In the case of specialized nutritious foods, price points must be carefully considered. While in most cases, in-kind provision has potential to reduce the cost of a nutritious diet, in practice large scale in-kind distribution may not be feasible. In such cases, price segmentation could be a more efficient and viable option to promote better access to nutrients. For home-based small agricultural production, the choice of crop grown is critical to maximizing better access to nutrients.

***Figure 4.8a**: Modelling results for child 12-23 months for regions Dodoma, Tanga, Morogoro, Dar es Salaam, and Mtwara. Bars show cost of diet for child under two. Percentage labels indicate the difference in cost of modelled diet relative to the nutritious diet.*

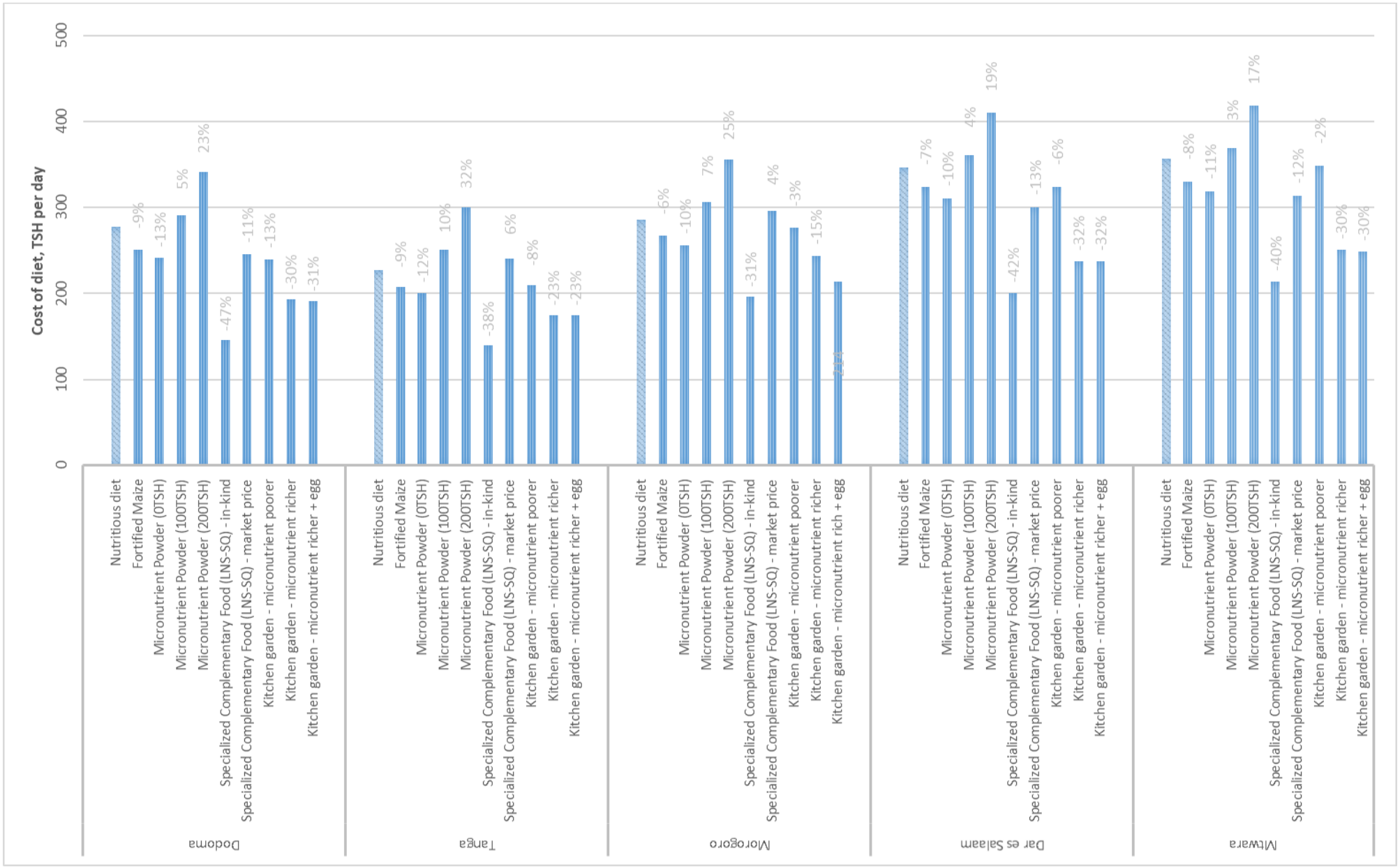


***Figure 4.8b**: Modelling results for child 12-23 months for regions Rukwa, Kigoma, Kagera, Njombe, and Unguja. Bars show cost of diet for child under two. Percentage labels indicate the difference in cost of modelled diet relative to the nutritious diet.*

