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Final Report

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Table of Contents

Acknowledgements.....	3
List of Acronyms.....	5
List of Tables.....	7
List of Figures.....	9
Executive Summary.....	10
1. Context and Justification.....	13
1.1 Introduction and Literature Review.....	13
1.2 Justification for the survey.....	15
1.3 Overview of SMART Methodology.....	15
2. Objectives.....	16
3. Methodology.....	16
3.1 Target population.....	16
3.2 Study Design.....	16
3.3 Sampling Design.....	17
3.4 Sample Size.....	18
3.5 Data collected.....	22
3.6 Survey Personnel.....	23
3.7 Training.....	24
3.8 Implementation of Fieldwork.....	27
3.9 Data entry and Data Analysis.....	27
3.10 Ethical Considerations.....	30
3.11 Limitations of the survey.....	31
4. Results.....	32
4.1 Children Nutritional Status (0-59 months).....	32
4.2 Vitamin A Supplementation (6-59 months).....	51
4.3 Deworming (12-59 months).....	52
4.4 Infant and Young Child Feeding Practices (0-23 months).....	54
4.5 Women Nutritional Status (15-49 years).....	64
4.6 Use of Iodized Salt.....	68
4.7 Handwashing Practices.....	69
5. Discussion.....	70
6. Conclusion and Recommendations.....	78
References.....	79
Annexes.....	81

List of Acronyms

BMI	Body Mass Index
CI	Confidence Interval
DFID	Department For International Development
DHS	Demographic and Health Survey
EA	Enumeration Area
ENA	Emergency Nutrition Assessment
FAO	Food and Agriculture Organization of the United Nations
GAM	Global Acute Malnutrition
GDP	Gross Domestic Product
HAZ	Height-for-Age Z-scores
HH	Household
IFA	Iron-Folic Acid
IYCF	Infant and Young Child Feeding
MAD	Minimum Acceptable Diet
MAFS	Ministry of Agriculture and Food Security
MAM	Moderate Acute Malnutrition
MDG	Millennium Development Goal
MKUKUTA	Kiswahili acronym for the National Strategy for Growth and Reduction of Poverty
MoH	Ministry of Health
MoHSW	Ministry of Health and Social Welfare
MUAC	Mid-Upper Arm Circumference
NBS	National Bureau of Statistics
NGO	Non-Government Organization
NNS	National Nutrition Survey
OCGS	Office of Chief Government Statistician
PPS	Probability Proportion to Size
RC	Reserve Cluster
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SMART	Standardized Monitoring and Assessment of Relief and Transitions
STATA	Data analysis and statistical software
TDHS	Tanzania Demographic and Health Survey
TFNC	Tanzania Food and Nutrition Centre
TRHCS	Tanzania Reproductive and Child Health Survey
UNICEF	United Nations Children's Fund
UN-REACH	Renewed Efforts Against Child Hunger and Undernutrition
VAS	Vitamin A supplementation
WAZ	Weight-for-Age Z-scores
WFP	World Food Programme

WHA	World Health Assembly
WHO	World Health Organization
WHZ	Weight-for-Height Z-scores
WRA	Women of Reproductive Age

List of Tables

Table 1: Summary of parameters used for sample sizes calculations

Table 2: Cut-offs for definition of wasting, stunting and underweight

Table 3: Cut-offs for definition of adult thinness, overweight and obesity by BMI

Table 4: Vitamin A Supplementation Coverage and Deworming Coverage

Table 5: Number and percentage of surveyed clusters and assessed children as compared to number of planned clusters and number of children by region, Mainland, Zanzibar and National

Table 6: Distribution of children by sex and sex-ratio by region, Mainland, Zanzibar and National

Table 7: Distribution of children by sex and by age group at national level

Table 8: Proportion of children with an exact date of birth by region, Mainland, Zanzibar and National

Table 9: Overall data quality score by region

Table 10: Mean z-scores, Design Effects and excluded subjects following SMART flags application by region, Mainland, Zanzibar and National (WHO 2006 Growth References)

Table 11: Prevalence of Global, Moderate and Severe Chronic Malnutrition (Height-for-Age Z-score) in children 0 to 59 months of age by age group and sex in Tanzania (WHO 2006)

Table 12: Prevalence of Global, Moderate and Severe Chronic Malnutrition (Height-for-Age Z-score) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

Table 13: Number of children 0-59 months suffering from stunting by region, Mainland, Zanzibar and National

Table 14: Prevalence of Global, Moderate and Severe Acute Malnutrition (Weight-for-Height Z-score) in children 0 to 59 months of age by age group and sex in Tanzania (WHO 2006)

Table 15: Prevalence of Global, Moderate and Severe Acute Malnutrition (Weight-for-Height Z-score) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

Table 16: Number of children 0-59 months suffering from moderate acute malnutrition or severe acute malnutrition by region, Mainland, Zanzibar and National

Table 17: Prevalence of Global, Moderate and Severe Underweight (Weight-for-Age Z-score) in children 0 to 59 months of age by age group and sex in Tanzania (WHO 2006)

Table 18: Prevalence of Global, Moderate and Severe Underweight (Weight-for-Age Z-score) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

Table 19: Prevalence of Global, Moderate and Severe Overweight (Weight-for-Height Z-score – no edema) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

Table 20: Vitamin A supplementation coverage by region, Mainland, Zanzibar and National in children 6 to 59 months

Table 21: Deworming coverage by region, Mainland, Zanzibar and National in children 12 to 59 months

Table 22: Ever breastfed by region, Mainland, Zanzibar and National (Children 0-23 months)

Table 23: Early Initiation of Breastfeeding by region, Mainland, Zanzibar and National (Children 0-23 months)

Table 24: Exclusive breastfeeding by region, Mainland, Zanzibar and National (Infants 0-5 months)

Table 25: Continued breastfeeding at 1 year by region, Mainland, Zanzibar and National (Children 12-15 months)

Table 26: Continued breastfeeding at 2 year by region, Mainland, Zanzibar and National (Children 20-23 months)

Table 27: Introduction of complementary food by region, Mainland, Zanzibar and National (Infants 6-8 months)

Table 28: Average number of food groups consumed by age group and by sex (Children 6-23 months)

Table 29: Average number of food groups consumed by region, Mainland, Zanzibar and National (Children 6-23 months)

Table 30: Minimum Dietary Diversity by age group and by sex (Children 6-23 months)

Table 31: Minimum Dietary Diversity by region, Mainland, Zanzibar and National (Children 6-23 months)

Table 32: Minimum meal frequency by age group and by sex (Children 6-23 months)

Table 33: Minimum meal frequency by age group and for breastfed/non-breastfed children, by region, Mainland, Zanzibar and National

Table 34: Minimum Acceptable Diet by age group and by sex (Children 6-23 months)

Table 35: Minimum Acceptable Diet (MAD) by age group and for breastfed/non-breastfed children, by region, Mainland, Zanzibar and National

Table 36: Description of the data (age, weight and height) collected from women aged 15 to 49 years by region, Mainland, Zanzibar and National

Table 37: Distribution of the sample of women aged 15 to 49 years by region, Mainland, Zanzibar and National

Table 38: Nutritional status of non-pregnant women 15 to 49 years according to BMI classification by region, Mainland, Zanzibar and National

Table 39: Nutritional status of non-pregnant women 15 to 49 years according to BMI classification by age group

Table 40: Percentage of women 15-49 years of age with children under five years of age who took an IFA supplementation during pregnancy for past birth, disaggregated by number of days by region, Mainland, Zanzibar and National

Table 41: Consumption of iodized salt in households by region, Mainland, Zanzibar and National

Table 42: Percentage of household that have soap and who report having used soap for handwashing at least at two critical times during past 24 hours (including “after defecating”), by region, Mainland, Zanzibar and National

List of Figures

Figure 1: The intergenerational cycle of stunting

Figure 2: Contribution to National Information System

Figure 3: Age distribution in months

Figure 4: Height-for-Age z-score (WHO 2006)

Figure 5: Weight-for-Height z-score (WHO 2006)

Figure 6: Weight-for-Age z-score (WHO 2006)

Figure 7: Trends of malnutrition by age in months

Figure 8: Distribution of age in years

Figure 9: Percent of pregnant women by age groups

Figure 10: Prevalence of Chronic Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 1-12)

Figure 11: Prevalence of Chronic Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 13-25)

Figure 12: Prevalence of Chronic Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Zanzibar)

Figure 13: Prevalence of Acute Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 1-12)

Figure 14: Prevalence of Acute Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 13-25)

Figure 15: Prevalence of Acute Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Zanzibar)

Figure 16: Prevalence of Underweight (Global, Moderate and Severe) according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 (National, Mainland and Zanzibar)

Figure 17: Trends in nutritional status of children under age 5 according to WHO Growth Standards 2006

Executive Summary

This report presents the results of the first National Nutrition Survey (NNS) with the SMART Methodology in Tanzania. This nutrition survey has been conducted from September 24th to November 21st, 2014. The objectives of the survey were to assess nutritional status of children aged 0-59 months and of women 15-49 years, level of Infant and Young Child Feeding (IYCF) practices, coverage of micronutrients interventions and handwashing practices in Tanzania.

The survey was a cross-sectional survey with two stage cluster sampling. All efforts were made to follow SMART methods to ensure a high quality nutrition survey. Variations from the SMART methods are noted in the methods section. Data were collected from 991 clusters of between 16 and 22 households and 16,984 children less than 5 years of age and 18,399 women in reproductive age group have been surveyed. Sample sizes were calculated at regional level in order to estimate global acute malnutrition with a desired precision of between 2-4 percent with design effect of 1.5. Ninety-eight percent of the selected clusters for children under five and for women in child bearing age were interviewed.

The results are representative at national and regional levels. The 30 domains were selected based on the current administrative structure (30 regions).

Data Quality Summary

Following the SMART methods, issues of data quality are reported in the survey document in order to identify mistakes to avoid in the future and to consistently improving the quality of nutrition surveys. The full data quality report from the ENA software is included in the annex of the report.

In the raw data, 96% of the children were found to have an age calculated from an exact day, month and year of birth ranging from 82% to 100% per region. The quality of age is excellent. Boys and girls were represented in the same proportion in the sample with an overall sex-ratio equal to 1.0. At the regional level, the sex-ratio varies from 0.8 to 1.2. It is within acceptable range.

All age groups were represented in proportions between 18.4% and 24.3%; only the 48-59 months age group is slightly less represented since it represents only 14.9% of the sample. There is no differences by age group regarding the sex-ratio. The overall age distribution shows fewer older children were measured compared to younger children but this difference was not significant.

At national level, the distributions of curves of Weight/Height, Height/Age and Weight/Age all follow bell shaped curves. The standard deviation for the distribution of Height/Age z-score was found to be above 1.2 in 6 regions and at Mainland, Zanzibar and National level. The standard deviation of Weight/Height z-score and Weight/Age z-score for the 30 regions fall inside the acceptable range of standard deviation from quality data.

The plausibility check report at national level highlighted the excellent quality of anthropometric data, both in terms of sample representativeness and quality of anthropometric measurements.

Key Findings

Child nutritional status

The anthropometry Z-scores were calculated using the WHO 2006 growth references.

At national level, stunting or chronic malnutrition was identified in 34.7% (33.7-35.7 95% CI) of children 0-59 months of age which is a high rate according to WHO classification. Severe stunting was found in 11.5 % of children countrywide. For Mainland, the survey results show a level of chronic malnutrition considered “very high”, exceeding the 40% threshold in 9 regions (Iringa, Njombe, Kagera, Dodoma, Ruvuma, Rukwa, Kigoma, Katavi and Geita) among which 3 regions are above 50%: Iringa (51.3%), Njombe (51.5%) and Kagera (51.9%). For Zanzibar, stunting rates are ranging from 20.6% in Town West to 30.4% in Unguja North. According to those results, more than 2,700,000 children under five years of age are stunted in Tanzania. Nutrition interventions should be prioritized in the regions with the higher number of stunted children and the higher prevalence of chronic malnutrition. These regions are Kagera, Kigoma, Dodoma, Mbeya and Mwanza.

On the national level, 3.8% (3.5 - 4.2 95% CI) of children aged 0 -59 months were found to have Global Acute Malnutrition (GAM) and 0.9% (0.8 – 1.1 95% CI) suffered from Severe Acute Malnutrition (SAM). For Mainland, the survey results show a level of GAM considered “acceptable” in all regions except for Dodoma with 5.2%. The lowest rates of GAM 0.7% was found in Iringa. The highest rates of GAM were found in

Dodoma, Tanga (4.8%), Mara (4.9%) and Singida (4.7%). For Zanzibar, wasting rates are ranging from 6.3% in Town West to 7.5% in Unguja South. The GAM rates for Zanzibar decreased from 12.0% in 2010 to 7.2%. It is expecting that there will be approximately 340,000 moderately acute malnourished children and more than 105,000 severely acute malnourished children in Tanzania.

The prevalence of underweight can be considered “Medium” by WHO cut-offs for level of public health significance. At national level, the prevalence of underweight is used for monitoring the MDG1 “Eradicate extreme poverty and hunger”. Tanzania is very close to reach the target for 2015 (12.5%) with a national prevalence of 13.4% (12.7-14.1 95% CI).

Vitamin A and Deworming

The proportion of all children aged 6-59 months who had received vitamin A in the last 6 months was 72.2% (70.6-73.7 95% CI) which is better than in 2010 (61.0%). About 28.0% of the children did not receive vitamin A supplement, which is alarming. Coverage of vitamin A supplementation decreased in Zanzibar from 79.0% in 2010 to 61.0%. A high coverage of vitamin A supplementation was noted at Arusha, Kagera and Unguja North (>90%) and the lowest at Mwanza, Singida, Manyara and Town West with less than 50%.

The proportion of all children aged 12-59 months who had received deworming in the last 6 months was 70.6% (69.0-72.2) at national level. The coverage is directly correlated with Vitamin A coverage which probably happened due to effectiveness of the integrated campaign organized in October 2014 at national level. Coverage of deworming increased from 50.0% in 2010 to 70.6%. There is a slight diminution of the coverage for Zanzibar from 72.0% in 2010 to 68.4%. A high coverage of deworming was noted at Kagera and Unguja North (>90%) and the lowest at Mwanza, Singida and Manyara with less than 50%.

IYCF

The survey revealed that 98.4% of children 0-23 months reported to have been ever breastfed and that 50.8% of children 0-23 months initiated breastfeeding within one hour. At national level, less than 42% of infants under six months of age were exclusively breastfed. In Zanzibar, less than 20% of infants under six months of age were exclusively breastfed which is low. The survey revealed that 90.0% of children 12-15 months were fed breast milk the day prior to survey. Less than 50% of children 20-23 months were still breastfed.

At national level, the survey shows that 89.5% of children from 6 to 8 months had a timely introduction of complementary food. The proportion of children aged 6-23 months who received foods from 4 or more food groups was 24.5% at national level. The higher proportion were noted at Kilimanjaro and Tanga with respectively 66.3% and 79.5% and the lowest at Iringa, Mbeya, Singida, Tabora, Manyara and Katavi with less than 10%. The proportion in Zanzibar represents less than half of the proportion at national level with 12.1%. The proportion of children aged 6-23 months who received solid, semi-solid or soft foods the minimum number of times or more was 65.7% at national level. The survey revealed that 20.0% of children 6-23 months received a minimum acceptable diet.

Women Nutritional Status

At national level, 5.5% of women 15-49 years of age were considered being in thinness (with 0.4% of severe thinness). A high prevalence of thinness was found at Pemba North (10.5%), Town West (10.1%), Pemba South (9.7%) and Manyara (8.8%). Prevalence of thinness were higher in age groups 15-19 years and 45-49 years with respectively 10.2% and 7.0%. In contrast to the prevalence of thinness, 20% of women were found overweight and 9.7% of women were above the cut off point for obesity. A high prevalence of obesity, around 20.0% was found at Kilimanjaro (21.8%), Dar-Es-Salaam (19.2%), Town West (20.7%) and Unguja South (18.4%). Prevalence of overweight and obesity were higher in age groups 35-39 years and 45-49 years.

At national level, 30.9% of women 15-49 years of age with children under five years of age didn't took an iron-folic acid supplementation during pregnancy for past birth. Majority of women took this supplementation less than 60 days.

Use of Iodized Salt

At national level, use of iodized salt the day prior to survey to cook the meal was 62.2%. Ten regions presented a percentage of use of iodized salt below 50% ranging from 5.9% in Lindi to 49.6% in Kagera. These regions are Lindi, Mtwara, Tabora, Rukwa, Geita, Ruvuma, Shinyanga, Singida, Simiyu and Kagera. Only 5 regions are above 90%: Dar-Es-Salaam, Mbeya, Kilimanjaro, Arusha and Mwanza.

For Zanzibar, use of iodized salt was ranging from 58.9% and 69.0% in Pemba North and South respectively to 78.4% in Unguja South. At national level, more than one third of the households had a non-iodized salt the day of the survey (34.6% in Mainland and 21.5% in Zanzibar). Between 0.6% and 12.6% of the surveyed households had no salt the day of the survey (3.3% for Mainland and 7% for Zanzibar).

Handwashing Practices

At national level, use of soap was 91.4%. Availability of soap was ranging from 78.1% in Lindi to 99.8% in Mwanza. For Zanzibar, use of soap was ranging from 85.3% and 87.4% in Pemba North and South respectively to 94.2% in Unguja South.

At national level, only 11.7% of the interviewed households members report having used soap for handwashing at least at two critical times during past 24 hours (including “after defecating”) (11.5% in Mainland and 13.2% in Zanzibar). Several regions in Mainland are below 1%. These regions are: Iringa, Mbeya, Singida, Tabora, Shinyanga and Geita. The highest rates were found in Tanga and Pwani with respectively 53.9% and 58.9%. For Zanzibar, it was ranging from 0.2% and 0.4% in Unguja North and Unguja South to 21.6% and 19.9% in Pemba South and Town West respectively.

Recommendations

Stunting was found at 34.7% at national level. It reflects the existence of chronic nutrition related problem in the country. It is difficult to address the problem within short period as it requires ranges of interventions which should be supported by positive behavioural and practice change of the community at large.

Chronic malnutrition is the cumulative effect through time and the country cannot afford to see children getting malnourished further which interfere with their growth and contribute to stunting. Therefore, it is recommended to continue and scale up the existing nutrition program to address children in risk of mortality.

All forms of malnutrition were found high in the first two years of age. Therefore, it is highly recommended to consider children in this age group through improving infant and young child feeding practices and maternal education towards behavioural and practice changes and to achieve them it is recommended to:

- ✓ Invest in the establishment of community, health and nutrition system workplaces and public places for promoting, supporting and protecting exclusive breastfeeding for the first six months of life and continued breastfeeding up to two years of age and beyond;
- ✓ Support community-based programs to provide information and counseling on optimal and appropriate complementary feeding practices;
- ✓ Educate pregnant women about the importance of prenatal care and protect maternal nutrition and health to prevent low birth weight babies;
- ✓ Promote regular growth monitoring and include measurement of length/height (not just weight) in nutrition programs;
- ✓ Invest in a mass communication campaign for development based on preventive activities: nutrition of pregnant women, promotion of exclusive breastfeeding, complementary feeding and continued breastfeeding, good hygienic practices, the production and consumption of available complementary foods;

Efforts should be made to improve coverage of vitamin A supplementation and deworming (80% target):

- ✓ Raising awareness of mothers on micronutrient supplementation and deworming campaigns;
- ✓ Strengthening distribution channels of vitamin A and deworming supplies and monitoring and evaluation of campaigns;
- ✓ Planning the achievement of mass activities around supplementation and deworming at least twice a year

It is also recommended to:

- ✓ Develop a plan to fight against overweight and obesity.
- ✓ Strengthen action towards universal iodization of salt in all regions, especially in the 10 regions below 50%. Improve nutritional education to prevent overweight and obesity

Finally, in order to monitor the effect of present and future interventions on trends of malnutrition, it is recommended that a follow-up SMART survey be implemented in September-November 2016 following the same methodology as the present investigation.

1. Context and Justification

1.1 Introduction and Literature Review

Located in Eastern Africa, the United Republic of Tanzania is the result of the union between the Republic of Tanganyika and the People's Republic of Zanzibar in 1964. With a surface of 947,000 square Kilometres and a population of 44.9 million people (43.6 million Mainland; 1.3 million Zanzibar) [1], Tanzania is characterized by high population growth rate (2.7%). The country was ranked 152nd out of 187 in the 2013 UN Human Development Index. Despite its economic growth, poverty remains prevalent in the country, particularly in rural areas (33% in rural area, 22% in urban) [2]. Approximately 70% of the population lives in rural households; such households make up 80% of the country's poor. Agriculture accounts for 45% of Tanzania's GDP, as well as the livelihoods of some 80% of the country population [3]. While Tanzania's food self-sufficiency has ranged from 88 to 112 percent over past 8 years, localized foods deficits are rampant.

Undernutrition is one of the world's most serious but least addressed public health problems. Research indicates that efficacious nutrition interventions exist and that these can be scaled up in a cost-effective manner [4; 5]. Stunting, i.e. a chronic restriction of a child's potential growth, has become an important target of nutrition and other development-related programs. In fact, child growth has been described as a mirror of conditions of society [6] and WHO recommends tracking stunting as a measure to assess inequities in health [7].

Evidence indicates undernutrition is handed down from one generation to the next as a grim inheritance [8]. Malnourished women or adolescent girls give birth to babies with low birth weight [8]. If these children grow up in an environment of suboptimal feeding practices and a high burden of infectious diseases, these children do not experience much catch-up growth in subsequent years, leading to an intergenerational cycle of stunting (Figure 1).

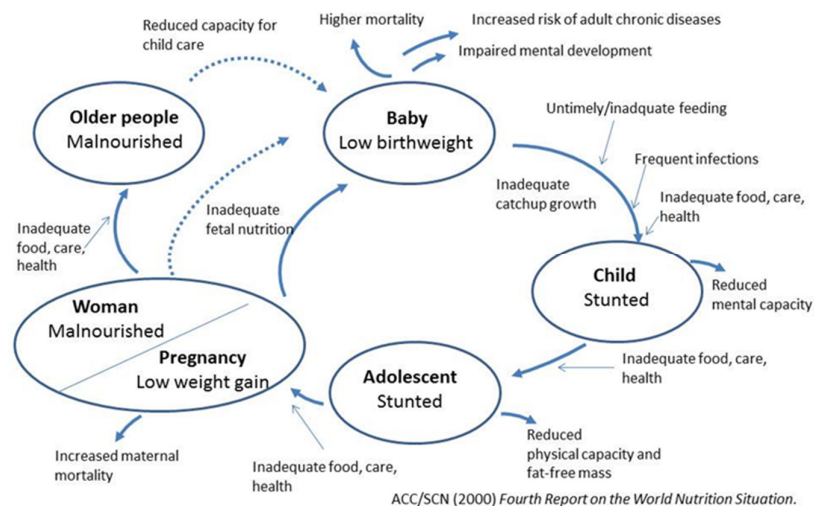


Figure 1: The intergenerational cycle of stunting

Given that stunting is a cumulative process that can begin in utero and continue until about 2 years after birth, particular attention is being attributed to addressing determinants of stunting during the first 1,000 days following birth [9]. It should be noted that environmental differences, rather than genetics, are the principal determinants of stunting [10]. As a result, children from different settings worldwide are expected to grow similarly if they are brought up in healthy environments.

Children who are stunted are more likely to get sick or die. If they survive they enter school late, do not learn well, and are less productive as adults. In later life, they are at an increased risk of chronic diseases. To illustrate, childhood stunting - even in its moderate form it increases mortality by 60% [11]. It is related to a 2-3 year reduced school attendance and 22% lower income in adulthood [12]. There is even evidence that poor nutritional status and childhood stunting may result in cognitive impairments which cannot be reversed in later life [13].

In Tanzania, the prevalence of chronic malnutrition or stunting, among children under five year has decreased from 50% in 1996 to 44% in 2005 [14]. But between 2005 and 2010, only 2 percent point decrease was observed and it is estimated that more than 3,000,000 children under five years of age will be affected by

stunting in 2014 [15]. Based on the WHO classification, the prevalence of 42% shows a level of chronic malnutrition being "very high" (whereby 42.3% was for Mainland and 30.2% was for Zanzibar). The prevalence of underweight among children under five years decreased from 27% in 1996 to 17% in 2005. But between 2005 and 2010, only 1% point decrease was observed on underweight level (whereby 15.7% was for Mainland and 19.9% was for Zanzibar) [14; 15]. Regarding the prevalence of underweight, the level can be considered "medium" by WHO cut-offs for level of public health significance [14; 15]. The prevalence of global acute malnutrition (or wasting) decreased in Tanzania from 9% in 1996 to 3.5% in 2005. However, the level has increased up to 4.9% in 2010 (whereby 4.6% was for Mainland and 12.0% was for Zanzibar), including 1.3% (whereby 1.1% was for Mainland & 4.5% was for Zanzibar) of severe acute malnutrition [14; 15]. In 2014 it is expected that there will be more than 220,000 severely acute malnourished children and 380,000 moderately acute malnourished children in Tanzania.

Optimal exclusive breastfeeding and timely and appropriate complementary feeding for children under five is crucial for children development and good health. WHO recommends mothers to exclusive breastfeed infants for first six months of life to achieve optimal growth, development and good health. Thereafter for these children to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while continuing to breastfeed for two years or beyond. The 2010 Tanzania Demographic and Health Survey (TDHS) shows the proportion of children exclusively breastfeed was 49.8% while the overall median duration of exclusive breastfeeding was 2.4 months for Mainland and 0.5 months for Zanzibar which is below the WHO recommended time for exclusive breastfeeding of six months [15]. Studies showed strong association of sub-optimum breastfeeding with disease burden and mortality among children under five. The non-exclusive breastfed children in the first six months of life was related with 1.4 million deaths and 10% of disease burden among children under five years of age [11]. Further the same article shows even with optimum breastfeeding children will become stunted if they do not receive adequate quantity and quality complementary foods after six months of age. TDHS showed the increasing trend of prevalence of stunting for children of age 7-22 months, this might be the effect of poor complementary feeding practices [15].

Vitamin A deficiency has association with disease burden and mortality among children under five years of age. Studies shows a significant association between vitamin A deficiency with diarrhea mortality and measles mortality (estimated relative risk were 1.47 and 1.35 respectively) in non-supplemented population as compared with supplemented population [11]. Recognizing the importance of vitamin A among children under five in Tanzania, apart from routine vitamin A supplementation during clinic visit, there exist twice yearly campaigns for vitamin A supplementation for all children under five. However TDHS showed coverage of vitamin A supplementation was 60.8% among children under five (whereby 60.3% was for Mainland and 78.7% was for Zanzibar), while the prevalence of vitamin A deficiency among children under five in the same survey time was estimated to be 33% [16]. Further in 2013 President Jakaya Kikwete launched large scale fortification in the country whereby edible oil is currently fortified with vitamin A as an effort to reduce prevalence of vitamin A deficiency.

Helminthes or intestinal worms represent a serious public health problem in areas where climate is tropical and inadequate sanitation and unhygienic conditions prevail. Helminthes cause significant malabsorption of iron and aggravate malnutrition and anemia, which eventually contributes to retarded growth and poor performance in school. Children under five years old are extremely vulnerable to the deficiencies induced by worm infections, therefore deworming is critical for the reduction of child morbidity and mortality.

Iodine deficiency has adverse effects on both pregnant outcome and child development; even mild and subclinical maternal iodine deficiency during pregnancy impairs motor and mental development of foetus and increases risk of miscarriage and foetus restriction [11]. As part of effort to reduce prevalence of iodine deficiency in the country salt produced in the country is currently fortified with iodine. However the test for urinary iodine concentration among women of reproductive age in Tanzania was estimated to be 21.7% for optimal urinary iodine concentration, while only 58.5% of assessed household consumed adequately iodized salt (salt with iodine content 15 ppm and above) (whereby 58.7% was for Mainland and 49.3% was for Zanzibar) [16].

To coordinate national efforts against malnutrition, Government of Tanzania has put in place a High Level Steering Committee on Nutrition with representatives from different sectors, NGOs, Private Sector, Academics, Donors and UN agencies. This committee is chaired by the Permanent secretary of the Prime Minister's Office and the secretariat is managed by the Tanzania Food and Nutrition Centre. Although district steering committees for nutrition are in place and District Nutrition Officers appointed, their capacities remain limited and have considerable scope for improvement. A National Nutrition Strategy (2011-2015) with a US\$

520 million budget was developed, but a recent Public expenditure review on nutrition has shown that only 0.22% of government expenditure was allocated to nutrition in Financial Year 2012/13 and therefore few nutrition activities are implemented [17].

1.2 Justification for the survey

Nutrition information in the country relies mainly in Tanzania Demographic Health Surveys (TDHS) that are carried out every 5 years. The most recent data are from TDHS 2010 and therefore may not reflect recent nutritional status of the country. In order to monitor closely key nutrition indicators such as stunting, wasting, Infant and Young Child Feeding (IYCF) practices and coverage of micronutrient interventions, Tanzania requires high quality and reliable source of nutrition information that takes short time to get the required information.

Further in the TDHS report, exclusive breastfeeding is reported only at national level and by age group, while there is no information disaggregated by regions and the proportion of children consumed the minimum acceptable diet among children 6 – 23 months is not estimated. Therefore if the situation remains like this decision makers at regional level will not be in a position to plan for appropriate nutrition interventions especially IYCF practices interventions.

Government of Tanzania will be required to report on 2015 MDGs and MKUKUTA II progress for nutrition indicator and to prepare a strategic plan for nutrition to reach the 2025 World Health Assembly (WHA) targets¹. This planning exercise will also require more recent and high quality nutrition information.

Therefore the Ministry of Health and Social Welfare (MoHSW) through Tanzania Food and Nutrition Centre and the Ministry of Health Zanzibar conducted a National Nutrition Survey (NNS) by using SMART (Standardized Monitoring and Assessment of Relief and Transitions) methodology, which is now considered as a golden standard for the implementation of nutrition surveys. This survey will be conducted in every two years in between Tanzania Demographic and Health Survey reporting time to show trends for nutrition status in the country.

1.3 Overview of SMART Methodology

SMART is an inter-agency initiative launched in 2002 by a network of organizations and humanitarian practitioners. SMART advocates a multi-partner, systematized approach to provide critical, reliable information for decision-making, and to establish shared systems and resources for host government partners and humanitarian organizations [19].

Nutrition surveys using SMART methodology produce the most robust estimates of the prevalence of malnutrition, but these results are not sufficient to track nutrition conditions on a monthly basis or on the level of all health districts. For this frequency and level of information, other sources of information are needed. Nutrition survey results should always contribute in to a National Nutrition Information System. This system combines survey data, nutrition program data (such as nutrition surveillance, management of severe acute malnutrition) and other information from civil society, non-governmental organizations, religious and community groups and the press to triangulate information and develop consensus on nutrition conditions in the country. Implementation of this first National Nutrition Survey (NNS), based on SMART methodology, is a good opportunity for reinforce the Nutrition Information System in Tanzania.

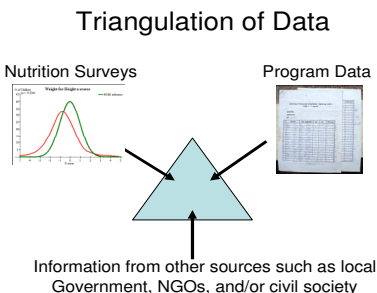


Figure 2: Contribution to National Information System

¹ Global target 1: 40% reduction of childhood stunting by 2025; Global target 2: 50% reduction of anemia in women of reproductive age by 2025; Global target 3: 50% reduction of low birth weight by 2025; Global target 4: No increase in childhood overweight by 2025; Global target 5: Increase exclusive breast-feeding rates in the first six months up to at least 50% by 2025; Global target 6: Reducing and maintaining childhood wasting to less than 5% [18]

2. Objectives

The objectives of the survey were to assess nutritional status of children aged 0-59 months and level of infant and young child feeding practices and coverage of micronutrient interventions in Tanzania.

More specifically, the survey allowed to:

- Estimate the prevalence of chronic malnutrition, acute malnutrition and underweight (global, moderate and severe) among children aged 0-59 months, at regional and national level.
- Evaluate the Infant and Young Child Feeding (IYCF) practices among children aged 0-23 months at regional and national level.
- Estimate the coverage of vitamin A supplementation among children aged 6-59 months six months prior to survey at regional and national level.
- Estimate the deworming coverage among children aged 12-59 months six months prior to survey, at regional and national level.
- Assess nutritional status of women aged 15-49 years through Body Mass Index (BMI) at regional and national level.
- Estimate the coverage of iron and/or folic acid supplementation during last pregnancy of women aged 15-49 years with children under age 5, at regional and national level.
- Estimate the coverage of iodized salt at household level for regional and national level.
- Estimate the percentage of household that have soap and the percentage of mothers/caretakers of children aged 0-59 months who report having used soap for handwashing at critical times.

3. Methodology

This survey was based on the SMART methodology. Based on the latest SMART methodology (Version 1, 2006), nutrition surveys using SMART methodology are simple, rapid and transparent to provide nutrition data for immediate action. Standardized procedures and recommendations are given in order to collect timely and reliable data from the field. All efforts have been made to follow SMART methodology to ensure a high quality nutrition data.

4.1 Target population

The target population for the anthropometric survey was all children between 0 and 59 months of age because they represent the most vulnerable portion of the population. For social and biological reasons women of the reproductive age (15-49 years of age) are amongst the most vulnerable to malnutrition [20]. For this reason women in this age category have been considered for this survey.

In selected households, all children from 0 to 59 months have been measured, all women from 15 to 49 years have been measured, handwashing practices have been assessed and the salt used by the household to cook meals, a day prior to survey, have been tested for iodine. The target group for the IYCF survey was all children between 0 and 23 months of age as recommended in the IYCF indicators [21]. Questions on IYCF have been asked to parents and caregivers of these 0-23 months aged children.

4.2 Study Design

The survey was designed as a cross-sectional household survey using a two stage cluster sampling representative on the regional level.

Tanzania is administratively divided into 30 regions. In order to determine the differences that exist within the regions concerning the rates of malnutrition and to provide relevant data for planning and evaluating nutrition programmes, the existing administrative structure (regions) have been used as a domain. Each region

constituted a domain. The domains used by TDHS conducted in 2010 are similar to the one this survey used which allow further comparison of results from this survey.

However, four new regions have been created on 1st March 2012: Katavi, Simiyu, Njombe and Geita. Rukwa has been divided in two regions: Rukwa and Katavi; Shinyanga has been divided in two regions: Shinyanga and Simiyu; Iringa has been divided in two regions: Iringa and Njombe; and part of Mwanza and a part of Kagera gave birth to Geita. The survey domains with their population figures are presented in Table 1 below.

4.3 Sampling Design

Operational Definitions

Enumeration Area:

A section subdivision operated by National Bureau of Statistics during the 2012 Tanzania Population and Housing Census. As the smallest administrative unit in Tanzania is the village, the purpose of creating this subdivision was to obtain a smaller and more convenient area unit for statistical purposes. Each cluster has been randomly selected from the total list of enumeration areas per region using PPS method.

Household:

“A person or a group of persons, related or unrelated, who live together and share a common source of food and livelihood, and recognize one person as a head”.

In a polygamous situation, if all wives cook together, eat together and live in the same compound, this has been considered as one household. However, if each wife has her own kitchen and prepares food for her own children, those were separate households.”

Respondent:

“A knowledgeable adult or mother/primary caretaker of children in the household”

First stage: cluster selection

The first stage sample of clusters has been drawn independently for each domain from the national sample frame with the support from National Bureau of Statistics (NBS) and Office of Chief Government Statistician (OCGS).

The complete list of Enumeration Areas (EA) has been used for cluster selection. The clusters have been randomly selected according to the probability proportional to size (PPS) method using the ENA software (ENA for SMART 2011, Nov. 16th 2013). The master sample that includes the list of EAs from the 2012 Tanzania Population and Housing Census has been used and random selection of the clusters has been done only once per region or domain.

Second stage: household selection

The second stage of sampling consisted of selecting households within each selected cluster by using a systematic random selection procedure.

The expected total number of household per cluster with detailed map has been provided by NBS and OCGS. The total number of household has been divided by the number of households to be interviewed (for example there are 176 households and 22 households to be selected – $176 / 22 = 8$). This number is the sampling interval. A random number table has been used to randomly select a start number between 1 and the sampling interval (for example between 1 and 8). The random start number identified the first household, and the sampling interval has been used to identify all following households to be included in the survey.

Special Cases

Absent household

If the household was absent, the survey team asked a neighbor of the residents' whereabouts. If they were expected to return before the survey team leaves the village/EA, the survey team returned to administer the questionnaire on the same day if possible. This household had an ID, even if the survey team was not able to revisit them. The survey team continued the survey by choosing the next household according to the selection method described above. This household was not replaced.

A household was considered as absent when its members slept there last night and went out for the day of the survey.

Abandoned house

If the household was abandoned, the survey team ignored this household as if it was a physical barrier and replaced it with another household using the sampling method described above.

Households without children and/or without women

If it was determined that a selected household does not have children between 0-59 months of age and/or women between 15-49 years, the survey team tested salt for iodine and completed the section for handwashing practices. In the cluster control form, the team leader wrote the household's number and a note indicating that no children between the ages of 0 and 59 months and/or no women between the ages of 15 and 49 years belonged to the household.

Homes that cannot be visited

If the residents of the household refused to participate in the survey or cannot participate because of important reasons, the team leader wrote down in the cluster control form the household's number and a note explaining that the home could not be visited. The survey team chose a new household by making use of the methodology previously described. This household was not replaced with another one.

Absent children/women

The team leader asked the reason of the children's/women's absence. If the child/woman (or children or women) was close to the home, someone was sent to bring them back. If the child/woman was expected to return before the survey team leaves the village, then the survey team returned before the end of the day to take the measurements. If the child/woman cannot be found before the team leaves the village, the child/woman available information (age, sex, etc.) was completed in the questionnaire and a note that the child/woman was absent was recorded in the cluster control form.

Disabled children/women

Disabled children/women have been included in the survey. If a physical deformity prevented the measurement of child's or woman's weight or height, the data were recorded as missing and the remaining data have been collected.

4.4 Sample Size

The sample size for the nutrition survey has been calculated using the ENA software (ENA for SMART 2011, Nov. 16th 2013) (Table 2). The assumptions for the sample size calculation are given below.

Expected prevalence

The prevalence of wasting found by TDHS 2010, vary from 2.5% (Shinyanga and Simiyu) to 16.4% (Unguja North).

Concern undertook a nutrition survey in November 2013 in Iringa, Mbeya and Njombe regions, and found a Global Acute Malnutrition (GAM) prevalence of 2.0%, 2.3% and 1.8% respectively (preliminary results). These most recent regional prevalence of wasting has been used in the sample size calculations for these 3 regions.

For Katavi, Simiyu and Geita the prevalence from TDHS for Rukwa, Shinyanga and Mwanza respectively has been used to calculate the sample size.

The TDHS reports wasting (<-2 Standard Deviations Weight-for-Height) and not GAM. Oedema is not collected in TDHS surveys. However, the low SAM rates suggested that the prevalence of oedema was very low and kwashiorkor cases were hardly ever encountered

Precision level

The general purpose of this survey, as mentioned above, was to provide nutrition data for immediate programmatic and long-term government monitoring purposes. From a practical point of view, this means the level of precision needed for sample size calculations was high in order to allow valid comparisons; that is why the level of precision chosen varied from 2% to 4%, according to the wasting rate.

Design effect

As nutrition outcomes are known to generally create relatively low design effects [22], the choice was made to use a 1.5 design effect to inflate the sample size and compensate the possible heterogeneity between clusters.

SMART methodology recommend to use fixed household method instead of quota sampling method for the numerous reasons: it is easier to create lists of households than lists of children in the field; sample sizes calculated in number of children can encourage teams to skip households without any children (thus introducing a bias for household-level indicators); and household can provide a common metric for comparing sample size of many indicators.

In order to do the conversion of number of children to sample into number of households, the following assumptions were made:

Average number of person per household, Percent of children under-five years old

Both data were taken from the 2012 Tanzania Population and Housing Census.

Non-response rate

It was expected to have 4% non-response rate which refers to the number of basic sampling units that were not able to be reached due to the following reasons: refusal, accessibility, security reasons, absentees, etc.