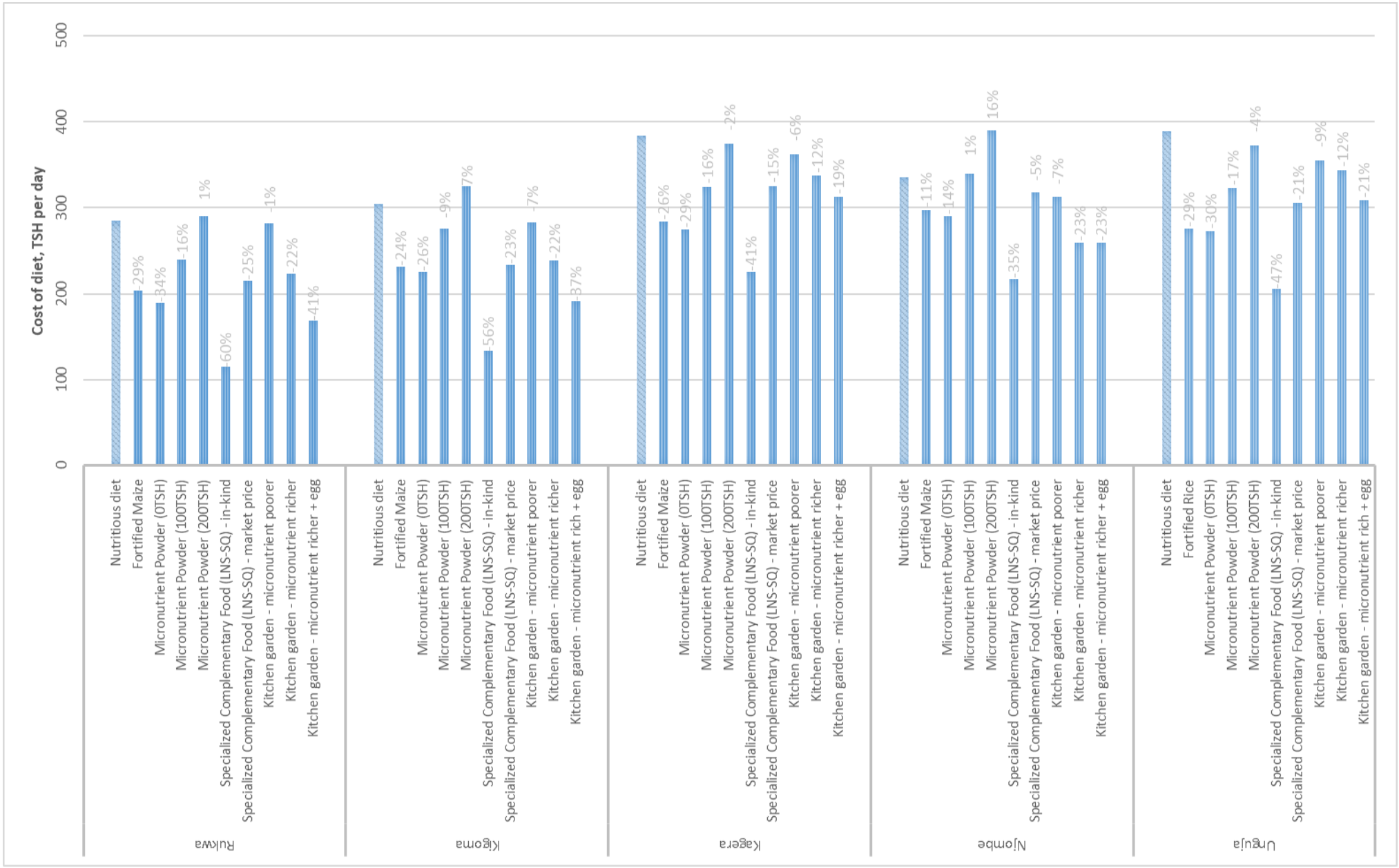


***Figure 4.9**: Modelling results for lactating woman. Bars show cost of diet for lactating woman. Percentage labels indicate the difference in cost of modelled diet relative to nutritious diet.*

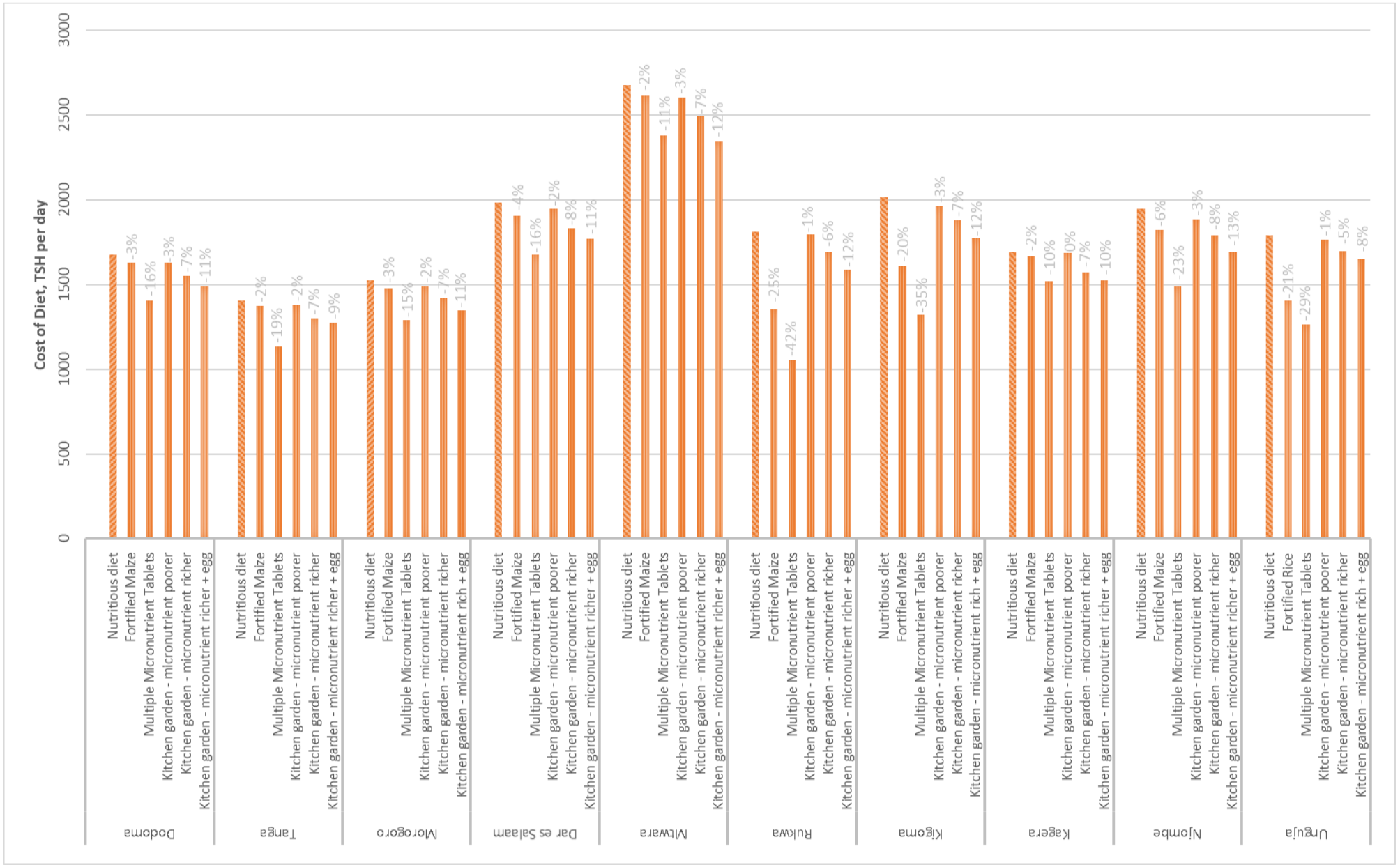


***Figure 4.10**: Modelling results for adolescent girl aged 14-15. Bars show cost of diet for adolescent girl. Percentage labels indicate the difference in cost of modelled diet relative to the nutritious diet.*