Table 1: Summary of parameters used for sample sizes calculations

	REGION	Estimated Prevalence of GAM (%) (WHO Ref. - DHS 2010)	P	q	t (98 %)	Precision	Design Effect	Number of children to include	Average Number of person per HH (Census 2012)	Percent of children U5 in total population (Census 2012)	Average Number of children U5 per HH	Percent of non-response HH	Number of HH to include	Number of Cluster (22 HH or 18 HH or 16 HH/per cluster)	Number of day for data collection (2 teams per region)
Mainland															
1	Dodoma	5.2	0.052	0.948	2.045	0.025	1.5	495	4.6	0.162	0.75	0.04	691	31	16
2	Arusha	9.5	0.095	0.905	2.045	0.03	1.5	599	4.5	0.162	0.73	0.04	855	39	20
3	Kilimanjaro	5.3	0.053	0.947	2.045	0.025	1.5	504	4.3	0.162	0.70	0.04	752	34	17
4	Tanga	5.5	0.055	0.945	2.045	0.025	1.5	522	4.7	0.162	0.76	0.04	713	32	16
5	Morogoro	5.3	0.053	0.947	2.045	0.025	1.5	504	4.4	0.162	0.71	0.04	735	33	18
6	Pwani	4.2	0.042	0.958	2.045	0.02	1.5	631	4.3	0.162	0.70	0.04	942	43	22
7	Dar-Es-Salaam	6.8	0.068	0.932	2.045	0.025	1.5	636	4.0	0.162	0.65	0.04	1021	60**	4
8	Lindi	4.1	0.041	0.959	2.045	0.02	1.5	617	3.8	0.162	0.62	0.04	1042	47	24
9	Mtwara	2.6	0.026	0.974	2.045	0.02	1.5	397	3.7	0.162	0.60	0.04	689	31	16
10	Ruvuma	4.8	0.048	0.952	2.045	0.02	1.5	717	4.5	0.162	0.73	0.04	1022	46	23
11	Iringa*	2.0	0.02	0.98	2.045	0.02	1.5	307	4.2	0.162	0.68	0.04	470	30	15
12	Mbeya*	2.3	0.023	0.977	2.045	0.02	1.5	352	4.3	0.162	0.70	0.04	526	30	15
13	Singida	9.2	0.092	0.908	2.045	0.03	1.5	582	5.3	0.162	0.86	0.04	705	32	16
14	Tabora	3.9	0.039	0.961	2.045	0.02	1.5	588	6.0	0.162	0.97	0.04	629	29	15
15	Rukwa	3.8	0.038	0.962	2.045	0.02	1.5	573	5.0	0.162	0.81	0.04	736	33	17
16	Kigoma	3.2	0.032	0.968	2.045	0.02	1.5	486	5.7	0.162	0.92	0.04	547	31	16
17	Shinyanga	2.5	0.025	0.975	2.045	0.02	1.5	382	5.9	0.162	0.96	0.04	416	28	14
18	Kagera	5.0	0.05	0.95	2.045	0.025	1.5	477	4.7	0.162	0.76	0.04	651	30	15
19	Mwanza	3.9	0.039	0.961	2.045	0.02	1.5	588	5.6	0.162	0.91	0.04	674	31	16
20	Mara	5.0	0.05	0.95	2.045	0.025	1.5	477	5.7	0.162	0.92	0.04	537	30	15
21	Manyara	7.4	0.074	0.926	2.045	0.025	1.5	688	5.2	0.162	0.84	0.04	849	39	20
22	Njombe*	1.8	0.018	0.982	2.045	0.02	1.5	277	4.1	0.162	0.66	0.04	434	28	14
23	Katavi	3.8	0.038	0.962	2.045	0.02	1.5	573	5.6	0.162	0.91	0.04	657	30	15
24	Simiyu	2.5	0.025	0.975	2.045	0.02	1.5	382	6.9	0.162	1.12	0.04	356	28	14
25	Geita	3.9	0.039	0.961	2.045	0.02	1.5	588	6.1	0.162	0.99	0.04	619	29	15

	REGION	Estimated Prevalence of GAM (%) (WHO Ref. - DHS 2010)	P	q	t (98 %)	Precision	Design Effect	Number of children to include	Average Number of person per HH (Census 2012)	Percent of children U5 in total population (Census 2012)	Average Number of children U5 per HH	Percent of non-response HH	Number of HH to include	Number of Cluster (22 HH/per cluster)	Number of day for data collection (2 teams per region)
Zanzibar															
26	Unguja North	16.4	0.164	0.836	2.045	0.04	1.5	538	5.00	0.156	0.78	0.04	717	33	17
27	Unguja South	10.6	0.106	0.894	2.045	0.035	1.5	485	4.40	0.156	0.69	0.04	735	33	17
28	Town West	11.5	0.115	0.885	2.045	0.035	1.5	521	5.20	0.156	0.81	0.04	668	30	15
29	Pemba North	12.7	0.127	0.873	2.045	0.035	1.5	568	5.30	0.156	0.83	0.04	714	32	16
30	Pemba South	8.9	0.089	0.911	2.045	0.03	1.5	565	5.40	0.156	0.84	0.04	698	32	16
TOTAL								15,618					20,799	1,014	

* : Baseline Nutrition Survey Concern – Preliminary Results (November 2013)

** : All the teams in Dar (60 clusters of 18 HH)

	22 HH/cluster
	18 HH/cluster
	16 HH/cluster

Calculations were made to determine how many households would be included in each cluster. The number of households to be completed per day (per cluster) was determined according to the time the team could spend on the field excluding transportation, other procedures and break times. The number of households per cluster varied from 16 to 22 according to the sample size in terms of households to investigate.

It is also recommended to have a minimum of 26 clusters per domain, so it was decided to have at least 28 clusters per domain in order to avoid to be below 26 clusters in case of issues during data collection (refusal for example).

4.5 Data collected

Anthropometric survey (children from 0 to 59 months of age) (Anthropometric Questionnaire – Annex 1)

Sex

The child's sex was noted on the questionnaire as “F” or “M”: F = female and M = male.

Age

The date of birth was taken from any relevant document such as birth certificate, family book or vaccination card, which recorded the name of the child and the date of birth. If the date of birth was unknown, the interviewer used the calendar of local events and the recall of the mother or caregiver was used to estimate the most correct age in months to be recorded on the questionnaire.

Weight

Children were weighted using a SECA Uniscale electronic scale with the precision of 100 grams. All children were measured naked following the recommended anthropometric methods. During the survey, some mothers or caregivers refused to remove the clothes for their children. During the survey training, the team leaders received the instructions to record if the weight of the child was measured with clothes. Smaller children where they were not able to stand on the scale were measured on their caregiver's hand using the mother-to-baby function of the scale.

Height/Length

The children's height/length was measured with a precision of 0.1 cm by using SHORR two pieces height boards. Children were measured lightly dressed with no shoes or braids, hairpieces or barrettes on their head that could interfere with a correct height measurement. Children who were less than 87 cm standing height were measured laying down while those 87 cm standing height or taller were measured standing.

Oedema

Only bilateral pedal oedemas are considered as nutritional oedema. Their presence was detected by applying a gentle pressure with the thumbs to top part of both feet during three seconds. If the imprint of the thumbs remained on both feet for a few seconds after releasing the thumbs, the child was considered to have nutritional oedema. Bilateral oedema were diagnosed and not graded. The diagnosis was simply recorded Y for “Yes” or N for “No”.

Mid-Upper Arm Circumference (MUAC)

The MUAC was measured in millimetres on the left arm, at midpoint between the shoulder's tip and the elbow, on a relaxed arm. MUAC was taken only for children between 6 and 59 months of age.

Measurement

The team leaders recorded if the measurers measured height or length.

L = length (recumbent length)

H = height (standing height)

Clothes

The team leaders recorded if the measurers measured weight with or without clothes

Y = yes, with clothes (100 grams are automatically removed from the weight result in the ENA software)

N = no, without clothes

Additional Data

Vitamin A supplementation in the past six months

The interviewer first tried to confirm if the child received a vitamin A supplementation by examining an official document. If there was no document, the interviewer showed vitamin A blue and red samples to the respondent and asked him/her if the child received a vitamin A supplementation drops in the mouth in the past six months.

Deworming in the past six months

The deworming status in the past six months was also confirmed with an official document. If it was not possible, the interviewer asked if the child received a “worm medicine” in the past six months.

Anthropometric survey (women from 15 to 49 years of age) (Anthropometric Questionnaire – Annex 1)

Age

The age was verified with an official document (if possible) and recorded in years on the questionnaire.

Weight

The weight was measured with a 100g precision by using the same equipment as for children.

Height

The height was measured with a precision of 0.1 cm by using SHORR three pieces height boards.

Additional Data

Iron and folic acid supplementation

The interviewer first confirmed if the woman with children under five years of age took Iron/Folic Acid supplementation (tablets or syrup) during her last pregnancy by examining an official document. If there was no document, the enumerator asked her if she received or bought an Iron/Folic acid supplementation during her last pregnancy. If yes, the enumerators asked during how many days she took these tablets or syrup.

Anthropometric Equipment

- *Weighing Scale:* SECA 881 Standing Digital Scales for adult and children (S0141020 Scale, electronic, mother/child, 150kgx100g)
- *Length/Height measuring board:* Shorr boards for measuring adults and children (Baby/infant/adult L-hgt mea.system/SET-2 for Shorr Boards)
- *MUAC Tapes:* MUAC for children (S0145620 MUAC, Child 11.5 Red/PAC-50)

Infant and Young Child Feeding practices (IYCF) (children from 0 to 23 months of age) (IYCF Questionnaire – Annex 2)

Several questions on breastfeeding practices and on complementary feeding practices were asked to the mothers/caregivers of children from 0 to 23 months of age.

Use of iodized salt at household level (all selected household)

In all selected households, interviewers asked for a teaspoon of salt. The salt was tested for iodine using a simple rapid test kit. Salt that turned any shade of purple after being diluted with a drop of the test solution was considered to be iodized.

Tested salt was one that had been used to prepare the main meal taken by the family the day previous the survey.

Handwashing practices

Several questions on handwashing practices were asked to key respondents at household level. The availability of soap at household level was also assessed.

The final survey questionnaire was translated to the local language (Kiswahili) and as part of the survey training, pretested and revised based on the received comments from the participants, before teams go out for actual data collection.

4.6 Survey Personnel

The survey was led by TFNC, supported by a Technical Committee and under the overall supervision of a Steering Committee. The Technical Committee was in charge of managing, coordinating and monitoring the key steps of the survey and was composed of representatives of the following organizations: TFNC, Ministry of Health and Social Welfare (MoHSW), NBS, UNICEF, OCGS and Zanzibar MoH. The Steering Committee was composed of representatives of the following organizations: Prime Minister Office, TFNC, MoHSW, NBS, MAFS, OCGS, Zanzibar MoH, WHO, UNICEF, WFP, UN-REACH, FAO, Irish Aid and DFID.

As part of the implementation of this national nutrition survey, a training on SMART methodology and the adaptation of SMART methodology to Tanzanian context were required. TFNC requested UNICEF to support

recruitment of a SMART Survey Consultant to provide technical assistance for the implementation of the national nutrition survey.

The survey needed 30 teams and 15 supervisors (1 for 2 teams). Each team was composed of 1 team leader and 2 measurers. The team leader was responsible for the interviews, daily data entry and review of data quality. She/he was also responsible for the correct selection of households within the selected clusters. The measurers took anthropometric measurements. The list of all persons involved in the 2014 National Nutrition Survey is presented in Annex 3.

4.7 Training

In order to train properly all the personnel of the survey, 5 different trainings have been organized:

- ✓ One training on SMART methodology
- ✓ One Training of Trainers (ToT) on the survey training
- ✓ Three survey trainings

Training on SMART Methodology

The SMART training organized by TFNC and UNICEF in collaboration with ACF-Canada took place from Monday 25th to Saturday 30th of August (6 days), at the Edema Conference Centre in Morogoro, Tanzania, bringing together members of the Technical Committee as well as Regional Nutrition Officers from Mainland and Nutritionists and statisticians from Zanzibar.

The purpose of this training was to train all members of the Technical Committee on the SMART methodology and to identify among them and among other participants the 15 supervisors of the NNS.

32 persons from Tanzania have been identified to participate. All members of the Technical Committee have been trained (9 persons) and 23 Regional Nutrition Officers (18 from Mainland and 5 from Zanzibar) have been selected by the Technical Committee and invited to participate in this training.

The training on SMART methodology has been done by the SMART Survey consultant from UNICEF Tanzania, with the help of another SMART Specialist from ACF-Canada (ACF-Canada Regional Office, Nairobi, Kenya).

The training included the following:

- Overview of Nutrition and Mortality Surveys (relevance of doing a survey, survey planning, survey objectives)
- Sampling (concept of representative sample, simple and systematic random sampling designs, cluster design: PPS method, choosing a sampling design, sample size calculation)
- Field procedures (final stage sampling issues, special cases, daily organization)
- Survey teams (organization and recruitment, training design, evaluation and supervision)
- Anthropometric survey (indicators and their expression, age determination, measurements, entering data into ENA software)
- Standardization test (principles and organization, interpretation of results)
- Anthropometric data analysis and plausibility check (data cleaning and analysis, flags, use of weights, statistical test used in the plausibility check, reporting)

All the 32 persons have been assessed through a pre-test at the beginning of the training and a post-test at the end of the training. Depending on the results, some Regional Nutrition Officers, nutritionists and statistician have been retained as Supervisors. For this survey, Supervisors have been drawn from members of the Technical Committee and Regional Nutrition Officers.

Training of Trainers (ToT) on the survey training

The ToT organized by TFNC and UNICEF took place from Monday 1st to Tuesday 2nd of September (2 days), at the NIMR Conference Room in Dar-Es-Salaam, Tanzania, bringing together some members of the Technical Committee as well as the supervisors of the NNS, selected after the training on SMART Methods. The purpose of this training was to train the 15 supervisors of the National Nutrition Survey on the National Nutrition Survey methodology and on the different tools that have been used during data collection, in order that the supervisors become trainers during the survey training.

17 persons from Tanzania have been identified to participate after the training on the SMART Methodology: 7 members of the Technical Committee (whose 5 supervisors) and 10 supervisors. This ToT has been done by the SMART Survey consultant from UNICEF Tanzania.

The training included the following:

- Presentation of the National Nutrition Survey with SMART Methods in Tanzania
- Presentation of the survey training's agenda and the organization for the survey training
- Sampling (study design and clusters' selection, concept of representative sample, sample size calculation and systematic random sampling,)
- Field procedures (special cases and daily organization)
- Survey teams (organization, evaluation and supervision)
- Anthropometric survey (indicators and their expression, age determination and measurements)
- Standardization test (principles and organization) and standardization of the anthropometric equipment
- Review of the questionnaires (anthropometric and IYCF) and the tools of the NNS (forms and Rapid Test Kit for iodized salt)

The theory of the survey training has been divided in 5 sessions, as described below:

- ✓ **Session 1: Anthropometry** (Weight; Height/Length; MUAC; Oedema)
- ✓ **Session 2** (Survey presentation; Overview on SMART Methods; Age estimation and use of the calendar of local events; Anthropometric questionnaire; Malnutrition and Referral Slip)
- ✓ **Session 3** (Sampling design: study design, cluster selection, household selection; Segmentation; Survey Team; Field Procedures: daily organization, special cases)
- ✓ **Session 4** (Standardization of anthropometric equipment; Organization of the standardization test; Writing numbers)
- ✓ **Session 5** (IYCF questionnaire; Role playing; Rapid Test Kit for iodine)

At the end of this training, the SMART Survey Consultant assigned 3 or 4 persons to one session of the survey training, based on the results of the post-test during the training on the SMART Methods and based on their knowledge/functions

Survey training

The first survey training organized by TFNC and UNICEF took place from Monday 15th to Monday 22nd of September (7 days), at the Msimbazi Centre in Dar-Es-Salaam, Tanzania, bringing together some District Nutrition Officers from regions as well as some students from the Tanzanian Universities, selected by the Technical Committee the week before the survey training.

The Technical Committee selected **100 potential enumerators** for the Survey Training:

- ✓ **District Nutrition Officers (DNO)** have been encouraged to apply through the Regional Administrative Secretary. Based on their availability, experience in conducting surveys, computer skills, etc., some of them have been invited to participate in the survey training.
- ✓ **Students:** An advertisement notice circulated in the universities seeking applications from suitably qualified candidates.

The purpose of this training was to train the potential enumerators on the National Nutrition Survey methodology and on the different tools that have been used during data collection.

The survey training has been done by the 15 supervisors/trainers under the supervision of the Technical Committee and the SMART Survey Consultant.

The training included the following:

- An overview of the survey and its objectives, as well as a brief introduction to SMART methodology.
- Interviewing and general communication skills
- Segmentation, community mapping, and random selection of households
- Identification of individuals to measure or interview
- How to complete the questionnaires (Anthropometry and IYCF)
- Correct age in months estimation or validation using the calendar of local events
- How to make correct anthropometric measurements.
- The standardization of anthropometric measures: Each measurer will have to measure 10 children less than five years of age twice (height, weight and MUAC). The results of the standardization test

by interviewer will be produced immediately to determine if further training and standardization is needed.

- The identification of bilateral oedema and how to refer children with acute malnutrition to the nearest health centre
- The data entry using the ENA (Emergency Nutrition Assessment) software, the data quality analysis and daily review and the daily back-up of data (only for the team leaders and the supervisors).

Standardization of the anthropometric tools

Before testing the enumerators for accuracy and precision of measurements, all anthropometric tools have been tested to ensure that each tool produce the same measure of a standard object (standard weight, wooden stick and plastic pipe). The scales or height boards that not produced exact measures were marked and eliminated before the standardization test and data collection.

Every day, before the start of fieldwork, the measurers were responsible to review their anthropometric equipment for damage and to measure the standard objects to ensure that the tools were still in good working order. Results were recorded daily on the standardization of anthropometric tools form.

Standardization of the enumerators

The standardization of anthropometry measurers was conducted in six sessions (16-18 enumerators per session – 3 days). Enumerators with good skills of measurement were assigned as a measurer within a team. Conducting a standardization test for anthropometric measures is a fundamental step in the training of interviewers for an anthropometric survey. It allows for judging objectively the precision and accuracy of the measurements made by the enumerators.

Pilot test

The survey tools were tested in one day. The enumerators were divided into teams. The teams were divided into groups (10 groups). Five EAs, not included in the sample (selected EAs/clusters), have been selected for the pilot test. Two groups were assigned to one EA, in two different corners. Each team selected a number of households to investigate among households listed in the EA. This process allowed to ensure that the methodology and survey equipment were adapted, but also to complete the training of enumerators.

Final selection of the enumerators

At the end of the survey training, among the 99 potential enumerators, only 71 have been retained for data collection. Selection has been done based on the results of the standardization test and the pre- and post-test assessments. 24 survey teams were devised to do data collection in Dar-Es-Salaam region.

Second survey training for additional Enumerators

The survey training for additional enumerators organized by TFNC and UNICEF took place from Thursday 25th to Saturday 27th of September (3 days), at TFNC in Dar-Es-Salaam, Tanzania, bringing together some students from the Tanzanian Universities, selected by the Technical Committee at the end of the first survey training in order to complete the 24 survey teams to 30 survey teams.

The purpose of this training was to train additional enumerators on the National Nutrition Survey methodology and on the different tools that will be used during data collection in order to compose 30 survey teams for data collection in the regions and to have some additional trained enumerators in case of problems during data collection (health problem, resignation, etc.)

This second survey training has been done by the SMART Survey Consultant and by one Technical Committee member from TFNC.

For this second survey training, it was not possible to organize a standardization test as well as the pilot test during one day because of budget and time constraints. Nevertheless the additional enumerators received a closely supervision during the first days of data collection when they joined the other teams members that had already participated in data collection in Dar-Es-Salaam region.

At the end of this second survey training, among the 25 participants, 19 have been retained to complete the teams. Selection has been done based on the results of the pre- and post-test assessments.

Third survey training for additional Enumerators

A third survey training for additional enumerators has been organized by TFNC from Monday 27th to Tuesday 28th of October (2 days), at NIMR Conference Room, in Dar-Es-Salaam, Tanzania, bringing together some students from the Tanzanian Universities, selected by TFNC in order to complete the 30 survey teams after that some enumerators drop out for money shortage issues.

This third survey training has been done by two Technical Committee members from TFNC, with the same agenda that the second survey training.

At the end of this third survey training, among the 42 participants, 8 have been retained to complete the teams. Selection has been done based on the results of the pre- and post-test assessments.

4.8 Implementation of Fieldwork

Communication/Sensitization on the survey

A communication plan has been developed and implemented in order to ensure that the government and health authorities on the national, regional and district level, and cooperating partners know the objectives and implementation dates of the survey.

Fieldwork plan

Fieldwork began with 24 teams in Dar-Es-Salaam for 5 days (from Wednesday 24th to Monday 29th of September), allowing the supervision teams to review the skills and implementation of all the survey teams before deploying them to remaining regions of the country.

After Dar-Es-Salaam, the survey teams evolved by group of 2 (or 3) teams with 1 (or 2) supervisor(s), as described in the table below. They covered 2 (or 3) regions and completed one cluster in one day.

Teams in Arusha, Singida, Pwani and Lindi received help from other teams at the end of data collection to avoid delays in fieldwork plan.

Data collection for Mainland started on the 2nd of October and finished the 21st of November 2014. In Zanzibar, data collection started on the 8th of October and finished on the 12th of November 2014.

Supervision

The enumerators for the survey were assessed before the launch of the survey and continually throughout the data collection.