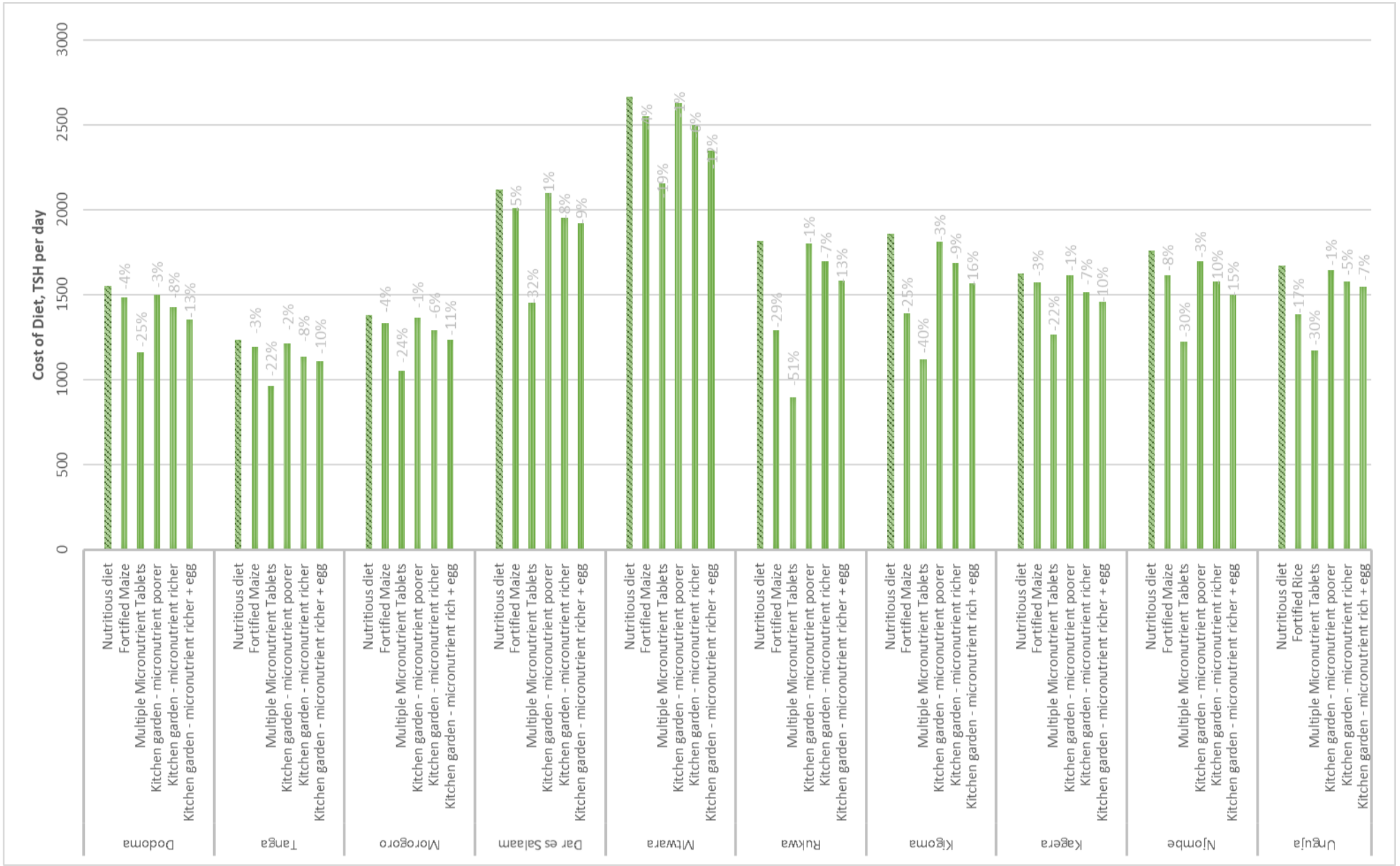


***Figure 4.11**: Modelling results for the five-person household. Bars show cost of diet for household. Percentage labels indicate the difference in cost of modelled diet relative to nutritious diet.*

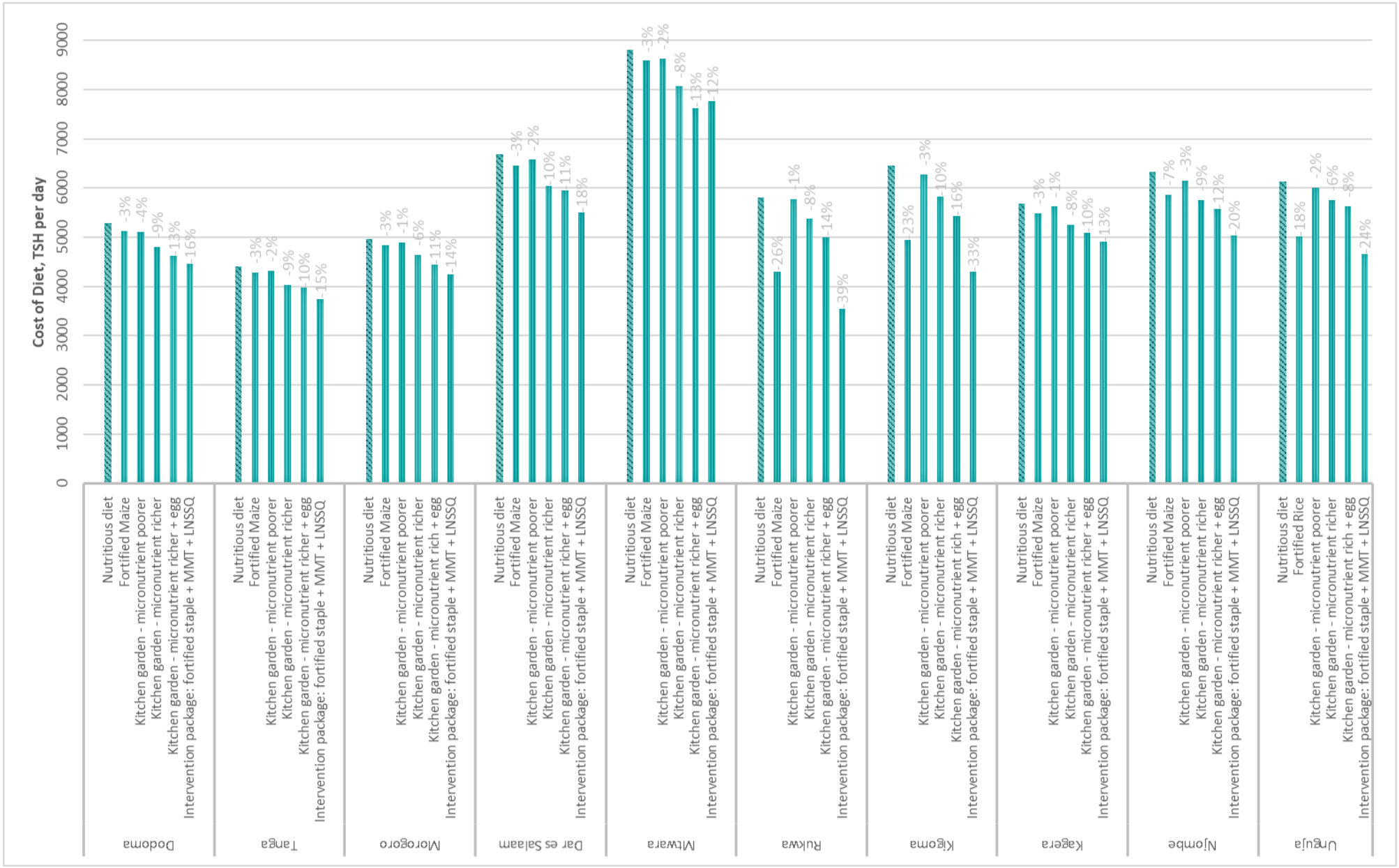
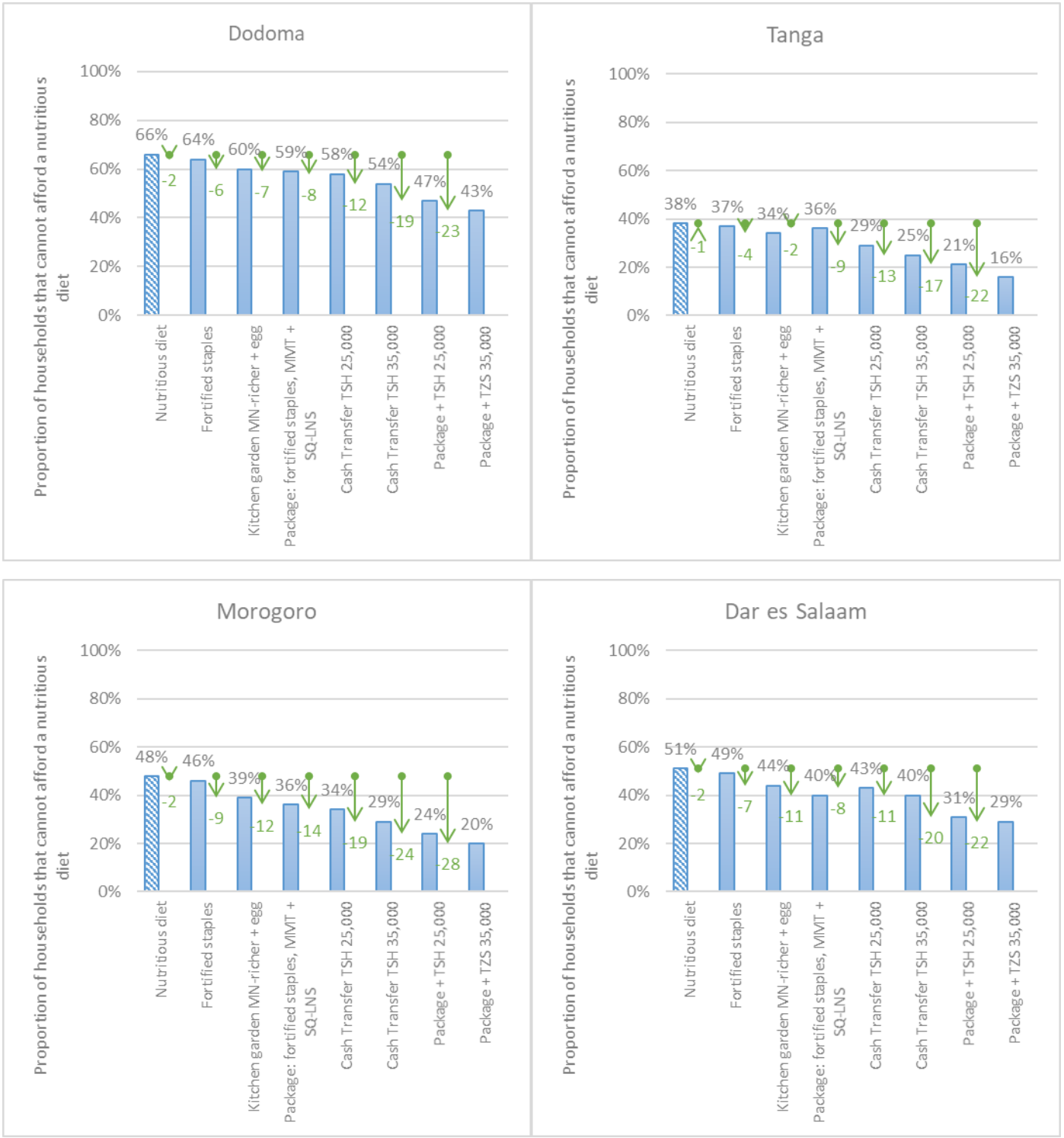
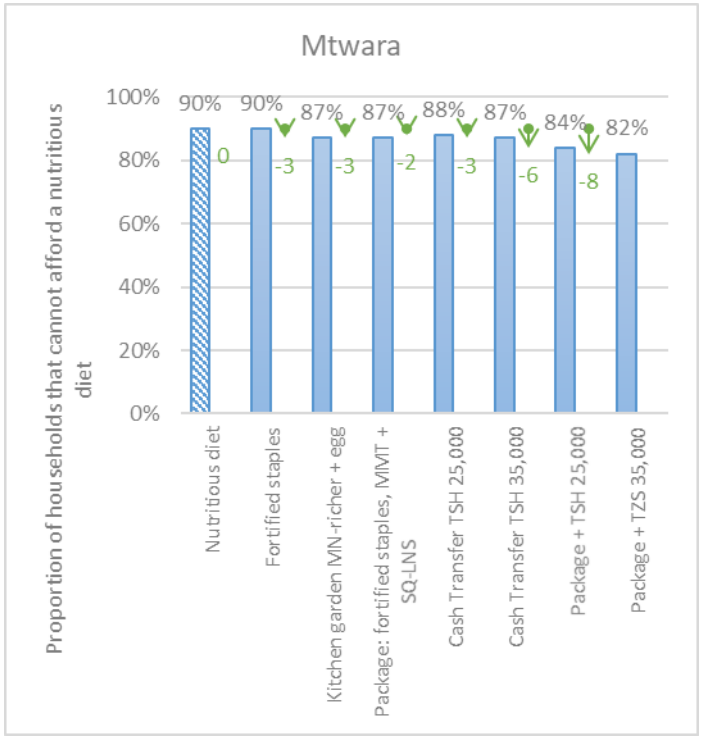
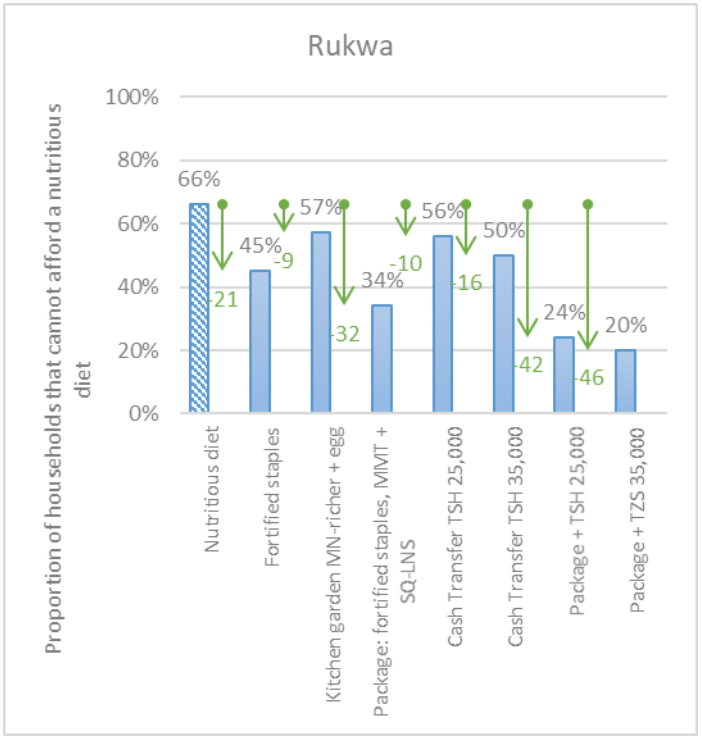
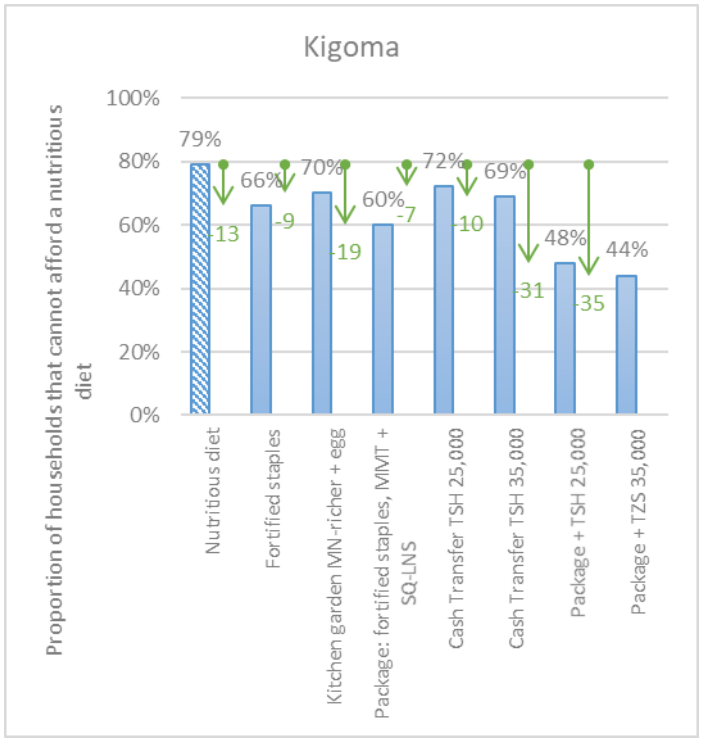