Supervision of fieldwork was conducted by the supervisors, the Technical Committee members and the SMART survey consultant. The team leader was responsible of the quality for his/her team. The supervisor was responsible of the quality for the two (or three) supervised teams. Each evening, after the end of data collection, the team leader sent data to his/her supervisor, then the supervisor sent the data to the SMART survey consultant. The SMART survey consultant sent bi-weekly report to all supervisors during data collection regarding the data quality, the back-up process and the calendar of fieldwork.

The SMART survey consultant did supervision visits with the teams 27, 28, 29, 5, 6, 7, 8, 19 and 20 in Unguja, Geita, Mara and Arusha respectively from Tuesday 14th of October to Friday 31st of October.

4.9 Data entry and Data Analysis

Data entry plan

ENA software (ENA for SMART 2011, Nov. 2nd 2014) and EpiData (Version 3.1) were used for data entry. The first round of data entry (anthropometric data for children, vitamin A and deworming) was completed in the field in order to facilitate quick review with the objective to improve the quality of data. The second round of data entry (anthropometric data for children and women, IYCF, handwashing practices and iodized salt data) was completed in Dar-Es-Salaam from Tuesday 18th of November to Saturday 29th of November. EpiData software was used to enter anthropometric data for women, IYCF, handwashing practices and information on salt.

Analysis plan

The nutrition results are presented in the standard format following the report template from the ENA software (ENA for SMART 2011, Nov. 2nd 2014). This format includes GAM, SAM, Stunting, Underweight and Overweight with 95% confidence intervals. The report has estimates of malnutrition calculated with the WHO

2006 growth references. These and all other data were loaded in STATA (version 11.1) for further analysis (results at national level, IYCF practices, etc.). The data quality report is included in the annexes of the final report.

Nutritional Anthropometric Indicators

The following cut-offs were used to determine the prevalence of wasting, stunting and underweight (Z-scores) using the WHO 2006 growth references.

Table 2: Cut-offs for definition of wasting, stunting and underweight

Classification	Acute Malnutrition or Wasting (WHZ)	Chronic Malnutrition or Stunting (HAZ)	Underweight (WAZ)
Global	<-2SD &/or bilateral edema	<-2 SD	<-2 SD
Moderate	≥-3 SD & <-2 SD	≥-3 SD & <-2 SD	≥-3 SD & <-2 SD
Severe	<-3 SD &/or bilateral edema	<-3 SD	<-3 SD

Stunting or low Height-for-Age is an indicator of linear growth retardation and cumulative growth deficits. Stunting reflects the failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. Height-for-Age represents the long-term effects of malnutrition in a population and is not sensitive to recent, short-term changes in dietary intake.

Wasting or low Weight-for-Height measures body mass in relation to body height or length to describe the current or acute nutritional status. Wasting represents the failure to receive adequate nutrition in the period immediately before the measurements and may be the result of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition.

Low Weight-for-Age is a composite index of low Height-for-Age and low Weight-for-Height. It takes into account both acute and chronic malnutrition. Weight measures with digital scales are very accurate likely causing the underweight index to be preferred in the past. While underweight or low Weight-for-Age is used for monitoring the Millennium Development Goals, it is no longer in use for monitoring individual children as it cannot detect children who are stunted but of normal weight.

Body mass Index (BMI) is used to classify underweight, overweight and obesity. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m²). BMI is not age dependent and same cut-offs are used for both sex. Maternal under nutrition is one of the main contributory factors for low birth weight babies. Babies who are undernourished in the womb face risk of dying during their early months and years. Those who survive are likely to remain undernourished throughout their lives, and to suffer higher incidences of chronic diseases. International classification of adult underweight, overweight and obesity according to BMI, WHO 2004 Standard, was employed for calculation of BMI.

Table 3: Cut-offs for definition of adult thinness, overweight and obesity by BMI

Classification	BMI (kg/m ²) Cut-offs
Severe thinness	<16.0
Thinness	<18.5
Normal range	18.5 ≤ BMI <25.0
Overweight	≥25.0
Obese	≥30.0

Vitamin A Supplementation and Deworming

To estimate vitamin A supplementation and deworming coverage, the following formula presented in table 13 were used.

Table 4: Vitamin A Supplementation Coverage and Deworming Coverage

Indicator	Numerator	Denominator
Vitamin A Supplementation	Number of children aged 6-59 months who received at least one high-dose vitamin A supplement in the six months preceding the survey	Total number of children age 6-59 months x 100
Deworming	Number of children 12-59 months dewormed in the six months preceding the interview	Total number of children age 12-59 months x 100

Iron/Folic acid supplementation

The analysis used by TDHS to estimate iron/folic acid supplementation coverage was followed: percentage of women with children under five years of age who took iron tablets or syrup during pregnancy for past birth, disaggregated by number of days (None, <60, 60-89, 90+).

Infant and Young Child Feeding Practices (IYCF)

IYCF indicators and formula that were used to calculate them are detailed below. These indicators and formula follow the guidelines from WHO "Indicators for assessing IYCF practices".

Children ever breastfed: Proportion of children born in the last 24 months who ever breastfed.

$$\frac{\text{Children born in the last 24 months who were ever breastfed}}{\text{Children born in the last 24 months}}$$

Early initiation of breastfeeding: Proportion of children born in the last 24 months who were put to the breast within one hour of birth.

$$\frac{\text{Children born in the last 24 months who were put to the breast within one hour after birth}}{\text{Children born in the last 24 months}}$$

Exclusive breastfeeding under 6 months: Proportion of infants 0-5 months of age who are fed exclusively with breast milk.

$$\frac{\text{Infants 0-5 months of age who received only breast milk during the previous day}}{\text{Infants 0-5 months of age}}$$

Exclusive breastfeeding means that the infant receives only breast milk. No other liquids or solids are given – not even water – with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicines.

Continued breastfeeding at 1 year: Proportion of children 12-15 months of age who are fed breast milk.

$$\frac{\text{Children 12-15 months of age who received breast milk during the previous day}}{\text{Children 12-15 months of age}}$$

Introduction of complementary foods: Proportion of infants 6-8 months of age who receive solid, semi-solid or soft foods.

$$\frac{\text{Infants 6-8 months of age who received solid, semi-solid or soft foods during the previous day}}{\text{Infants 6-8 months of age}}$$

Minimum dietary diversity: Proportion of children 6-23 months of age who receive foods from 4 or more food groups.

$$\frac{\text{Children 6-23 months of age who received foods from } \geq 4 \text{ food groups during the previous day}}{\text{Children 6-23 months of age}}$$

The 7 foods groups used for tabulation of this indicator are:

- Grains, roots and tubers
- Legumes and nuts
- Dairy products (milk, yogurt, cheese)
- Flesh foods (meat, fish, poultry and liver/organ meats)
- Eggs
- Vitamin-A rich fruits and vegetables
- Other fruits and vegetables

Minimum meal frequency: Proportion of breastfed and non-breastfed children 6-23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more.

The indicator is calculated from the following two fractions:

$$\frac{\text{Breastfed children 6-23 months of age who received solid, semi-solid or soft food the minimum number of times during the previous day}}{\text{Breastfed children 6-23 months of age}}$$

And

$$\frac{\text{Non-breastfed children 6-23 months of age who received solid, semi-solid or soft food the minimum number of times during the previous day}}{\text{Non-breastfed children 6-23 months of age}}$$

Minimum is defined as:

- 2 times for breastfed infants 6-8 months
- 3 times for breastfed children 9-23 months
- 4 times for non-breastfed children 6-23 months

Minimum acceptable diet: Proportion of children 6-23 months of age who receive a minimum acceptable diet (apart from breast milk)

This composite indicator will be calculated from the following two fractions:

$$\frac{\text{Breastfed children 6-23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day}}{\text{Breastfed children 6-23 months of age}}$$

And

$$\frac{\text{Non-breastfed children 6-23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day}}{\text{Non-breastfed children 6-23 months of age}}$$

Handwashing practices

Availability of soap at household level: Proportion of household that have soap

$$\frac{\text{Household that have soap}}{\text{Total number of household}}$$

Handwashing at critical times: Proportion of mothers/caretakers of children 0-59 months who report having used soap for handwashing at least at two critical times during past 24 hours

$$\frac{\text{Mothers/caretakers of children 0-59 months of age who mentioned handwashing at appropriate times during the previous day}}{\text{Total number of mothers/caretakers of children 0-59 months of age}}$$

Critical moments that WHO lists as the instances for maximum effect on diarrheal disease reduction include the following:

- After defecation
- After handling child's feces or cleaning a child's bottom
- Before preparing food
- Before feeding a child
- Before eating

4.10 Ethical Considerations

The study has been approved by National Institute of Medical Research Coordinating Committee of the Ministry of Health and Social Welfare and Ethical Committee of the Ministry of Health Zanzibar. All the logistical arrangements of visiting the sites in the study have been made by Regional Administrative Secretary for the respective regions.

This study carried no risk for participating respondents. Privacy of respondents of the study was not put in public. To ensure privacy and confidentiality all interviews were undertaken in a convenient place where other people were not able to listen or follow the proceedings. All respondents were informed about the nature of the study, its risks and benefits, rights to terminate interview at any time, refusal to answer to any question that they deem sensitive, the data collection procedures and confidentiality. A consent statement was read

by the enumerator prior to the interview and the respondent was required to give a verbal consent before the commencement of the interview. No financial compensation was given to the participating households. Questionnaires were given unique identification number and confidentiality was observed for the names of the respondents. The names of the respondents were not used in the report and any communication emanating from the study.

Results of weight, height and Mid Upper Arm Circumference (MUAC) measurements were verbally communicated to the mother/caregivers of the children. All children with signs of acute malnutrition were given referral form to go to the nearest health facility for immediate management of their situation. The team leader filled out two copies of the referral form (one for the mother/caregiver and one for the supervisor).

4.11 Limitations of the survey

Reliability of sample frame

The master sample frame used for the random selection of clusters (Enumeration Areas) was created in 2012 by NBS. As the projections at EA level were technically difficult to obtain, the choice was made to use the original population to estimate for the cluster selection when applying the PPS method.

Reliability of EA maps

The mapping of the enumeration areas dated from the 2012 Census, which means that the boundaries might have change since then.

Reserve Clusters

In the case that several of the selected clusters cannot be surveyed due to refusal or insecurity for example, the ENA software automatically selected reserve clusters at the planning stage. 10% of the required clusters + 1 were pre-selected. All these reserve clusters should only be used if the total number of surveyed clusters is less than 26 or if less than 80% of the sample size in terms of children is reached, in order to keep an acceptable precision for the results (narrower Confidence Intervals). Following SMART Methodology, there is never replacement of one cluster with another one.

During data collection, some teams made some reserve clusters (RC) before that they be informed to not use them:

- ✓ 2 RC in Kilimanjaro
- ✓ 2 RC in Mtwara
- ✓ 1 RC in Shinyanga

As all samples in all regions reached the planned sample sizes and as total number of clusters per region is always higher than 26 clusters, data from reserve clusters have been cancelled.

Clusters Selection in Dar-Es-Salaam Region

A mistake has been observed during clusters selection for Dar-Es-Salaam region. The clusters have been selected in only one district among 3 districts which compose Dar-Es-Salaam Region. Results are representative for Kinondoni District. Reasons for this mistake can be due to the ENA software during the clusters selection process (too much lines in the Enumeration Areas list) or due to the file (file not complete for Dar-Es-Salaam).

Reserve Teams and additional survey trainings

The field work was planned without reserve teams and when 12 enumerators dropped out during data collection, the field work suffered significant challenges. Two additional survey training were conducted and persons retained were subsequently recruited as Measurers. This contributed to increase duration of data collection. In order to overcome such problems in future surveys it is recommended to train reserve teams to accomplish the survey timely and reduce associated costs.

4. Results

5.1 Children Nutritional Status (0-59 months)

Description of sample

The number of cluster scheduled and number of clusters completed is included in Table 5. The percentage of completed clusters was ranging from 88% to 100%, with 98% overall. 23 clusters haven't been surveyed due to the following reasons:

- ✓ Refusal (1 cluster in Arusha, 1 cluster in Kilimanjaro and 1 cluster in Mara)
- ✓ Time and distance constraints (2 clusters in Pwani (Mafia Island) and 1 cluster in Arusha)
- ✓ Inaccessibility (1 cluster in Kilimanjaro, 1 cluster in Pwani, 4 clusters in Tanga, 1 cluster in Lindi, 1 cluster in Iringa, 2 clusters in Rukwa, 1 cluster in Kigoma and 2 clusters in Kagera)
- ✓ Insecurity (1 cluster in Manyara).
- ✓ No EA maps (1 cluster in Manyara)
- ✓ Two clusters haven't been surveyed in Geita: one was not found by the Administrative Officer and no local leader was found to give permission to enter the community for the second

These missing clusters are randomly distributed among the different regions and the minimum total number of clusters per region is 27 (SMART recommends to have a minimum of 26 clusters per domain). There is no selection bias regarding the representativeness of the sample, the results and statistical analysis.

Regarding the number of children surveyed versus the number of children planned during sample size calculations, in all 30 regions there response rate was above 80% which is acceptable in surveys. The response rate was ranging from 81% in Kilimanjaro to 145% in Iringa, with 109% overall at national level.

Table 5: Number and percentage of surveyed clusters and assessed children as compared to number of planned clusters and number of children by region, Mainland, Zanzibar and National

	Region/Overall	Number of cluster planned	Number of cluster surveyed	%	Number of children planned	Number of children assessed	%
	Mainland	854	831	97.3%	12,942	14,286	110.4%
1	Dodoma	31	31	100%	495	697	141%
2	Arusha	39	37	95%	599	516	86%
3	Kilimanjaro	34	32	94%	504	406	81%
4	Tanga	32	28	88%	522	599	115%
5	Morogoro	33	33	100%	504	547	109%
6	Pwani	43	40	93%	631	864	137%
7	Dar-Es-Salaam	60	60	100%	636	555	87%
8	Lindi	47	46	98%	617	730	118%
9	Mtwara	31	31	100%	397	430	108%
10	Ruvuma	46	46	100%	717	846	118%
11	Iringa	30	29	97%	307	444	145%
12	Mbeya	30	30	100%	352	508	144%
13	Singida	32	32	100%	582	644	111%
14	Tabora	29	29	100%	588	547	93%
15	Rukwa	33	31	94%	573	583	102%
16	Kigoma	31	30	97%	486	583	120%
17	Shinyanga	28	28	100%	382	379	99%
18	Kagera	30	28	93%	477	665	139%
19	Mwanza	31	31	100%	588	760	129%
20	Mara	30	29	97%	477	389	82%
21	Manyara	39	37	95%	688	598	87%
22	Njombe	28	28	100%	277	280	101%
23	Katavi	30	30	100%	573	493	86%
24	Simiyu	28	28	100%	382	503	132%
25	Geita	29	27	93%	588	720	122%
	Zanzibar	160	160	100%	2,677	2,698	100.8%
26	Unguja North	33	33	100%	538	507	94%
27	Unguja South	33	33	100%	485	461	95%
28	Town West	30	30	100%	521	506	97%
29	Pemba North	32	32	100%	568	564	99%
30	Pemba South	32	32	100%	565	660	117%
	National	1,014	991	98%	15,618	16,984	109%

The sample of the anthropometry part included 16,984 children below 5 years. This sample consisted of 14,928 children aged 6-59 months which is 87.9% and 12.1% of children were aged 0 to 5 months of age. Children less than 2 years (0-23 months) were 7,770 (45.7%) of less than 5 years. There was a lack of information on the age for 5 children in the sample including 1 children on age and sex.

Boys and girls are represented in the same proportion in the sample with an overall sex ratio equal to 1.0. At the level of the regions the sex ratio varies from 0.8 to 1.2 which is within acceptable range.

Table 6: Distribution of children by sex and sex-ratio by region, Mainland, Zanzibar and National

	Region/Overall	N	Boys (%)	Girls (%)	Ratio: Boys /Girls
	Mainland	14,280	50.1	49.9	1.0
1	Dodoma	697	52.9	47.1	1.1
2	Arusha	515	50.9	49.1	1.0
3	Kilimanjaro	406	53.9	46.1	1.2
4	Tanga	598	47.2	52.8	0.9
5	Morogoro	547	51.9	48.1	1.1
6	Pwani	864	51.2	48.8	1.0
7	Dar-Es-Salaam	555	50.3	49.7	1.0
8	Lindi	729	46.9	53.1	0.9
9	Mtwara	430	51.6	48.4	1.1
10	Ruvuma	846	50.1	49.9	1.0
11	Iringa	444	45.7	54.3	0.8
12	Mbeya	508	49.8	50.2	1.0
13	Singida	644	50.5	49.5	1.0
14	Tabora	547	52.7	47.3	1.1
15	Rukwa	582	49.5	50.5	1.0
16	Kigoma	582	51.7	48.3	1.1
17	Shinyanga	379	44.3	55.7	0.8
18	Kagera	665	53.7	46.3	1.2
19	Mwanza	686	51.5	48.5	1.1
20	Mara	389	51.4	48.6	1.1
21	Manyara	598	47.8	52.2	0.9
22	Njombe	280	51.1	48.9	1.0
23	Katavi	492	51.2	48.8	1.0
24	Simiyu	503	45.5	54.5	0.8
25	Geita	720	47.9	52.1	0.9
	Zanzibar	2,696	50.6	49.4	1.0
26	Unguja North	507	51.5	48.5	1.1
27	Unguja South	461	48.8	51.2	1.0
28	Town West	506	52.4	47.6	1.1
29	Pemba North	563	52.2	47.8	1.1
30	Pemba South	659	48.6	51.4	0.9
	National	16,976	50.2	49.8	1.0

The Table 7 presents the distribution by age group and sex of the sample of children below 5 years assessed in anthropometry part of the survey. All age groups are represented in proportions between 18.4% and 24.3%. Only the 48-59 months age group is slightly less represented since it represents only 14.9% of the overall sample. In the two last age groups (36-47 months and 48-59 months) there are fewer children than expected. There was no differences by age group regarding the sex-ratio.

Table 7: Distribution of children by sex and by age group at national level

Age group in months	N	Boys (%)	Girls (%)	Ratio: Boys /Girls
0-11	4,123	50.1	49.9	1.0
12-23	3,645	50.1	49.9	1.0
24-35	3,561	49.9	50.1	1.0
36-47	3,121	50.8	49.2	1.0
48-59	2,526	49.9	50.1	1.0
National	16,976	50.2	49.8	1.0

Review of data quality

In the raw data, 96% of the children were found to have an age calculated from an exact day, month and year of birth. The quality of age is excellent.

Table 8: Proportion of children with an exact date of birth by region, Mainland, Zanzibar and National

	Region/Overall	Percentage of exact date of birth
	Mainland	96%
1	Dodoma	96%
2	Arusha	91%
3	Kilimanjaro	97%
4	Tanga	100%
5	Morogoro	97%
6	Pwani	100%
7	Dar-Es-Salaam	97%
8	Lindi	100%
9	Mtwara	100%
10	Ruvuma	98%
11	Iringa	100%
12	Mbeya	100%
13	Singida	92%
14	Tabora	100%
15	Rukwa	82%
16	Kigoma	99%
17	Shinyanga	97%
18	Kagera	98%
19	Mwanza	100%
20	Mara	99%
21	Manyara	86%
22	Njombe	96%
23	Katavi	86%
24	Simiyu	98%
25	Geita	99%
	Zanzibar	95%
26	Unguja North	100%
27	Unguja South	100%
28	Town West	100%
29	Pemba North	90%
30	Pemba South	87%
	National	96%

The overall age distribution (Figure 3) shows fewer older children were measured compared to younger children but this difference was not significant.

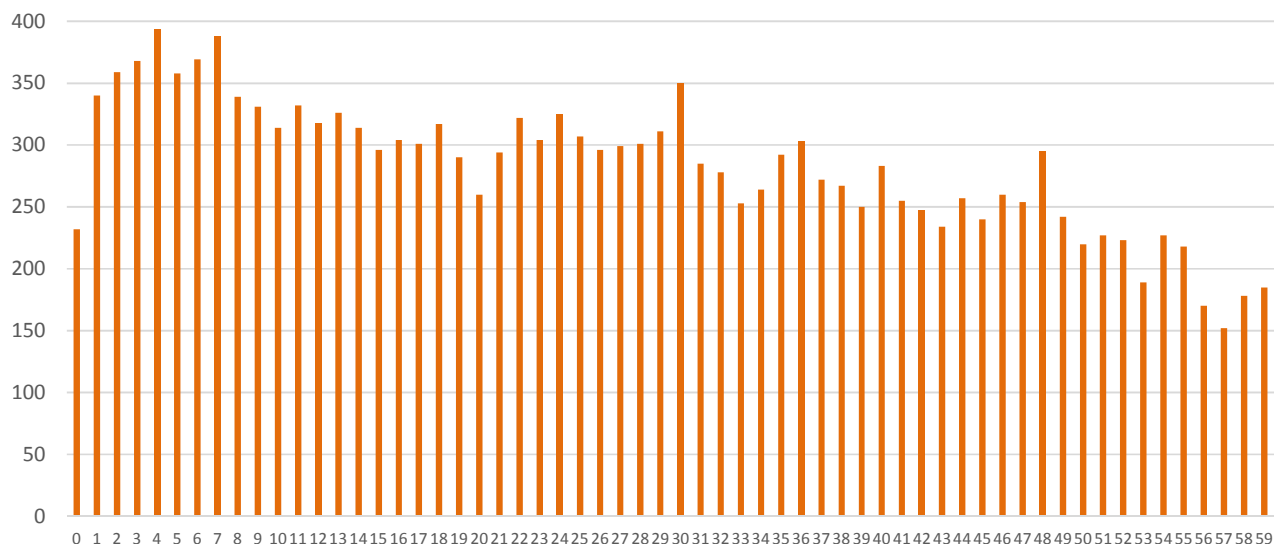


Figure 3: Age distribution in months

The data quality report (plausibility check report) at national level is included in the Annexes of the report (Annex 4). The data quality review was done after applying the SMART flags to the data at regional level and WHO flags to the data at Mainland, Zanzibar and National level. At National level, distributions of curves of Weight/Height, Height/Age and Weight/Age all follow bell shaped curves. The curve of Height/Age is flatter than normal. This may be due to poor height measures and/or the not optimal age distribution.