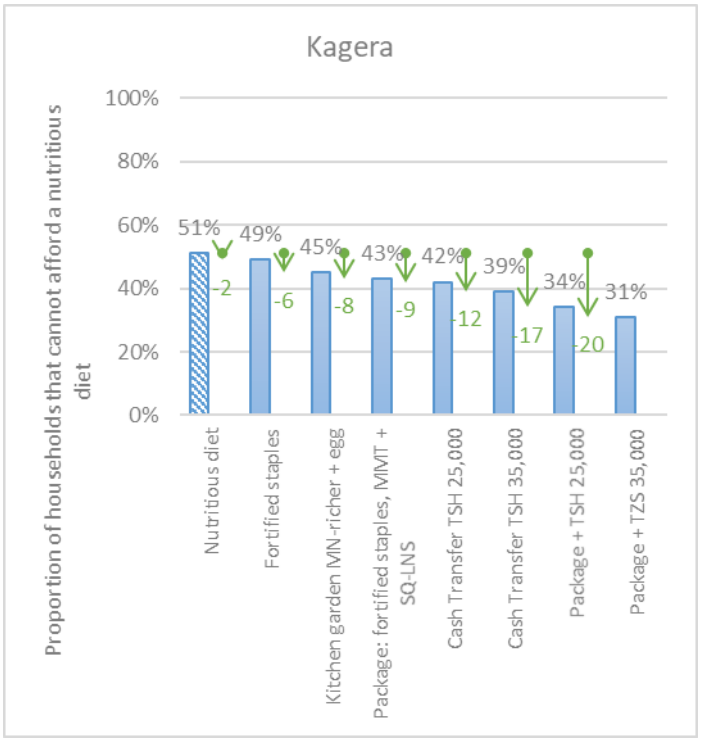
Figure 4.12: *Change in the proportion of households who could not afford a nutritious diet with various modelling interventions by region. Green arrows indicate the change in percentage points of a given intervention from the nutritious diet (diagonal bars).*