The Plausibility Check report at national level highlighted the “Excellent” quality of the anthropometric data, both in terms of sample representativeness and quality of anthropometric measurements. There were no significant digit preferences for weight, height and MUAC measures.

The Table 9 shows the overall data quality score by region. Data quality was “Excellent” or “Good” in all regions except for Pwani and Katavi where quality was “Acceptable”.

Table 9: Overall data quality score by region

	Region/Overall	Missing and flagged data	Overall Sex Ratio	Overall Age Distrib	DPS Weight	DPS Height	DPS MUAC	SD WHZ	Skewness WHZ	Kurtosis WHZ	Poisson Dist.	Overall Data Quality Score
Mainland												
1	Dodoma	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	11%
2	Arusha	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	9%
3	Kilimanjaro	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	8%
4	Tanga	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	8%
5	Morogoro	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	5%
6	Pwani	Green	Green	Orange	Green	Green	Green	Green	Green	Green	Green	19%
7	Dar-es-Salaam	Green	Green	Orange	Green	Green	Green	Green	Green	Green	Yellow	13%
8	Lindi	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	1%
9	Mtwara	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	7%
10	Ruvuma	Green	Green	Orange	Green	Green	Green	Green	Green	Green	Green	14%
11	Iringa	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	2%
12	Mbeya	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	4%
13	Singida	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	5%
14	Tabora	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	2%
15	Rukwa	Green	Green	Orange	Green	Green	Green	Green	Green	Green	Green	12%
16	Kigoma	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	2%
17	Shinyanga	Green	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Green	8%
18	Kagera	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	4%
19	Mwanza	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	4%
20	Mara	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	6%
21	Manyara	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	0%
22	Njombe	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	7%
23	Katavi	Green	Green	Yellow	Green	Yellow	Green	Green	Green	Green	Green	18%
24	Simiyu	Green	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Green	11%
25	Geita	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	6%
Zanzibar												
26	Unguja North	Green	Green	Yellow	Green	Green	Green	Green	Green	Yellow	Green	12%
27	Unguja South	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	8%
28	Town West	Green	Green	Yellow	Green	Green	Green	Green	Green	Yellow	Green	11%
29	Pemba North	Green	Green	Yellow	Green	Green	Green	Green	Green	Orange	Green	12%
30	Pemba South	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	8%
National												

Green	Excellent (Overall score 0-9)
Light Green	Good (Overall score 10-14)
Yellow	Acceptable (Overall score 15-24)
Orange	Problematic (Overall score >25)

Children with missing data for sex, weight, height, edema or MUAC were automatically excluded from the analysis by the ENA software for their respective estimation of prevalence.

The standard deviation for the distribution of Height/Age z-score was found to be above 1.2 in Arusha, Kilimanjaro, Pwani, Rukwa, Manyara, Katavi, Mainland, Zanzibar and at national level. The standard deviation of Weight/Height z-score and Weight/Age z-scores for the 30 regions was inside the acceptable range of standard deviation from good quality data (Table 10).

Table 10: Mean z-scores, Design Effects and excluded subjects following SMART flags application by region, Mainland, Zanzibar and National (WHO 2006 Growth References)

	Indicator	Total	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available	z-scores out of range
1	Dodoma					
	Weight-for-Height	677	-0.30 ± 1.04	1.37	14	6
	Height-for-Age	673	-1.78 ± 1.13	1.86	15	9
	Weight-for-Age	675	-1.22 ± 1.03	1.50	13	9
2	Arusha					
	Weight-for-Height	499	-0.22 ± 1.01	1.12	3	14
	Height-for-Age	475	-1.21 ± 1.27	1.15	3	38
	Weight-for-Age	504	-0.80 ± 1.11	1.01	2	10
3	Kilimanjaro					
	Weight-for-Height	397	-0.02 ± 1.03	1.00	0	9
	Height-for-Age	388	-0.85 ± 1.26	1.97	0	18
	Weight-for-Age	399	-0.46 ± 1.12	1.34	0	7
4	Tanga					
	Weight-for-Height	584	-0.12 ± 1.12	1.19	1	14
	Height-for-Age	571	-1.18 ± 1.16	2.21	1	27
	Weight-for-Age	590	-0.73 ± 1.04	2.07	1	8
5	Morogoro					
	Weight-for-Height	529	0.04 ± 1.01	1.00	16	2
	Height-for-Age	518	-1.58 ± 1.13	1.38	14	15
	Weight-for-Age	520	-0.85 ± 0.99	1.00	15	12
6	Pwani					
	Weight-for-Height	835	0.04 ± 1.12	1.00	1	28
	Height-for-Age	820	-1.44 ± 1.22	1.53	0	44
	Weight-for-Age	850	-0.73 ± 1.08	1.08	0	14
7	Dar-Es-Salaam					
	Weight-for-Height	535	-0.07 ± 1.11	1.27	14	6
	Height-for-Age	529	-0.88 ± 1.11	1.47	13	13
	Weight-for-Age	543	-0.48 ± 1.06	1.03	12	0
8	Lindi					
	Weight-for-Height	725	0.06 ± 1.06	1.00	0	5
	Height-for-Age	710	-1.59 ± 1.16	1.32	1	19
	Weight-for-Age	715	-0.83 ± 1.00	1.00	1	14
9	Mtwara					
	Weight-for-Height	419	0.14 ± 1.00	1.15	6	5
	Height-for-Age	408	-1.56 ± 1.10	1.00	6	16
	Weight-for-Age	420	-0.76 ± 0.99	1.19	6	4
10	Ruvuma					
	Weight-for-Height	835	0.22 ± 1.04	1.00	0	11
	Height-for-Age	818	-1.93 ± 1.14	2.01	0	28
	Weight-for-Age	837	-0.94 ± 1.02	1.58	0	9
11	Iringa					
	Weight-for-Height	440	0.29 ± 0.96	1.00	1	3
	Height-for-Age	425	-2.03 ± 1.15	2.11	0	19
	Weight-for-Age	440	-0.94 ± 1.04	1.38	0	4
12	Mbeya					
	Weight-for-Height	505	0.20 ± 1.04	1.46	0	3
	Height-for-Age	480	-1.60 ± 1.14	1.70	0	28
	Weight-for-Age	498	-0.76 ± 1.02	1.54	0	10
13	Singida					
	Weight-for-Height	623	-0.16 ± 1.08	1.00	3	18
	Height-for-Age	605	-1.52 ± 1.20	1.80	2	37
	Weight-for-Age	637	-0.98 ± 1.07	1.35	1	6
14	Tabora					
	Weight-for-Height	541	0.05 ± 1.00	1.41	0	6
	Height-for-Age	534	-1.51 ± 1.16	1.00	0	13
	Weight-for-Age	544	-0.79 ± 0.97	1.15	0	3
15	Rukwa					
	Weight-for-Height	576	0.06 ± 1.16	1.00	2	5
	Height-for-Age	541	-1.95 ± 1.28	1.84	1	41
	Weight-for-Age	569	-1.04 ± 1.04	1.65	1	13
16	Kigoma					
	Weight-for-Height	565	-0.09 ± 1.02	1.22	7	11
	Height-for-Age	558	-1.89 ± 1.18	1.00	7	18
	Weight-for-Age	573	-1.09 ± 1.06	1.10	5	5

	Indicator	Total	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available	z-scores out of range*
17	Shinyanga					
	Weight-for-Height	372	-0.09 ± 1.03	1.00	1	6
	Height-for-Age	360	-1.37 ± 1.14	1.00	0	19
	Weight-for-Age	372	-0.78 ± 0.99	1.09	1	6
18	Kagera					
	Weight-for-Height	649	-0.10 ± 1.00	1.12	7	9
	Height-for-Age	632	-2.07 ± 1.08	2.01	6	27
	Weight-for-Age	653	-1.25 ± 1.06	1.55	4	8
19	Mwanza					
	Weight-for-Height	679	0.15 ± 1.04	1.34	2	5
	Height-for-Age	666	-1.53 ± 1.11	1.13	1	19
	Weight-for-Age	675	-0.75 ± 0.98	1.07	0	11
20	Mara					
	Weight-for-Height	387	-0.05 ± 1.09	1.39	2	0
	Height-for-Age	383	-1.45 ± 1.16	1.69	0	6
	Weight-for-Age	387	-0.84 ± 1.02	1.03	2	0
21	Manyara					
	Weight-for-Height	587	-0.03 ± 1.07	1.32	4	7
	Height-for-Age	570	-1.59 ± 1.21	1.10	4	24
	Weight-for-Age	588	-0.91 ± 1.06	1.64	3	7
22	Njombe					
	Weight-for-Height	278	0.22 ± 1.07	1.09	1	1
	Height-for-Age	264	-2.03 ± 1.15	1.40	0	16
	Weight-for-Age	277	-0.96 ± 1.06	1.19	0	3
23	Katavi					
	Weight-for-Height	478	0.34 ± 1.13	1.20	3	12
	Height-for-Age	468	-1.71 ± 1.26	1.03	1	24
	Weight-for-Age	484	-0.70 ± 1.08	1.26	2	7
24	Simiyu					
	Weight-for-Height	497	-0.15 ± 0.99	1.27	5	1
	Height-for-Age	498	-1.28 ± 1.10	1.19	0	5
	Weight-for-Age	496	-0.84 ± 0.94	1.02	4	3
25	Geita					
	Weight-for-Height	718	0.20 ± 0.96	1.00	0	2
	Height-for-Age	715	-1.87 ± 1.07	1.47	0	5
	Weight-for-Age	716	-0.92 ± 0.94	1.12	0	4
26	Unguja North					
	Weight-for-Height	493	-0.45 ± 1.02	1.04	7	7
	Height-for-Age	483	-1.34 ± 1.09	1.53	7	17
	Weight-for-Age	491	-1.05 ± 0.98	1.81	5	11
27	Unguja South					
	Weight-for-Height	452	-0.38 ± 1.07	1.28	7	2
	Height-for-Age	448	-1.16 ± 1.16	1.28	7	6
	Weight-for-Age	451	-0.92 ± 0.99	1.40	7	3
28	Town West					
	Weight-for-Height	496	-0.32 ± 1.08	1.00	4	6
	Height-for-Age	481	-0.99 ± 1.19	1.49	4	21
	Weight-for-Age	498	-0.73 ± 1.00	1.00	3	5
29	Pemba North					
	Weight-for-Height	547	-0.50 ± 1.04	1.00	10	6
	Height-for-Age	534	-1.29 ± 1.09	1.31	9	20
	Weight-for-Age	546	-1.09 ± 1.00	1.48	8	9
30	Pemba South					
	Weight-for-Height	641	-0.50 ± 1.00	1.06	13	6
	Height-for-Age	628	-1.31 ± 1.11	1.86	12	20
	Weight-for-Age	641	-1.07 ± 1.03	1.24	11	8
	Mainland					
	Weight-for-Height	14,182	0.02 ± 1.14	1.00	94	10
	Height-for-Age	14,176	-1.54 ± 1.40	1.19	75	35
	Weight-for-Age	14,198	-0.87 ± 1.11	1.03	73	15
	Zanzibar					
	Weight-for-Height	2,655	-0.45 ± 1.10	1.00	41	1
	Height-for-Age	2,651	-1.19 ± 1.32	1.74	39	7
	Weight-for-Age	2,661	-0.99 ± 1.09	1.17	34	2
	National Overall					
	Weight-for-Height	16,837	-0.05 ± 1.15	1.38	135	11
	Height-for-Age	16,827	-1.48 ± 1.40	1.49	114	42
	Weight-for-Age	16,859	-0.89 ± 1.11	1.44	107	17

Anthropometry Results

The results presented in this report applied the WHO growth reference standards of 2006. The estimates of malnutrition are presented for children from 0-59 months of age.

As recommended by the SMART Methodology, SMART flags (exclusion of z-scores from observed mean) were used for analysis at regional level to exclude extreme values that were likely resulted from incorrect anthropometric measurements (-4 z-scores/+3 z-scores for WHZ in Dar-Es-Salaam, Lindi, Mtwara, Iringa, Rukwa, Mwanza, Manyara, Njombe, Katavi, Geita and Unguja South in order to avoid to exclude some severely acute malnourished children ; -3 z-scores/+3 z-scores for WHZ in Dodoma, Arusha, Kilimanjaro, Tanga, Morogoro, Pwani, Ruvuma, Mbeya, Singida, Tabora, Kigoma, Shinyanga, Kagera, Mara, Simiyu, Unguja North, Town West, Pemba North and Pemba South ; -3 z-scores/+3 z-scores for HAZ and WAZ in all regions).

WHO flags (exclusion of z-scores from reference mean (zero) were used for Mainland, for Zanzibar and for the 30 regions together. WHO flags were also used for overweight prevalence.

Prevalence of Chronic Malnutrition

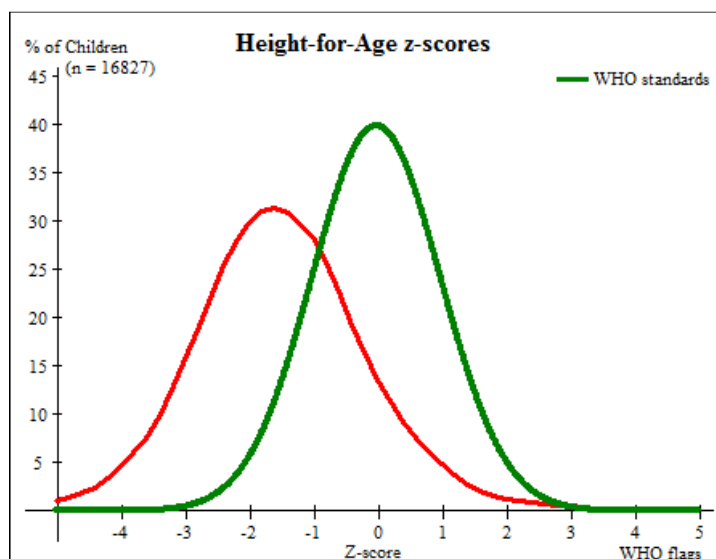


Figure 4: Height-for-Age z-score (WHO 2006)

The figure 4 above shows that the distribution of Height-for-Age of the assessed children in Tanzania was shifted to the left and was flatter as compared to the WHO standard normal distribution of reference population even when WHO flags are applied. The mean HAZ was -1.48 ± 1.40 SD. The distribution was flattened may be due to “poor” height measures during data collection and/or age distribution not optimal.

Table 11: Prevalence of Global, Moderate and Severe Chronic Malnutrition (Height-for-Age Z-score) in children 0 to 59 months of age by age group and sex in Tanzania (WHO 2006)

Background characteristic	N	Stunting (HAZ <-2)		Moderate Stunting (HAZ <-2 and >=-3)		Severe Stunting (HAZ <-3)	
		n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
Age							
0-5 months	2,036	341	16.6% [14.5-18.6]	229	11.4% [9.7-13.1]	112	5.1% [4.0-6.3]
6-11 months	2,049	545	25.4% [23.2-27.6]	372	17.6% [15.6-19.5]	173	7.9% [6.6-9.1]
12-23 months	3,626	1,490	39.3% [37.3-41.4]	963	25.2% [23.5-26.9]	527	14.1% [12.8-15.5]
24-35 months	3,529	1,567	43.6% [41.6-45.7]	973	27.4% [25.6-29.2]	594	16.2% [14.8-17.6]
36-47 months	3,087	1,205	38.7% [36.6-40.8]	821	26.9% [25.1-28.8]	384	11.8% [10.5-13.0]
48-59 months	2,500	826	31.9% [29.7-34.1]	604	23.2% [21.3-25.1]	222	8.7% [7.3-10.0]
Sex							
Male	8,438	3,257	37.9% [36.6-39.3]	2,106	24.7% [23.6-25.8]	1,151	13.2% [12.3-14.1]
Female	8,389	2,717	31.4% [30.1-32.8]	1,856	21.6% [20.5-22.7]	861	9.8% [9.0-10.6]

Table 12: Prevalence of Global, Moderate and Severe Chronic Malnutrition (Height-for-Age Z-score) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

#	Region/Overall	N	Stunting (HAZ <-2)						Moderate Stunting (HAZ <-2 and >=-3)		Severe Stunting (HAZ <-3)	
			All		Boys		Girls		All		All	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
	Mainland	14,176	5,282	35.0% [34.0-36.1]	2,876	38.3% [36.9-39.6]	2,406	31.7% [30.3-33.1]	3,453	23.4% [22.5-24.2]	1,829	11.7% [11.0-12.3]
1	Dodoma	673	304	45.2% [39.9-50.6]	181	50.4% [43.4-57.4]	123	39.2% [33.4-45.3]	203	30.2% [26.7-33.9]	101	15.0% [11.8-18.8]
2	Arusha	475	130	27.4% [23.1-32.0]	71	29.5% [23.9-35.8]	59	25.2% [19.5-31.9]	88	18.5% [15.4-22.1]	42	8.8% [5.9-13.0]
3	Kilimanjaro	388	71	18.3% [13.3-24.6]	44	21.1% [16.0-27.2]	27	15.1% [8.9-24.4]	56	14.4% [10.2-20.0]	15	3.9% [2.2-6.8]
4	Tanga	571	136	23.8% [18.8-29.7]	65	23.7% [18.3-30.2]	71	23.9% [17.6-31.5]	106	18.6% [14.2-23.9]	30	5.3% [3.0-8.9]
5	Morogoro	518	191	36.9% [32.0-42.1]	110	40.7% [33.6-48.3]	81	32.7% [24.7-41.8]	132	25.5% [21.3-30.2]	59	11.4% [8.9-14.5]
6	Pwani	820	276	33.7% [29.7-37.9]	144	33.9% [29.1-39.1]	132	33.4% [28.3-39.0]	196	23.9% [20.6-27.5]	80	9.8% [7.4-12.8]
7	Dar-Es-Salaam	529	86	16.3% [12.7-20.5]	54	20.3% [15.2-26.5]	32	12.2% [8.4-17.2]	75	14.2% [11.0-18.1]	11	2.1% [1.2-3.7]
8	Lindi	710	257	36.2% [32.1-40.5]	137	41.6% [35.1-48.5]	120	31.5% [26.5-37.0]	179	25.2% [22.0-28.7]	78	11.0% [8.6-14.0]
9	Mtwara	408	148	36.3% [31.9-40.9]	79	37.3% [30.3-44.8]	69	35.2% [29.0-41.9]	110	27.0% [23.8-30.4]	38	9.3% [6.5-13.1]
10	Ruvuma	818	396	48.4% [43.4-53.4]	203	49.9% [44.5-55.3]	193	47.0% [40.6-53.4]	260	31.8% [28.1-35.7]	136	16.6% [13.7-20.1]
11	Iringa	425	218	51.3% [44.1-58.4]	115	59.0% [47.9-69.2]	103	44.8% [37.7-52.1]	132	31.1% [26.3-36.3]	86	20.2% [15.3-26.3]
12	Mbeya	480	173	36.0% [30.4-42.1]	101	41.7% [34.8-49.0]	72	30.3% [23.6-37.8]	124	25.8% [21.4-30.8]	49	10.2% [7.3-14.1]
13	Singida	605	206	34.0% [29.0-39.5]	116	38.3% [31.6-45.5]	90	29.8% [24.2-36.1]	135	22.3% [18.5-26.7]	71	11.7% [8.9-15.4]
14	Tabora	534	170	31.8% [28.3-35.6]	100	35.7% [30.8-40.9]	70	27.6% [22.1-33.7]	116	21.7% [19.0-24.7]	54	10.1% [7.6-13.3]
15	Rukwa	541	257	47.5% [41.6-53.5]	135	50.6% [44.5-56.6]	122	44.5% [36.2-53.2]	130	24.0% [20.4-28.1]	127	23.5% [18.7-29.1]
16	Kigoma	588	271	48.6% [44.3-52.9]	135	47.0% [40.3-53.8]	136	50.2% [44.1-56.3]	174	31.2% [27.7-34.9]	197	17.4% [13.8-21.6]
17	Shinyanga	360	108	30.0% [26.4-33.9]	52	32.7% [28.8-36.9]	56	27.9% [22.4-34.1]	84	23.3% [20.2-26.7]	24	6.7% [4.5-9.8]