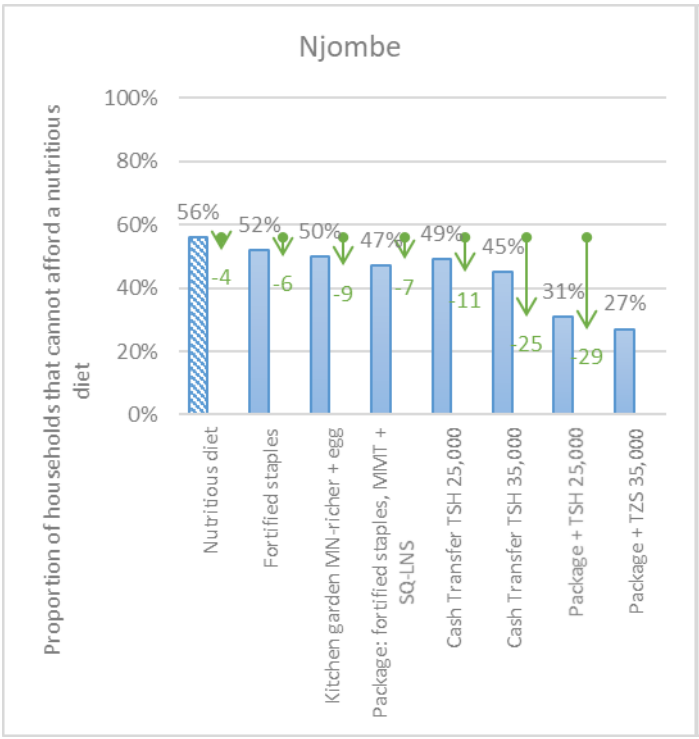


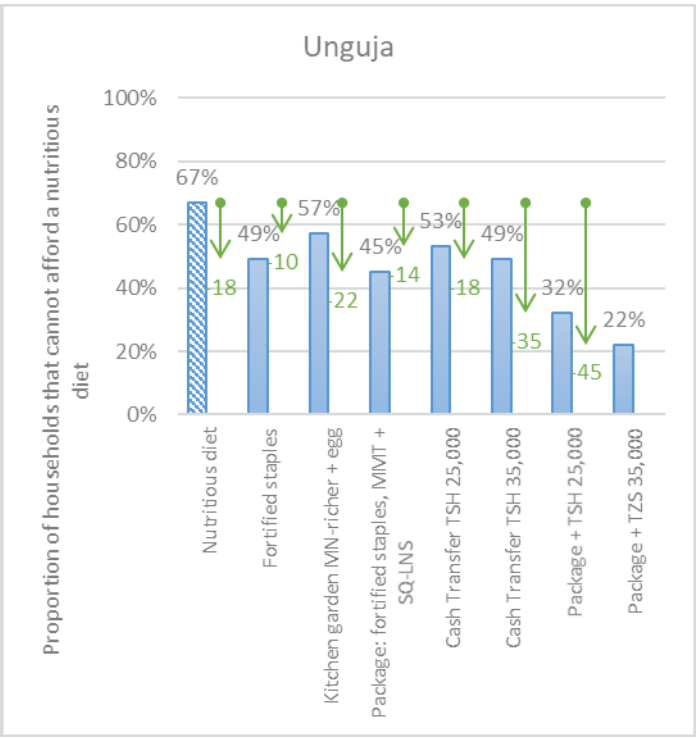

Mtwara
Proportion of households that cannot afford a nutritious diet
100%
80%
60%
40%
20%
0%
90%
90%
87%
87%
88%
87%
84%
82%
0
-3
-3
-2
-3
-6
-8
Nutritious diet
Fortified staples
Kitchen garden MN-richer + egg
Package: fortified staples, MMT + SQ-LNS
Cash Transfer TSH 25,000
Cash Transfer TSH 35,000
Package + TSH 25,000
Package + TZS 35,000


Rukwa
Proportion of households that cannot afford a nutritious diet
100%
80%
60%
40%
20%
0%
66%
45%
57%
34%
56%
50%
24%
20%
-21
-9
-32
-10
-16
-42
-46
Nutritious diet
Fortified staples
Kitchen garden MN-richer + egg
Package: fortified staples, MMT + SQ-LNS
Cash Transfer TSH 25,000
Cash Transfer TSH 35,000
Package + TSH 25,000
Package + TZS 35,000


Kigoma
Proportion of households that cannot afford a nutritious diet
100%
80%
60%
40%
20%
0%
79%
66%
70%
60%
72%
69%
48%
44%
-13
-9
-19
-7
-10
-31
-35
Nutritious diet
Fortified staples
Kitchen garden MN-richer + egg
Package: fortified staples, MMT + SQ-LNS
Cash Transfer TSH 25,000
Cash Transfer TSH 35,000
Package + TSH 25,000
Package + TZS 35,000


Kagera
Proportion of households that cannot afford a nutritious diet
100%
80%
60%
40%
20%
0%
51%
49%
45%
43%
42%
39%
34%
31%
-2
-6
-8
-9
-12
-17
-20
Nutritious diet
Fortified staples
Kitchen garden MN-richer + egg
Package: fortified staples, MMT + SQ-LNS
Cash Transfer TSH 25,000
Cash Transfer TSH 35,000
Package + TSH 25,000
Package + TZS 35,000


Njombe
Proportion of households that cannot afford a nutritious diet
100%
80%
60%
40%
20%
0%
56%
52%
50%
47%
49%
45%
31%
27%
-4
-6
-9
-7
-11
-25
-29
Nutritious diet
Fortified staples
Kitchen garden MN-richer + egg
Package: fortified staples, MMT + SQ-LNS
Cash Transfer TSH 25,000
Cash Transfer TSH 35,000
Package + TSH 25,000
Package + TZS 35,000


Unguja
Proportion of households that cannot afford a nutritious diet
100%
80%
60%
40%
20%
0%
67%
49%
57%
45%
53%
49%
32%
22%
-18
-10
-22
-14
-18
-35
-45
Nutritious diet
Fortified staples
Kitchen garden MN-richer + egg
Package: fortified staples, MMT + SQ-LNS
Cash Transfer TSH 25,000
Cash Transfer TSH 35,000
Package + TSH 25,000
Package + TZS 35,000

Reference Table 4.1: *Maximum, minimum, and average market prices across regions, for July 2016, for food items included in Cost of the Diet analysis. The last column sums the number of regions in the price monitoring list that have a price for that item.*

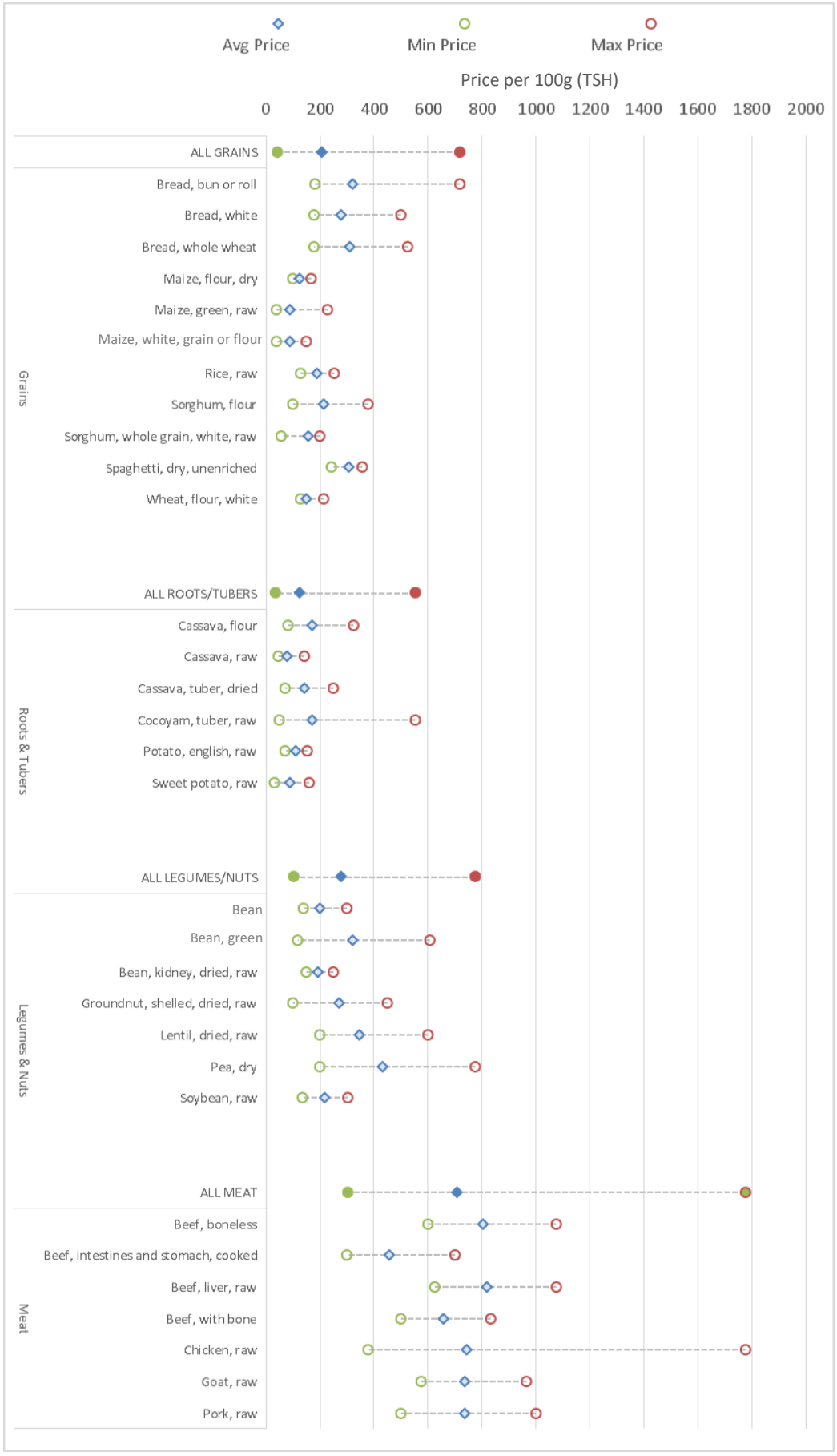
Food item	Max Price	Min Price	Avg Price	# of regions with food item
GRAINS	717	40	203	
Bread, bun or roll	717	180	321	27
Bread, chapati with maize flour	344	284	314	2
Bread, wheat, white	195	187	191	2
Bread, white	500	180	280	25
Bread, whole wheat	525	180	312	20
Maize, flour, dry	169	100	124	27
Maize, green, raw	229	40	90	21
Maize, white, grain or flour	150	40	90	25
Millet, flour	207	120	163	2
Rice, raw	253	127	189	27
Sorghum, flour	379	100	214	9
Sorghum, whole grain, white, raw	200	55	157	22
Spaghetti, dry, unenriched	356	243	306	27
Wheat, flour, white	213	127	149	27
Wheat, whole grain, raw	187	173	180	2
ROOTS/TUBERS	553	32	122	
Cassava, flour	325	80	173	21
Cassava, raw	144	47	80	26
Cassava, tuber, dried	250	70	142	17
Cocoyam, tuber, raw	553	51	171	20
Potato, english, raw	154	69	109	27
Sweet potato, raw	160	32	88	27
LEGUMES/NUTS	775	100	276	
Bean	300	140	198	24
Bean, green	606	116	320	17
Bean, kidney, dried, raw	250	150	194	27
Cowpea, uncooked	373	267	320	2
Groundnut, shelled, dried, raw	450	100	271	26
Lentil, dried, raw	600	200	345	23
Pea, dry	775	200	433	21
Soybean, raw	305	134	218	27
MEAT	1778	300	706	
Beef, boneless	1075	600	805	26
Beef, intestines and stomach, cooked	700	300	457	22
Beef, liver, raw	1075	625	820	21
Beef, mince, raw	654	654	654	1
Beef, tripe, raw	533	500	517	2
Beef, with bone	833	500	658	27
Chicken, raw	1778	380	745	27
Goat, raw	967	575	737	24
Pork, raw	1000	500	738	21
Sausage	528	528	528	1
FISH	2811	400	778	
Fish, dried	1700	400	722	27
Fish, raw	1215	461	773	22
Fish, sardine, raw	673	484	578	2