#	Region/Overall	N	Stunting (HAZ <-2)						Moderate Stunting (HAZ <-2 and >=-3)		Severe Stunting (HAZ <-3)	
			All		Boys		Girls		All		All	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
18	Kagera	632	328	51.9% [46.1-57.6]	184	54.4% [49.7-59.1]	144	49.0% [40.2-57.8]	210	33.2% [28.7-38.0]	118	18.7% [15.3-22.6]
19	Mwanza	666	228	34.2% [30.3-38.4]	126	36.7% [30.7-43.2]	102	31.6% [27.9-35.5]	164	24.6% [21.1-28.5]	64	9.6% [7.1-13.0]
20	Mara	383	123	32.1% [26.1-38.8]	64	32.7% [26.0-40.1]	59	31.6% [23.1-41.4]	90	23.5% [19.0-28.7]	33	8.6% [5.6-13.0]
21	Manyara	570	213	37.4% [33.2-41.8]	104	38.5% [33.7-43.5]	109	36.3% [30.1-43.1]	142	24.9% [21.3-28.9]	71	12.5% [10.1-15.3]
22	Njombe	264	136	51.5% [44.1-58.9]	74	54.8% [45.4-63.9]	62	48.1% [37.2-58.5]	82	31.1% [25.3-37.5]	54	20.5% [15.2-27.0]
23	Katavi	468	205	43.8% [39.1-48.6]	123	51.5% [45.1-57.8]	82	35.8% [29.0-43.2]	138	29.5% [26.1-33.1]	67	14.3% [11.3-18.0]
24	Simiyu	498	130	26.1% [21.9-30.8]	68	30.4% [24.0-37.5]	62	22.6% [18.0-28.0]	100	20.1% [16.8-23.8]	30	6.0% [4.0-8.9]
25	Geita	715	329	46.0% [41.4-50.7]	176	51.6% [44.4-58.8]	153	40.9% [34.7-47.4]	219	30.6% [26.9-19.2]	110	15.4% [12.2-19.2]
	Zanzibar	2,651	692	24.4% [22.1-26.6]	381	26.7% [24.0-29.5]	311	21.9% [19.1-24.6]	509	17.5% [15.5-19.4]	183	6.9% [5.8-8.0]
26	Unguja North	483	147	30.4% [25.4-36.0]	83	33.3% [27.2-40.1]	64	27.4% [21.0-34.8]	122	25.3% [20.3-30.9]	125	5.2% [3.7-7.2]
27	Unguja South	448	110	24.6% [20.2-29.5]	59	27.2% [20.9-34.6]	51	22.1% [16.0-29.7]	79	17.6% [14.1-21.8]	31	6.9% [4.3-11.6]
28	Town West	481	99	20.6% [16.4-25.6]	59	23.2% [18.4-28.8]	40	17.6% [12.5-24.3]	64	13.3% [10.4-16.9]	35	7.3% [4.8-10.9]
29	Pemba North	534	131	24.5% [20.4-29.1]	74	26.4% [21.3-32.3]	57	22.4% [17.6-28.2]	103	19.3% [15.9-23.2]	28	5.2% [3.7-7.4]
30	Pemba South	628	177	28.2% [23.5-33.4]	89	29.0% [22.8-36.0]	88	27.4% [22.2-33.3]	136	21.7% [18.1-25.7]	41	6.5% [4.8-8.8]
	National	16,827	5,974	34.7% [33.7-35.7]	3,257	37.9% [36.6-39.3]	2,717	31.4% [30.1-32.8]	3,962	23.2% [22.4-24.0]	2,012	11.5% [10.9-12.2]

Table 13: Number of children 0-59 months suffering from stunting by region, Mainland, Zanzibar and National

	Region/Overall	Estimated Population (Census 2012)	Estimated Population 2015 ²	Population 0-59 months	Stunting	
					Prevalence (%)	Number of children
	Mainland					2,673,719
1	Dodoma	2,083,588	2,217,630	359,256	45.2	162,384
2	Arusha	1,694,310	1,835,288	297,317	27.4	81,465
3	Kilimanjaro	1,640,087	1,730,255	280,301	18.3	51,295
4	Tanga	2,045,205	2,183,180	353,675	23.8	84,175
5	Morogoro	2,218,492	2,382,088	385,898	36.9	142,396
6	Pwani	1,098,668	1,172,787	189,992	33.7	64,027
7	Dar-Es-Salaam	4,364,541	5,139,612	832,617	16.3	135,717
8	Lindi	864,652	888,208	143,890	36.2	52,088
9	Mtwara	1,270,854	1,317,156	213,379	36.3	77,457
10	Ruvuma	1,376,891	1,465,470	237,406	48.4	114,905
11	Iringa	941,238	972,642	157,568	51.3	80,832
12	Mbeya	2,707,410	2,932,685	475,095	36	171,034
13	Singida	1,370,637	1,467,403	237,719	34	80,825
14	Tabora	2,291,623	2,496,832	404,487	31.8	128,627
15	Rukwa	1,004,539	1,104,094	178,863	47.5	84,960
16	Kigoma	217,930	234,001	37,908	48.6	18,423
17	Shinyanga	1,534,808	1,633,546	264,634	30	79,390
18	Kagera	2,458,023	2,701,625	437,663	51.9	227,147
19	Mwanza	2,772,509	3,029,595	490,794	34.2	167,852
20	Mara	1,743,830	1,877,914	304,222	32.1	97,655
21	Manyara	1,425,131	1,566,368	253,752	37.4	94,903
22	Njombe	702,097	719,082	116,491	51.5	59,993
23	Katavi	564,604	620,559	100,531	43.8	44,032
24	Simiyu	1,584,157	1,671,251	270,743	26.1	70,664
25	Geita	1,739,530	1,878,772	304,361	46	140,006
	Zanzibar					53,376
26	Unguja North	187,455	206033	32,141	30.4	9,771
27	Unguja South	115,588	122663	19,135	24.6	4,707
28	Town West	593,678	671667	104,780	20.6	21,585
29	Pemba North	211,732	220097	34,335	24.5	8,412
30	Pemba South	195,116	201626	31,454	28.3	8,901
	Total					2,727,096

According to those results, more than 2,700,000 children under five years of age are stunted in Tanzania. Nutrition interventions should be prioritized in the regions with the higher number of stunted children and the higher prevalence of chronic malnutrition. These regions are Kagera, Kigoma, Dodoma, Mbeya and Mwanza.

² Based on the Average Annual Rate 2002-2012 by region from the Census General Report

Prevalence of Global Acute Malnutrition

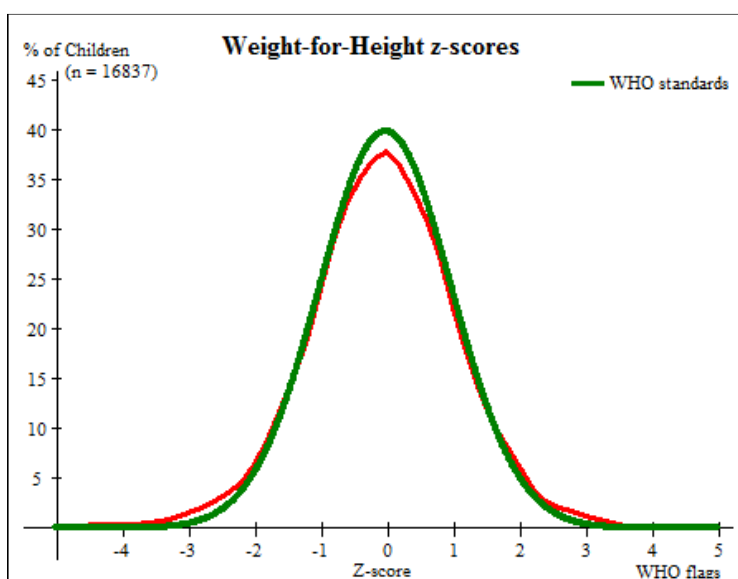


Figure 5: Weight-for-Height z-score (WHO 2006)

The above graph shows that the distribution of Weight-for-Height follows very closely to the WHO standard normal distribution of reference population, with mean WHZ -0.05 ± 1.15 SD. The standard deviation indicates the good quality of weight and height measurements during data collection.

Table 14: Prevalence of Global, Moderate and Severe Acute Malnutrition (Weigh-for-Height Z-score) in children 0 to 59 months of age by age group and sex in Tanzania (WHO 2006)

Background characteristic	N	Global Acute Malnutrition (WHZ <-2 and/or edema)		Moderate Acute Malnutrition (WHZ <-2 and >=-3)		Severe Acute Malnutrition (WHZ <-3 and/or edema)	
		n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
Age							
0-5 months	2,029	126	5.4% [4.2-6.5]	84	3.7% [2.8-4.5]	42	1.7% [1.1-2.3]
6-11 months	2,056	112	5.1% [3.9-6.2]	87	3.9% [2.9-4.9]	25	1.1% [0.6-1.6]
12-23 months	3,636	189	4.9% [4.0-5.8]	136	3.6% [2.8-4.4]	53	1.3% [0.9-1.7]
24-35 months	3,531	113	2.8% [1.8-3.0]	83	2.0% [1.5-2.6]	30	0.8% [0.4-1.1]
36-47 months	3,087	85	2.4% [1.8-3.1]	73	2.0% [1.4-2.5]	12	0.5% [0.1-0.8]
48-59 months	2,502	99	3.4% [2.5-4.3]	84	2.9% [2.1-3.8]	15	0.4% [0.2-0.7]
Sex							
Male	8,451	414	4.7% [4.1-5.2]	307	3.5% [3.0-4.0]	107	1.2% [0.9-1.4]
Female	8,394	310	3.0% [2.5-3.4]	240	2.3% [1.9-2.7]	70	0.7% [0.5-0.9]

Table 15: Prevalence of Global, Moderate and Severe Acute Malnutrition (Weigh-for-Height Z-score) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

#	Region	N	Global Acute Malnutrition (WHZ <-2 and/or edema)						Moderate Acute Malnutrition (WHZ <-2 and >=-3)		Severe Acute Malnutrition (WHZ <-3 and/or edema)		Edema
			All		Boys		Girls		All		All		All
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	%
	Mainland	14,191	526	3.7% [3.3-4.1]	311	4.6% [4.0-5.2]	215	2.8% [2.4-3.3]	389	2.8% [2.5-3.2]	137	0.9% [0.7-1.1]	0.07%
1	Dodoma	677	35	5.2% [3.5-7.6]	24	6.7% [4.3-10.2]	11	3.5% [1.7-7.1]	32	4.7% [3.1-7.2]	3	0.4% [0.1-1.4]	0.0%
2	Arusha	499	23	4.6% [3.0-7.1]	13	5.2% [3.0-8.7]	10	4.0% [2.0-7.9]	21	4.2% [2.6-6.7]	2	0.4% [0.1-1.7]	0.0%
3	Kilimanjaro	397	16	4.0% [2.5-6.4]	9	4.2% [2.2-7.9]	7	3.8% [2.0-7.3]	16	4.0% [2.5-6.4]	0	0.0% [0.0-0.0]	0.0%
4	Tanga	584	28	4.8% [3.2-7.2]	18	6.5% [3.7-11.0]	10	3.3% [1.6-6.5]	27	4.6% [3.1-6.9]	1	0.2% [0.0-1.4]	0.0%
5	Morogoro	530	20	3.8% [2.4-5.8]	12	4.3% [2.6-7.1]	8	3.2% [1.6-6.3]	19	3.6% [2.3-5.5]	1	0.2% [0.0-1.4]	0.2%
6	Pwani	835	26	3.1% [2.2-4.4]	12	2.8% [1.5-5.2]	14	3.4% [2.1-5.5]	26	3.1% [2.2-4.4]	0	0.0% [0.0-0.0]	0.0%
7	Dar-Es-Salaam	535	20	3.7% [2.3-6.1]	16	6.0% [3.6-9.9]	4	1.5% [0.6-4.0]	14	2.6% [1.4-4.9]	6	1.1% [0.4-3.5]	0.0%
8	Lindi	725	21	2.9% [1.9-4.3]	10	2.9% [1.6-5.5]	11	2.9% [1.6-5.1]	17	2.3% [1.4-3.8]	4	0.6% [0.2-1.4]	0.0%
9	Mtwara	419	10	2.4% [1.2-4.7]	6	2.8% [1.3-5.9]	4	2.0% [0.7-5.1]	8	1.9% [0.9-4.0]	2	0.5% [0.1-1.9]	0.0%
10	Ruvuma	835	22	2.6% [1.8-3.9]	14	3.3% [2.1-5.3]	8	1.9% [1.0-3.6]	20	2.4% [1.6-3.6]	2	0.2% [0.1-1.0]	0.0%
11	Iringa	440	3	0.7% [0.2-2.1]	1	0.5% [0.1-3.8]	2	0.8% [0.2-3.4]	2	0.5% [0.1-1.9]	1	0.2% [0.0-1.7]	0.0%
12	Mbeya	550	10	2.0% [0.9-4.3]	6	2.4% [1.1-5.3]	4	1.6% [0.5-5.3]	10	2.0% [0.9-4.3]	0	0.0% [0.0-0.0]	0.0%
13	Singida	623	29	4.7% [3.4-6.4]	16	5.1% [3.3-7.9]	13	4.2% [2.5-7.0]	26	4.2% [2.9-5.9]	3	0.5% [0.2-1.5]	0.0%
14	Tabora	541	11	2.0% [1.0-4.2]	7	2.5% [1.0-6.8]	4	1.5% [0.6-4.0]	11	2.0% [1.0-4.2]	0	0.0% [0.0-0.0]	0.0%
15	Rukwa	576	22	3.8% [2.5-5.7]	9	3.2% [1.7-5.7]	13	4.5% [2.6-7.4]	13	2.3% [1.2-4.2]	9	1.6% [0.9-2.8]	0.0%
16	Kigoma	565	22	3.9% [2.4-6.2]	13	4.5% [2.3-8.7]	9	3.2% [1.8-5.8]	20	3.5% [2.1-6.0]	2	0.4% [0.1-1.4]	0.0%

#	Region	N	Global Acute Malnutrition (WHZ <-2 and/or edema)						Moderate Acute Malnutrition (WHZ <-2 and >=-3)		Severe Acute Malnutrition (WHZ <-3 and/or edema)		Edema
			All		Boys		Girls		All		All		All
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	%
17	Shinyanga	373	9	2.4% [1.3-4.4]	6	3.7% [1.7-7.7]	3	1.4% [0.4-4.5]	8	2.1% [1.1-4.1]	1	0.3% [0.0-2.1]	0.3%
18	Kagera	650	20	3.1% [1.9-4.8]	11	3.2% [1.7-6.0]	9	3.0% [1.5-5.6]	18	2.8% [1.6-4.6]	2	0.3% [0.1-1.3]	0.2%
19	Mwanza	679	10	1.5% [0.7-3.1]	5	1.4% [0.6-3.5]	5	1.5% [0.5-4.1]	8	1.2% [0.6-2.5]	2	0.3% [0.1-1.2]	0.0%
20	Mara	389	19	4.9% [2.8-8.3]	14	7.0% [3.8-12.4]	5	2.6% [0.9-7.3]	16	4.1% [2.4-7.0]	3	0.8% [0.2-3.5]	0.0%
21	Manyara	587	21	3.6% [2.2-5.9]	13	4.6% [2.5-8.4]	8	2.6% [1.3-5.0]	17	2.9% [1.7-4.9]	4	0.7% [0.3-1.8]	0.0%
22	Njombe	278	7	2.5% [1.1-5.5]	5	3.5% [1.3-9.2]	2	1.5% [0.3-6.2]	6	2.2% [1.0-4.6]	1	0.4% [0.0-2.7]	0.0%
23	Katavi	478	8	1.7% [0.8-3.6]	1	0.4% [0.1-3.2]	7	3.0% [1.2-7.0]	6	1.3% [0.6-2.8]	2	0.4% [0.1-3.3]	0.0%
24	Simiyu	503	15	3.0% [1.7-5.3]	10	4.4% [2.2-8.7]	5	1.8% [0.7-4.4]	11	2.2% [1.1-4.2]	4	0.8% [0.3-2.1]	0.6%
25	Geita	718	9	1.3% [0.7-2.4]	6	1.7% [0.8-3.6]	3	0.8% [0.2-3.7]	8	1.1% [0.5-2.3]	1	0.1% [0.0-1.1]	0.0%
	Zanzibar	2,654	198	7.2% [6.3-8.2]	103	7.0% [5.4-8.6]	95	7.5% [6.0-9.1]	158	5.7% [4.9-6.6]	40	1.5% [1.0-2.1]	0.0%
26	Unguja North	493	33	6.7% [4.7-9.4]	20	7.9% [5.0-12.2]	13	5.4% [3.5-8.3]	28	5.7% [3.9-8.3]	5	1.0% [0.4-2.4]	0.0%
27	Unguja South	452	34	7.5% [5.1-10.9]	17	7.7% [4.5-12.8]	17	7.4% [4.1-12.9]	32	7.1% [4.9-10.2]	2	0.4% [0.1-1.8]	0.0%
28	Town West	496	31	6.3% [4.7-8.2]	12	4.6% [2.6-8.0]	19	8.0% [5.5-11.6]	26	5.2% [3.7-7.3]	5	1.0% [0.4-2.3]	0.0%
29	Pemba North	547	40	7.3% [5.4-9.8]	19	6.7% [4.0-11.0]	21	8.0% [5.4-11.7]	35	6.4% [4.7-8.7]	5	0.9% [0.4-2.1]	0.0%
30	Pemba South	641	43	6.7% [4.9-9.1]	24	7.6% [5.2-11.1]	19	5.8% [3.7-9.2]	38	5.9% [4.2-8.2]	5	0.8% [0.3-1.8]	0.0%
	National	16,845	724	3.8% [3.5-4.2]	414	4.7% [4.1-5.2]	310	3.0% [2.5-3.4]	547	2.9% [2.6-3.2]	177	0.9% [0.8-1.1]	0.07%

Table 16: Number of children 0-59 months suffering from moderate acute malnutrition or severe acute malnutrition by region, Mainland, Zanzibar and National

Region	Estimated Population (Census 2012)	Estimated Population 2015 ³	Population 0-59 months	Moderate Acute Malnutrition		Severe Acute Malnutrition	
				Prevalence (%)	Number of MAM children*	Prevalence (%)	Number of SAM children**
Mainland					320,227		101,195
Dodoma	2,083,588	2,217,630	359,256	4.7	25,328	0.4	3,736
Arusha	1,694,310	1,835,288	297,317	4.2	18,731	0.4	3,092
Kilimanjaro	1,640,087	1,730,255	280,301	4.0	16,818	0	5,275***
Tanga	2,045,205	2,183,180	353,675	4.6	24,404	0.2	1,839
Morogoro	2,218,492	2,382,088	385,898	3.6	20,838	0.2	2,007
Pwani	1,098,668	1,172,787	189,992	3.1	8,835	0	2,771***
Dar-Es-Salaam	4,364,541	5,139,612	832,617	2.6	32,472	1.1	23,813
Lindi	864,652	888,208	143,890	2.3	4,964	0.6	2,245
Mtwara	1,270,854	1,317,156	213,379	1.9	6,081	0.5	2,774
Ruvuma	1,376,891	1,465,470	237,406	2.4	8,547	0.2	1,235
Iringa	941,238	972,642	157,568	0.5	1,182	0.2	819
Mbeya	2,707,410	2,932,685	475,095	2.0	14,253	0	4,470***
Singida	1,370,637	1,467,403	237,719	4.2	14,976	0.5	3,090
Tabora	2,291,623	2,496,832	404,487	2.0	12,135	0	3,806***
Rukwa	1,004,539	1,104,094	178,863	2.3	6,171	1.6	7,441
Kigoma	217,930	2,284,847	370,145	3.5	19,433	0.4	3,850
Shinyanga	1,534,808	1,633,546	264,634	2.1	8,336	0.3	2,064
Kagera	2,458,023	2,701,625	437,663	2.8	18,382	0.3	3,414
Mara	2,772,509	3,029,595	490,794	1.2	8,834	0.3	3,828
Mwanza	1,743,830	1,877,914	304,222	4.1	18,710	0.8	6,328
Manyara	1,425,131	1,566,368	253,752	2.9	11,038	0.7	4,618
Njombe	702,097	719,082	116,491	2.2	3,844	0.4	1,212
Katavi	564,604	620,559	100,531	1.3	1,960	0.4	1,046
Simiyu	1,584,157	1,671,251	270,743	2.2	8,935	0.8	5,631
Geita	1,739,530	1,878,772	304,361	1.1	5,022	0.1	791
Zanzibar					19,039		5,217
Unguja North	187,455	206,033	32,141	5.7	2,748	1	836
Unguja South	115,588	122,663	19,135	7.1	2,038	0.4	199
Town West	593,678	671,667	104,780	5.2	8,173	1	2,724
Pemba North	211,732	220,097	34,335	6.4	3,296	0.9	803
Pemba South	195,116	201,626	31,454	5.9	2,784	0.8	654
Total					339,266		106,411

* The estimations were made using 1.5 incidence factor for MAM

** The estimations were made using 2.6 incidence factor for SAM (burden)

*** The estimations were made using a ratio SAM/MAM = 0.314 (National ratio of 90,089 (SAM) / 287,226 (MAM)). The estimations of MAM children for Kilimanjaro, Pwani, Mbeya and Tabora have been removed for calculation.

According to survey results, it is expected that there will be approximately 340,000 moderately acute malnourished children and more than 105,000 severely acute malnourished children in Tanzania.

³ Based on the Average Annual Rate 2002-2012 by region from the Census General Report

Prevalence of Underweight

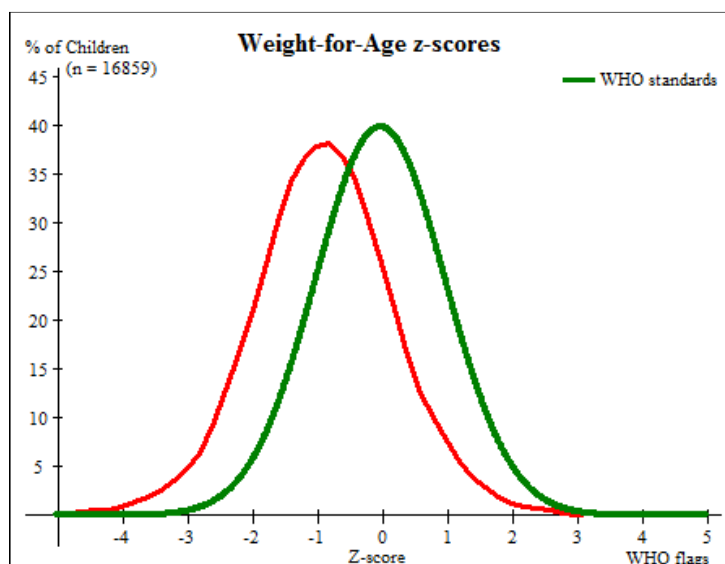


Figure 6: Weight-for-Age z-score (WHO 2006)

The above graph shows that the distribution of Weight-for-Age is shifted to the left but still following the WHO standard natural distribution of reference population when WHO flags are applied with mean z-score -0.89 ± 1.11 SD.

Table 17: Prevalence of Global, Moderate and Severe Underweight (Weigh-for-Age Z-score) in children 0 to 59 months of age by age group and sex in Tanzania (WHO 2006)

Background characteristic	N	Underweight (WAZ <-2)		Moderate Underweight (WAZ <-2 and >=-3)		Severe Underweight (WAZ <-3)	
		n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
Age							
0-5 months	2,037	162	7.3% [5.9-8.8]	108	5.0% [3.8-6.2]	54	2.3% [1.6-3.1]
6-11 months	2,058	242	11.1% [9.5-12.7]	174	7.8% [6.4-9.2]	68	3.3% [2.5-4.2]
12-23 months	3,640	597	15.8% [14.4-17.3]	462	12.2% [10.9-13.6]	135	3.6% [2.9-4.2]
24-35 months	3,536	528	14.0% [12.7-15.3]	415	11.1% [9.9-12.2]	113	3.0% [2.3-3.6]
36-47 months	3,091	487	14.4% [13.0-15.9]	406	12.0% [10.7-13.3]	81	2.4% [1.8-3.0]
48-59 months	2,505	392	14.3% [12.8-15.9]	329	12.3% [10.9-13.8]	63	2.0% [1.4-2.6]
Sex							
Male	8,460	1,300	14.6% [13.6-15.5]	991	11.2% [10.3-12.0]	309	3.4% [3.0-3.8]
Female	8,407	1,108	14.3% [12.8-15.9]	903	10.0% [9.3-10.8]	205	2.2% [1.9-2.6]

Table 18: Prevalence of Global, Moderate and Severe Underweight (Weigh-for-Age Z-score) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

#	Region	N	Underweight (WAZ <-2)						Moderate Underweight (WAZ <-2 and >=-3)		Severe Underweight (WAZ <-3)	
			All		Boys		Girls		All		All	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
	Mainland	14,207	1,985	13.4% [12.7-14.1]	1,079	14.6% [13.6-15.6]	906	12.2% [11.3-13.1]	1,565	10.6% [10.0-11.2]	420	2.8% [2.5-3.1]
1	Dodoma	675	147	21.8% [18.1-26.0]	92	25.8% [18.1-26.0]	55	17.3% [13.1-22.6]	109	16.1% [13.6-19.0]	38	5.6% [3.7-8.6]
2	Arusha	504	77	15.3% [12.3-18.8]	39	15.3% [11.2-20.5]	38	15.3% [11.1-20.6]	63	12.5% [9.8-15.9]	14	2.8% [1.7-4.6]
3	Kilimanjaro	399	30	7.5% [4.9-11.3]	18	8.4% [5.3-13.2]	12	6.5% [13.4-12.0]	23	5.8% [3.7-8.9]	7	1.8% [0.8-3.8]
4	Tanga	590	60	10.2% [7.0-14.5]	31	11.1% [7.0-17.2]	29	9.3% [5.7-15.0]	53	9.0% [6.3-12.6]	7	1.2% [0.5-2.6]
5	Morogoro	520	60	11.5% [9.1-14.5]	34	12.5% [8.8-17.6]	26	10.4% [7.0-15.2]	49	9.4% [7.2-12.3]	11	2.1% [1.2-3.7]
6	Pwani	850	104	12.2% [10.1-14.8]	58	13.3% [10.6-16.6]	46	11.1% [8.0-15.2]	89	10.5% [8.4-13.0]	15	1.8% [1.1-2.8]
7	Dar-Es-Salaam	543	36	6.6% [4.8-9.2]	25	9.2% [6.1-13.7]	11	4.1% [2.2-7.4]	31	5.7% [4.0-8.1]	5	0.9% [0.4-2.2]
8	Lindi	715	79	11.0% [8.9-13.6]	43	12.8% [9.6-17.0]	36	9.5% [7.1-12.5]	62	8.7% [6.7-11.1]	17	2.4% [1.5-3.6]
9	Mtwara	420	39	9.3% [6.6-13.0]	17	7.9% [4.8-12.6]	22	10.8% [6.8-16.7]	34	8.1% [5.6-11.5]	5	1.2% [0.5-2.8]
10	Ruvuma	837	119	14.2% [11.4-17.6]	60	14.3% [10.7-18.8]	59	14.1% [10.7-18.5]	98	11.7% [9.3-14.6]	21	2.5% [1.6-4.0]
11	Iringa	440	68	15.5% [11.7-20.1]	40	19.9% [14.0-27.5]	28	11.7% [8.1-16.6]	54	12.3% [9.4-15.9]	14	3.2% [1.8-5.6]
12	Mbeya	498	62	12.4% [9.2-16.7]	30	12.0% [7.7-18.3]	32	12.0% [7.7-18.3]	54	10.8% [7.9-14.6]	8	1.6% [0.9-3.0]
13	Singida	637	114	17.9% [14.6-21.8]	63	19.6% [15.0-25.1]	51	16.2% [12.5-20.8]	98	15.4% [12.4-18.9]	16	2.5% [1.7-3.7]
14	Tabora	544	55	10.1% [7.6-13.3]	35	12.2% [8.7-16.8]	20	7.8% [4.8-12.4]	49	9.0% [6.7-12.1]	6	1.1% [0.5-2.7]
15	Rukwa	569	99	17.4% [13.6-22.0]	50	17.8% [13.3-23.4]	49	17.0% [12.2-23.3]	79	13.9% [10.7-17.9]	20	3.5% [2.1-5.9]
16	Kigoma	573	108	18.8% [15.6-22.6]	58	19.8% [15.3-25.3]	50	17.9% [13.8-22.7]	83	14.5% [11.4-18.2]	25	4.4% [3.1-6.1]
17	Shinyanga	372	36	9.7% [6.9-13.5]	19	11.4% [7.9-16.4]	17	8.3% [4.8-13.9]	33	8.9% [6.4-12.2]	3	0.8% [0.3-2.5]

#	Region	N	Underweight (WAZ <-2)						Moderate Underweight (WAZ <-2 and >=-3)		Severe Underweight (WAZ <-3)	
			All		Boys		Girls		All		All	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
18	Kagera	653	145	22.2% [18.3-26.6]	79	22.6% [18.4-27.5]	66	21.7% [16.2-28.5]	112	21.7% [16.2-28.5]	33	5.1% [3.3-7.7]
19	Mwanza	675	69	10.2% [8.0-13.0]	37	10.7% [7.1-15.6]	32	9.8% [7.1-13.3]	55	8.1% [6.3-10.4]	14	2.1% [1.3-3.3]
20	Mara	387	51	13.2% [10.0-17.2]	26	13.1% [8.7-19.3]	25	13.3% [8.8-19.6]	47	12.1% [9.0-16.1]	4	1.0% [0.4-2.5]
21	Manyara	588	81	13.8% [10.5-17.9]	40	14.2% [10.2-19.6]	41	13.4% [9.5-18.5]	62	10.5% [7.5-14.6]	19	3.2% [1.9-5.6]
22	Njombe	277	47	17.0% [12.5-22.6]	20	14.0% [8.8-21.5]	27	20.1% [14.6-27.2]	40	14.4% [10.1-20.2]	7	2.5% [1.2-5.4]
23	Katavi	484	61	12.6% [9.5-16.5]	38	15.3% [11.5-20.1]	23	9.7% [5.9-15.8]	54	11.2% [8.4-14.7]	7	1.4% [0.7-3.0]
24	Simiyu	497	54	10.9% [8.3-14.1]	29	12.9% [8.8-18.7]	25	9.2% [6.2-13.4]	49	9.9% [7.3-13.2]	5	1.0% [0.4-2.8]
25	Geita	716	89	12.4% [10.0-15.4]	45	13.2% [10.1-17.0]	44	11.8% [8.3-16.4]	83	11.6% [9.2-14.5]	6	0.8% [0.3-2.0]
	Zanzibar	2,660	423	13.9% [12.5-15.4]	221	13.6% [11.6-15.5]	202	14.3% [12.2-16.3]	329	10.8% [9.6-12.1]	94	3.1% [2.3-3.8]
26	Unguja North	491	82	16.7% [12.6-21.8]	46	18.3% [13.2-24.7]	36	15.1% [10.9-20.5]	68	13.8% [10.2-18.5]	14	2.9% [1.6-5.1]
27	Unguja South	451	68	15.1% [11.5-19.6]	33	15.0% [11.2-19.8]	35	15.2% [10.0-22.3]	60	13.3% [10.1-17.4]	8	1.8% [0.9-3.3]
28	Town West	498	51	10.2% [8.2-12.7]	21	8.0% [5.2-12.0]	30	12.8% [9.7-16.7]	44	8.8% [7.0-11.1]	7	1.4% [0.6-3.2]
29	Pemba North	546	91	16.7% [13.1-21.0]	50	17.5% [12.8-23.6]	41	15.7% [11.6-20.9]	70	12.8% [10.0-16.4]	21	3.8% [2.2-6.7]
30	Pemba South	641	116	18.1% [14.9-21.8]	61	19.6% [15.4-24.5]	55	16.7% [12.5-22.0]	94	14.7% [12.1-17.7]	22	3.4% [2.3-5.2]
	National	16,867	2,408	13.4% [12.7-14.1]	1,300	14.6% [13.6-15.5]	1,108	12.2% [11.3-13.1]	1,894	10.6% [10.0-11.1]	514	2.8% [2.5-3.1]

Prevalence of Overweight

Table 19: Prevalence of Global, Moderate and Severe Overweight (Weigh-for-Height Z-score – no edema) in children 0 to 59 months of age by region, Mainland, Zanzibar and National (WHO 2006)

	Region	N	Overweight (WHZ >2)		Severe Overweight (WHZ >3)	
			N	% [CI 95%]	n	% [CI 95%]
	Mainland	14,191	533	3.6% [3.2-4.0]	107	0.7% [0.6-0.9]
1	Dodoma	683	10	1.5% [0.6-2.4]	2	0.3% [0.0-0.7]
2	Arusha	512	11	2.1% [0.9-3.4]	6	1.2% [0.2-2.1]
3	Kilimanjaro	406	15	3.7% [1.9-5.5]	7	1.7% [0.5-3.0]
4	Tanga	596	19	3.2% [1.8-4.6]	4	0.7% [0.0-1.3]
5	Morogoro	532	15	2.8% [1.4-4.2]	2	0.4% [0.0-0.9]
6	Pwani	862	52	6.0% [4.4-7.6]	16	1.9% [1.0-2.8]
7	Dar-Es-Salaam	541	27	5.0% [3.2-6.8]	5	0.9% [0.1-1.7]
8	Lindi	729	25	3.4% [2.1-4.8]	2	0.3% [0.0-0.7]
9	Mtwara	424	14	3.3% [1.6-5.0]	2	0.5% [0.0-1.1]
10	Ruvuma	845	40	4.7% [3.3-6.2]	8	0.9% [0.3-1.6]
11	Iringa	443	18	4.1% [2.2-5.9]	3	0.7% [0.0-1.4]
12	Mbeya	508	25	4.9% [3.0-6.8]	4	0.8% [0.0-1.6]
13	Singida	641	22	3.4% [2.0-4.8]	4	0.6% [0.0-1.2]
14	Tabora	547	21	3.8% [2.2-5.5]	6	1.1% [0.2-2.0]
15	Rukwa	580	29	5.0% [3.2-6.8]	4	0.7% [0.0-1.4]
16	Kigoma	575	19	3.3% [1.8-4.8]	5	0.9% [0.1-1.6]
17	Shinyanga	379	12	3.2% [1.4-4.9]	3	0.8% [0.0-1.7]
18	Kagera	659	13	2.0% [0.9-3.0]	1	0.2% [0.0-0.4]
19	Mwanza	756	34	4.5% [3.0-6.0]	5	0.7% [0.1-1.2]
20	Mara	389	10	2.6% [1.0-4.1]	0	0.0% [0.0-0.0]
21	Manyara	593	17	2.9% [1.5-4.2]	2	0.3% [0.0-0.8]
22	Njombe	279	10	3.6% [1.4-5.8]	2	0.7% [0.0-1.7]
23	Katavi	490	45	9.2% [6.6-11.7]	11	2.2% [0.9-3.6]
24	Simiyu	502	5	1.0% [0.1-1.9]	0	0.0% [0.0-0.0]
25	Geita	720	25	3.5% [2.1-4.8]	3	0.4% [0.0-0.9]
	Zanzibar	2,654	36	1.8% [1.0-2.7]	3	0.1% [0.0-0.3]
26	Unguja North	499	8	1.6% [0.5-2.7]	1	0.2% [0.0-0.6]
27	Unguja South	453	6	1.3% [0.3-2.4]	1	0.2% [0.0-0.7]
28	Town West	502	14	2.8% [1.3-4.2]	1	0.2% [0.0-0.6]
29	Pemba North	553	6	1.1% [0.2-1.9]	0	0.0% [0.0-0.0]
30	Pemba South	647	2	0.3% [0.0-0.7]	0	0.0% [0.0-0.0]
	National	16,845	569	3.5% [3.2-3.9]	110	0.7% [0.5-0.8]

The critical age for the onset of malnutrition for children is between 6 and 23 months. In the above graph, stunting and underweight prevalence start at 16.0% and 8.4% respectively in the first month of life. Chronic malnutrition increases quickly until it reaches peak at 26 months of age (46.4%). By this age, the majority of the damage of malnutrition in childhood is done and cannot be reversed. Underweight reaches its peak in at 18 months with 18.7%. Prevalence of global acute malnutrition starts above 5% up to the first 18 months of life and steadily coming down as age increases

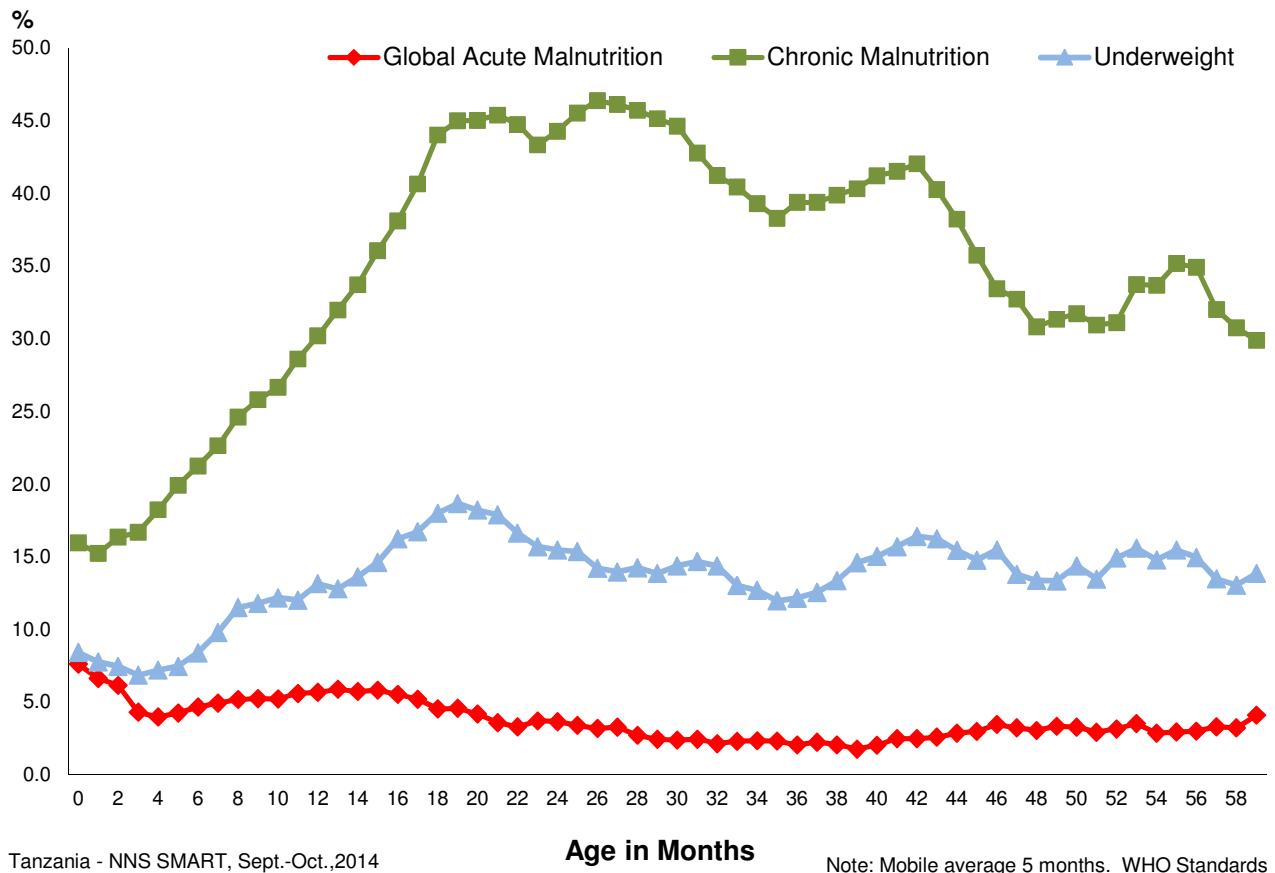


Figure 7: Trends of malnutrition by age in months

5.2 Vitamin A Supplementation (6-59 months)

Provision of vitamin A supplementation every 6 months can help protect a child from death and disease associated with vitamin A deficiency and is recognized as one of the most cost-effective approaches to improve child survival. The last campaign for vitamin A supplementation and deworming held from Saturday 18th of October to Friday 24th of October 2014. The proportion of all children aged 6-59 months who had received vitamin A in the last 6 months was 72.2% (Table 20). About 28.0% of the children did not receive vitamin A supplement, which is alarming. A high coverage of vitamin A supplementation was noted at Arusha, Kagera and Unguja North (>90%) and the lowest at Mwanza, Singida, Manyara and Town West with less than 50%.