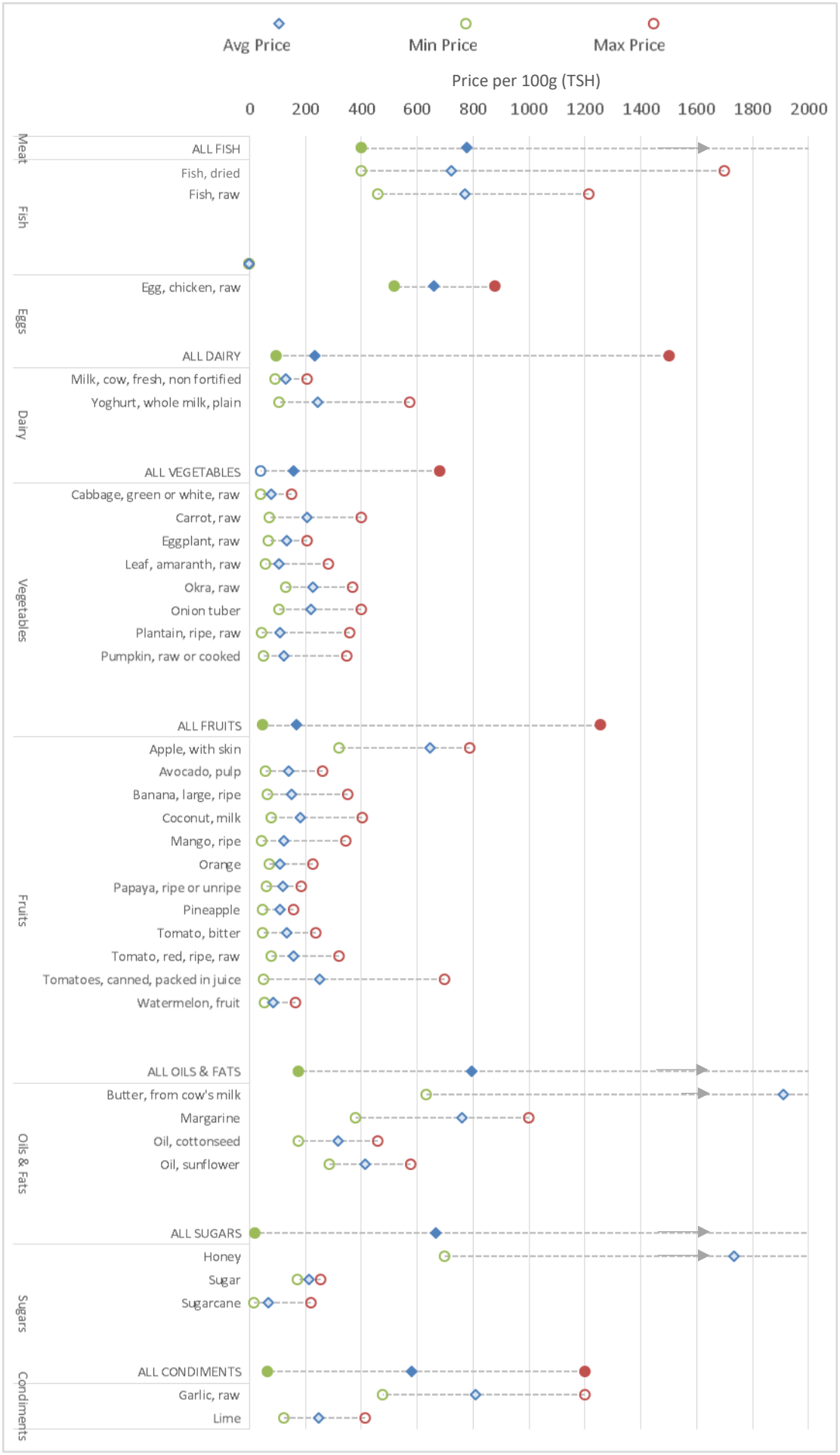
Food item	Max Price	Min Price	Avg Price	# of regions with food item
Fish, tuna, canned in water, drained	2811	2811	2811	1
EGG				
Egg, chicken, raw	877	517	659	27
DAIRY	1500	94	232	
Milk, cow, fresh, non fortified	208	94	130	27
Yoghurt, whole milk, plain	572	106	244	21
Yogurt, fruit	1500	667	1076	3
VEGETABLES	680	40	156	
Cabbage, green or white, raw	152	40	80	27
Carrot, raw	400	71	207	25
Cucumber, raw	127	113	120	2
Eggplant, raw	206	69	134	23
Leaf, amaranth, raw	282	58	105	27
Okra, raw	370	130	229	27
Onion tuber	400	107	219	27
Pepper, sweet, raw	680	378	529	2
Plantain, ripe, raw	360	44	108	27
Pumpkin, raw or cooked	349	50	124	13
FRUITS	1253	44	168	
Apple, with skin	789	321	646	11
Avocado, pulp	263	58	141	20
Banana, large, ripe	353	66	151	27
Banana, large, unripe	158	121	140	2
Coconut, milk	403	79	184	26
Grapefruit, pulp	1253	243	694	5
Mango, ripe	347	44	122	27
Orange	226	71	110	27
Papaya, ripe or unripe	186	62	119	26
Pineapple	159	47	111	27
Tomato, bitter	237	48	133	27
Tomato, red, ripe, raw	320	79	159	27
Tomatoes, canned, packed in juice	700	50	251	14
Tomato paste, concentrated	619	619	619	1
Watermelon, fruit	165	53	87	22
Jackfruit	100	71	85	2
OILS & FATS	5000	175	794	
Butter, from cow's milk	5000	633	1912	16
Margarine	1000	380	760	19
Oil, cottonseed	460	175	317	13
Oil, sesame	736	331	444	4
Oil, sunflower	576	288	416	25
Oil	767	644	705	2
SUGARS	3547	17	665	
Honey	3547	700	1736	22
Sugar	255	173	212	27
Sugarcane	220	17	69	19
CONDIMENTS	1200	64	579	
Garlic, raw	1200	478	810	27
Lime	413	124	249	16
Lemon	157	64	110	2

***Reference Table 4.2**: Staple foods assigned to each region for calculation of the nutritious diet.*

Zone	Region	Staple food
NORTHERN	Arusha	Maize
	Kilimanjaro	Maize, Plantain
	Tanga	Maize
EASTERN	Morogoro	Maize
	Pwani	Maize, Cassava
	Dar es Salaam	Maize, Rice
SOUTHERN	Lindi	Maize, Cassava
	Mtwara	Maize, Cassava
SOUTHERN HIGHLANDS	Ruvuma	Maize
	Iringa	Maize
	Njombe	Maize
SOUTH WEST HIGHLANDS	Mbeya	Maize
	Rukwa	Maize
	Katavi	Maize
CENTRAL	Dodoma	Maize
	Singida	Maize
	Manyara	Maize
WESTERN	Tabora	Maize
	Kigoma	Maize
LAKE	Shinyanga	Maize, Rice
	Kagera	Maize, Plantain
	Mwanza	Maize
	Mara	Maize, Cassava
	Simiyu	Maize
	Geita	Maize
ZANZIBAR	Unguja	Rice
	Pemba	Rice

***Reference Table 4.3**: Maximum, minimum, and average market prices per 100g, for July 2016, for food items included in Cost of the Diet analysis. Food items present in less than five regions (as per Reference Table 4.1) are not represented in the chart. Maximum prices beyond 2000 TSH (represented by a grey arrow), affecting some items in fish, oils & fats and sugar groups, are not shown below (values can be seen in Reference Table 4.1)*




Avg Price
Min Price
Max Price
Price per 100g (TSH)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Meat
Fish
ALL FISH
Fish, dried
Fish, raw
Eggs
Egg, chicken, raw
Dairy
ALL DAIRY
Milk, cow, fresh, non fortified
Yoghurt, whole milk, plain
Vegetables
ALL VEGETABLES
Cabbage, green or white, raw
Carrot, raw
Eggplant, raw
Leaf, amaranth, raw
Okra, raw
Onion tuber
Plantain, ripe, raw
Pumpkin, raw or cooked
Fruits
ALL FRUITS
Apple, with skin
Avocado, pulp
Banana, large, ripe
Coconut, milk
Mango, ripe
Orange
Papaya, ripe or unripe
Pineapple
Tomato, bitter
Tomato, red, ripe, raw
Tomatoes, canned, packed in juice
Watermelon, fruit
Oils & Fats
ALL OILS & FATS
Butter, from cow's milk
Margarine
Oil, cottonseed
Oil, sunflower
Sugars
ALL SUGARS
Honey
Sugar
Sugarcane
Condiments
ALL CONDIMENTS
Garlic, raw
Lime

***Reference Table 4.4**: Cost of a nutritious diet in 26 regions of Tanzania, for the entire five-person household and each individual within the household.*

Zone	Region	Cost of a Nutritious Diet, TSH					
		Child, 12-23 months	**Lactating woman**	**Adolescent girl**	**Child, 6-7 years**	**Man**	**Household**
Central	Dodoma	277	1,675	1,554	669	1,111	5,286
	Singida	321	1,580	1,725	670	1,080	5,376
	Manyara	266	1,548	1,507	638	1,070	5,028
Eastern	Morogoro	286	1,527	1,383	621	1,149	4,966
	Pwani	400	2,075	1,946	867	1,508	6,796
	Dar es Salaam	347	1,986	2,124	811	1,413	6,681
Lake	Shinyanga	237	1,386	1,229	606	1,094	4,552
	Kagera	384	1,694	1,627	724	1,250	5,680
	Mwanza	252	1,596	1,415	625	1,022	4,909
	Mara	293	1,607	1,532	641	1,085	5,157
	Simiyu	281	1,760	1,655	725	1,074	5,494
	Geita	179	1,219	1,035	515	824	3,772
Northern	Arusha	311	1,813	1,676	715	1,264	5,780
	Kilimanjaro	366	1,790	1,630	742	1,318	5,846
	Tanga	227	1,405	1,234	567	965	4,399
South West Highlands	Mbeya	244	1,552	1,358	692	1,131	4,976
	Rukwa	285	1,811	1,818	684	1,205	5,805
	Katavi	198	1,267	1,169	528	846	4,008
Southern	Lindi	364	1,782	1,587	715	1,271	5,719
	Mtwara	357	2,677	2,670	1,242	1,864	8,809
Southern Highlands	Ruvuma	229	1,541	1,344	608	957	4,678
	Iringa	280	1,695	1,531	707	1,181	5,394
	Njombe	336	1,947	1,762	795	1,492	6,332
Western	Tabora	326	1,694	1,892	776	1,268	5,957
	Kigoma	304	2,016	1,863	845	1,422	6,450
Zanzibar	Unguja	389	1,791	1,672	805	1,481	6,138
	Pemba	364	1,692	1,596	766	1,442	5,860
NATIONAL AVERAGE *% of household cost*		**300** *5%*	**1,708** *31%*	**1,612** *29%*	**715** *13%*	**1,214** *22%*	**5,550**

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