Table 20: Vitamin A supplementation coverage by region, Mainland, Zanzibar and National in children 6 to 59 months

	Region	N	VAS			No VAS (%)	Don't know (%)	Total (%)
			By card (%)	By recall (%)	Total VAS (%) [95% CI]			
	Mainland	12,621	30.0%	42.6%	72.6% [71.0-74.1]	23.6%	3.8%	100.0%
1	Dodoma	624	0.3%	86.9%	87.2% [79.3-92.4]	11.4%	1.4%	100.0%
2	Arusha	468	25.2%	66.7%	91.9% [87.3-94.9]	6.8%	1.3%	100.0%
3	Kilimanjaro	363	26.2%	59.2%	85.4% [79.6-89.8]	10.7%	3.9%	100.0%
4	Tanga	519	43.5%	18.3%	61.8% [54.1-69.0]	37.4%	0.8%	100.0%
5	Morogoro	480	11.3%	55.0%	66.3% [57.0-74.4]	29.4%	4.3%	100.0%
6	Pwani	745	18.3%	68.3%	86.6% [82.0-90.1]	12.5%	0.9%	100.0%
7	Dar-Es-Salaam	482	46.1%	27.8%	73.9% [67.6-79.2]	19.7%	6.4%	100.0%
8	Lindi	646	25.1%	52.9%	78.0% [70.1-84.3]	18.4%	3.6%	100.0%
9	Mtwara	375	56.3%	22.4%	78.7% [69.0-85.9]	18.1%	3.2%	100.0%
10	Ruvuma	741	23.8%	52.6%	76.4% [69.0-82.5]	21.6%	2.0%	100.0%
11	Iringa	386	50.8%	26.7%	77.5% [69.0-84.2]	19.2%	3.3%	100.0%
12	Mbeya	456	44.3%	32.9%	77.2% [71.8-81.8]	20.2%	2.6%	100.0%
13	Singida	584	9.8%	38.9%	48.6% [33.7-63.9]	38.7%	12.7%	100.0%
14	Tabora	509	21.4%	39.1%	60.5% [52.5-68.0]	35.4%	4.1%	100.0%
15	Rukwa	498	37.6%	18.7%	56.2% [45.8-66.1]	41.6%	2.2%	100.0%
16	Kigoma	508	20.9%	52.0%	72.8% [64.2-80.0]	23.6%	3.6%	100.0%
17	Shinyanga	339	36.3%	34.8%	71.1% [62.2-78.6]	18.0%	10.9%	100.0%
18	Kagera	598	17.4%	78.3%	95.7% [92.9-97.4]	4.0%	0.3%	100.0%
19	Mwanza	616	45.0%	3.9%	48.9% [38.2-59.6]	48.7%	2.4%	100.0%
20	Mara	347	23.3%	64.8%	88.2% [80.1-93.3]	11.2%	0.6%	100.0%
21	Manyara	522	1.0%	40.8%	41.8% [33.2-50.9]	44.1%	14.1%	100.0%

	Region	N	VAS			No VAS (%)	Don't know (%)	Total (%)
			By card (%)	By recall (%)	Total VAS (%) [95% CI]			
22	Njombe	238	31.1%	42.0%	73.1% [61.7-82.1]	19.3%	7.6%	100.0%
23	Katavi	427	27.9%	23.2%	51.1% [41.7-60.3]	45.9%	3.0%	100.0%
24	Simiyu	444	7.4%	69.4%	76.8% [68.6-83.4]	22.3%	0.9%	100.0%
25	Geita	642	76.9%	0.0%	76.9% [69.9-82.7]	22.7%	0.4%	100.0%
	Zanzibar	2,307	18.4%	39.8%	58.2% [53.3-63.1]	39.5%	2.3%	100.0%
26	Unguja North	422	23.9%	68.0%	91.9% [85.6-95.6]	8.1%	0.0%	100.0%
27	Unguja South	389	31.6%	52.4%	84.1% [65.9-93.5]	14.9%	1.0%	100.0%
28	Town West	436	25.0%	11.9%	36.9% [29.1-45.5]	59.2%	3.9%	100.0%
29	Pemba North	479	3.8%	47.0%	50.7% [38.8-62.6]	46.8%	2.5%	100.0%
30	Pemba South	581	0.7%	82.4%	83.1% [78.3-87.1]	16.4%	0.5%	100.0%
	National	14,928	29.6%	42.6%	72.2% [70.6-73.7]	24.1%	3.7%	100.0%

5.3 Deworming (12-59 months)

Helminthes or intestinal worms represent a serious public health problem in areas where climate is tropical and inadequate sanitation and unhygienic conditions prevail. Helminthes cause significant malabsorption of vitamin A and aggravate malnutrition and anemia, which eventually contributes to retarded growth and poor performance in school. Children under five years old are extremely vulnerable to the deficiencies induced by worm infections, therefore deworming is critical for the reduction of child morbidity and mortality.

Deworming was conducted simultaneously with vitamin A supplementation in October 2014 (18-24). The proportion of all children aged 12-59 months who had received deworming in the last 6 months was 70.6% at national level (Table 21). A high coverage of deworming was noted at Kagera and Unguja North (>90%) and the lowest at Mwanza, Singida and Manyara with less than 50%.

Table 21: Deworming coverage by region, Mainland, Zanzibar and National in children 12 to 59 months

	Region	N	Deworming			No Deworming (%)	Don't know (%)	Total (%)
			By card (%)	By recall (%)	Total Deworming (%) [95% CI]			
	Mainland	10,873	25.4%	45.2%	70.6% [25.0-4.4]	25.0%	4.4%	100.0%
1	Dodoma	534	0%	87.1%	87.1% [79.5-92.1]	11.2%	1.7%	100.0%
2	Arusha	466	20.4%	68.7%	89.2% [83.7-92.9]	9.1%	1.7%	100.0%
3	Kilimanjaro	324	23.1%	62.3%	85.5% [79.1-90.2]	10.2%	4.3%	100.0%
4	Tanga	435	43.4%	16.6%	60.0% [51.4-68.0]	39.1%	0.9%	100.0%
5	Morogoro	417	1.7%	63.5%	65.2% [55.9-73.6]	29.3%	5.5%	100.0%
6	Pwani	615	16.1%	70.6%	86.7% [80.2-91.2]	12.4%	0.9%	100.0%

	Region	N	Deworming			No Deworming (%)	Don't know (%)	Total (%)
			By card (%)	By recall (%)	Total Deworming (%) [95% CI]			
7	Dar-Es-Salaam	402	42.0%	32.8%	74.9% [68.1-80.6]	18.9%	6.2%	100.0%
8	Lindi	576	12.3%	58.0%	70.3% [61.3-78.0]	25.2%	4.5%	100.0%
9	Mtwara	318	47.8%	29.9%	77.7% [67.0-85.7]	18.2%	4.1%	100.0%
10	Ruvuma	629	21.1%	49.1%	70.3% [61.2-78.0]	27.3%	2.4%	100.0%
11	Iringa	334	53.9%	26.6%	80.5% [70.8-87.6]	15.9%	3.6%	100.0%
12	Mbeya	389	44.0%	31.9%	75.9% [69.1-81.5]	21.1%	3.0%	100.0%
13	Singida	499	6.8%	41.7%	48.5% [32.7-64.6]	37.1	14.4%	100.0%
14	Tabora	452	20.8%	39.2%	60.0% [52.3-67.2]	35.4%	4.6%	100.0%
15	Rukwa	412	39.1%	18.0%	57.0% [45.1-68.2]	40.3%	2.7%	100.0%
16	Kigoma	449	14.9%	55.0%	69.9% [61.0-77.6]	26.1%	4.0%	100.0%
17	Shinyanga	297	31.0%	37.4%	68.4% [59.8-75.8]	19.5%	12.1%	100.0%
18	Kagera	536	4.1%	90.3%	94.4% [91.4-96.4]	4.9%	0.7%	100.0%
19	Mwanza	529	33.5%	3.4%	36.9% [26.7-48.4]	59.0%	4.1%	100.0%
20	Mara	295	21.7%	67.8%	89.5% [79.6-94.9]	9.8%	0.7%	100.0%
21	Manyara	456	0.0%	40.8%	40.8% [30.8-51.6]	44.3%	14.9%	100.0%
22	Njombe	206	26.2%	43.2%	69.4% [56.0-80.2]	21.4%	9.2%	100.0%
23	Katavi	368	28.5%	22.0%	50.5% [39.6-61.4]	46.7%	2.8%	100.0%
24	Simiyu	382	5.8%	70.4%	76.2% [68.5-82.5]	22.8%	1.0%	100.0%
25	Geita	556	70.0%	0.0%	70.0% [62.6-76.4]	29.7%	0.3%	100.0%
	Zanzibar	1,982	14.8%	53.6%	68.4% [63.8-73.0]	30.1%	1.5%	100.0%
26	Unguja North	364	23.9%	70.6%	94.5% [88.2-97.5]	5.2%	0.3%	100.0%
27	Unguja South	329	23.1%	59.3%	82.4% [65.7-91.9]	16.4%	1.2%	100.0%
28	Town West	373	20.1%	35.4%	55.5% [46.4-64.2]	42.4%	2.1%	100.0%
29	Pemba North	410	1.2%	57.3%	58.5% [47.1-69.2]	40.0%	1.5%	100.0%
30	Pemba South	506	0.0%	84.6%	84.6% [80.5-88.0]	14.4%	1.0%	100.0%
	National	12,855	25.1%	45.5%	70.6% [69.0-72.2]	25.2%	4.2%	100.0%

5.4 Infant and Young Child Feeding Practices (0-23 months)

Children ever breastfed

98.4% of children 0-23 months reported to have been ever breastfed (Table 22). This is higher than the national rate of 96.9% (TDHS 2010).

Table 22: Ever breastfed by region, Mainland, Zanzibar and National (Children 0-23 months)

	Region	N	Proportion of children born in the past 24 months who were ever breastfed	
			n	% [95% CI]
	Mainland	5,849	5,753	98.4% [98.0-98.7]
1	Dodoma	296	291	98.3% [96.8-99.8]
2	Arusha	187	184	98.4% [96.6-100.0]
3	Kilimanjaro	123	117	95.1% [91.3-98.9]
4	Tanga	267	266	99.6% [98.9-100.0]
5	Morogoro	250	245	98.0% [96.3-99.7]
6	Pwani	420	415	98.8% [97.8-99.8]
7	Dar-Es-Salaam	251	244	97.2% [95.2-99.3]
8	Lindi	293	287	98.0% [96.3-99.6]
9	Mtwara	234	229	97.9% [96.0-99.7]
10	Ruvuma	359	347	96.7% [94.8-98.5]
11	Iringa	196	195	99.5% [98.5-100.0]
12	Mbeya	206	204	99.0% [97.7-100.0]
13	Singida	195	192	98.5% [97.7-100.0]
14	Tabora	176	174	98.9% [97.3-100.0]
15	Rukwa	240	237	98.8% [97.3-100.0]
16	Kigoma	211	209	99.1% [97.7-100.0]
17	Shinyanga	166	162	97.6% [95.3-99.9]
18	Kagera	242	240	99.2% [98.0-100.0]
19	Mara	329	324	98.5% [97.2-99.8]
20	Mwanza	138	138	100%
21	Manyara	217	211	97.2% [95.0-99.4]
22	Njombe*	137	132	96.4% [93.2-99.5]
23	Katavi	187	182	97.3% [95.0-99.6]
24	Simiyu	202	201	99.5% [98.5-100.0]
25	Geita	327	327	100%
	Zanzibar	1,224	1,212	98.9% [98.2-99.6]
26	Unguja North	246	245	99.6% [98.8-100.0]
27	Unguja South	211	209	99.1% [97.7-100.0]
28	Town West	225	222	98.7% [97.2-100.0]
29	Pemba North	260	259	99.6% [98.9-100.0]
30	Pemba South	282	277	98.2% [96.7-99.8]
	National	7,073	6,965	98.4% [98.0-98.7]

Early Initiation of Breastfeeding

Early initiation of breastfeeding has the potential to prevent 22% of newborn deaths. The survey revealed that 50.8% of children 0-23 months initiated breastfeeding within 1 hour (Table 23). This result is very close to the national rate recorded in 2010: 48.7% (TDHS 2010). Early initiation of breastfeeding is higher in Zanzibar with 61.7%.

Table 23: Early Initiation of Breastfeeding by region, Mainland, Zanzibar and National (Children 0-23 months)

	Region	N	Proportion of children born in the past 24 months who were put to the breast within one hour of birth	
			n	% [95% CI]
	Mainland	5,849	2,809	50.5% [48.6-52.4]
1	Dodoma	296	176	59.5% [53.9-65.1]
2	Arusha	187	119	63.6% [56.7-70.6]
3	Kilimanjaro	123	95	77.2% [69.8-84.7]
4	Tanga	267	204	76.4% [71.3-81.5]
5	Morogoro	250	155	62.0% [56.0-68.0]
6	Pwani	420	128	30.5% [26.1-34.9]
7	Dar-Es-Salaam	251	154	61.4% [55.3-67.4]
8	Lindi	293	153	52.2% [46.5-57.9]
9	Mtwara	234	122	52.1% [45.7-58.6]
10	Ruvuma	359	210	58.5% [53.4-63.6]
11	Iringa	196	148	75.5% [69.5-81.5]
12	Mbeya	206	135	65.5% [59.0-72.0]
13	Singida	195	51	26.2% [20.0-32.3]
14	Tabora	176	35	19.9% [14.0-25.8]
15	Rukwa	240	54	22.5% [17.2-27.8]
16	Kigoma	211	140	66.4% [60.0-72.7]
17	Shinyanga	166	39	23.5% [17.0-30.0]
18	Kagera	242	144	59.5% [53.3-65.7]
19	Mara	329	135	41.0% [35.7-46.4]
20	Mwanza	138	42	30.4% [22.7-38.1]
21	Manyara	217	98	45.2% [38.5-51.8]
22	Njombe	137	94	68.6% [60.8-76.4]
23	Katavi	187	38	20.3% [14.5-26.1]
24	Simiyu	202	63	31.2% [24.8-37.6]
25	Geita	327	77	23.5% [18.9-28.2]
	Zanzibar	1,224	756	61.7% [57.7-65.6]
26	Unguja North	246	172	69.9% [64.2-75.7]
27	Unguja South	211	141	66.8% [60.5-73.2]
28	Town West	225	140	62.2% [55.9-68.6]
29	Pemba North	260	136	52.3% [46.2-58.4]
30	Pemba South	282	167	59.2% [53.5-65.0]
	National	7,073	3,565	50.8% [49.0-52.7]

Exclusive breastfeeding under 6 months

WHO recommends mothers to exclusive breastfeed infants for first six months of life to achieve optimal growth, development and good health.

At national level, less than 42% of infants under six months of age were exclusively breastfed (Table 24). The 2010 TDHS shows the proportion of children exclusively breastfed was 49.8%. In Zanzibar, less than 20% of infants under six months of age were exclusively breastfed which is low.

Table 24: Exclusive breastfeeding by region, Mainland, Zanzibar and National (Infants 0-5 months)

	Region	N	Proportion of infants 0-5 months of age who are fed exclusively with breast milk	
			n	% [95% CI]
	Mainland	1,629	663	41.8% [39.1-44.6]
1	Dodoma	74	27	36.5% [25.4-47.5]
2	Arusha	46	15	32.6% [18.9-46.3]
3	Kilimanjaro	43	11	25.6% [12.4-38.8]
4	Tanga	82	10	12.2% [5.1-19.3]
5	Morogoro	62	35	56.5% [44.0-68.9]
6	Pwani	122	40	32.8% [24.4-41.2]
7	Dar-Es-Salaam	64	32	50.0% [37.6-62.4]
8	Lindi	88	34	38.6% [28.4-48.9]
9	Mtwara	80	21	26.3% [16.5-36.0]
10	Ruvuma	103	20	19.4% [11.7-27.1]
11	Iringa	59	37	62.7% [50.3-75.2]
12	Mbeya	55	15	27.3% [15.4-39.2]
13	Singida	51	28	54.9% [41.1-68.7]
14	Tabora	38	17	44.7% [28.7-60.8]
15	Rukwa	81	34	42.0% [31.2-52.8]
16	Kigoma	63	37	58.7% [46.5-71.0]
17	Shinyanga	38	18	47.4% [31.3-63.5]
18	Kagera	61	43	70.5% [58.9-82.0]
19	Mara	79	38	48.1% [37.0-59.2]
20	Mwanza	39	13	33.3% [18.3-48.3]
21	Manyara	69	23	33.3% [22.1-44.5]
22	Njombe	45	20	44.4% [29.8-59.1]
23	Katavi	60	32	53.3% [40.6-66.1]
24	Simiyu	52	24	46.2% [32.5-59.8]
25	Geita	75	39	52.0% [40.6-63.4]
	Zanzibar	384	67	19.7% [14.0-25.4]
26	Unguja North	85	15	17.6% [9.5-25.8]
27	Unguja South	66	18	27.3% [16.4-38.1]
28	Town West	71	18	25.4% [15.2-35.5]
29	Pemba North	84	9	10.7% [4.1-17.4]
30	Pemba South	78	7	9.0% [2.6-15.4]
	National	2,013	730	41.1% [38.4-43.7]

Continued breastfeeding at 1 year

The survey revealed that 90.0% of children 12-15 months were fed breast milk during the day prior to survey (Table 25). This result is very close to the national rate recorded in 2010: 94.0% (TDHS 2010).

Table 25: Continued breastfeeding at 1 year by region, Mainland, Zanzibar and National (Children 12-15 months)

	Region	N	Proportion of children 12-15 months of age who are fed breast milk during the previous day	
			n	% [95% CI]
	Mainland	921	839	90.0% [87.7-92.4]
1	Dodoma	51	48	94.1% [87.6-100.0]
2	Arusha	31	30	96.8% [90.4-100.0]
3	Kilimanjaro	14	14	100.0%
4	Tanga	39	36	92.3% [83.8-100.0]
5	Morogoro	33	33	100.0%
6	Pwani	55	49	89.1% [80.8-97.4]
7	Dar-Es-Salaam	36	29	80.6% [67.4-93.7]
8	Lindi	52	50	96.2% [90.9-100.0]
9	Mtwara	37	34	91.9% [83.0-100.0]
10	Ruvuma	49	46	93.9% [87.1-100.0]
11	Iringa	29	28	96.6% [89.8-100.0]
12	Mbeya	26	26	100.0%
13	Singida	26	21	80.8% [65.3-96.2]
14	Tabora	38	33	86.8% [75.9-97.7]
15	Rukwa	32	30	93.8% [85.2-100.0]
16	Kigoma	37	36	97.3% [92.0-100.0]

	Region	N	Proportion of children 12-15 months of age who are fed breast milk during the previous day	
			n	% [95% CI]
17	Shinyanga	23	17	73.9% [55.5-92.3]
18	Kagera	44	42	95.5% [89.2-100.0]
19	Mara	55	44	80.0% [69.3-90.7]
20	Mwanza	24	18	75.0% [57.3-92.7]
21	Manyara	27	23	85.2% [71.5-98.9]
22	Njombe	28	25	89.3% [77.6-100.0]
23	Katavi	27	27	100.0%
24	Simiyu	40	36	90.0% [80.6-99.4]
25	Geita	68	64	94.1% [88.5-99.8]
	Zanzibar	191	169	90.1% [85.2-95.0]
26	Unguja North	44	43	97.7% [93.3-100.0]
27	Unguja South	30	27	90.0% [79.1-100.0]
28	Town West	34	32	94.1% [86.1-100.0]
29	Pemba North	37	27	73.0% [58.5-87.5]
30	Pemba South	46	40	87.0% [77.1-96.8]
	National	1,112	1,008	90.0% [87.8-92.3]

Continued breastfeeding at 2 year

The survey revealed that less than 50% of children 20-23 months were still breastfed (Table 26). This result is very close to the national rate recorded in 2010: 51.0% (TDHS 2010).

Table 26: Continued breastfeeding at 2 year by region, Mainland, Zanzibar and National (Children 20-23 months)

	Region	N	Proportion of children 20-23 months of age who are fed breast milk during the previous day	
			n	% [95% CI]
	Mainland	757	370	48.0% [43.6-52.3]
1	Dodoma	38	19	50.0% [33.9-66.1]
2	Arusha	25	22	88.0% [75.0-100.0]
3	Kilimanjaro	10	7	70.0% [40.0-100.0]
4	Tanga	26	15	57.7% [38.3-77.1]
5	Morogoro	48	25	52.1% [37.8-66.4]
6	Pwani	49	24	49.0% [34.8-63.1]
7	Dar-Es-Salaam	32	12	37.5% [20.4-54.6]
8	Lindi	45	26	57.8% [43.2-72.4]
9	Mtwara	24	15	62.5% [42.7-82.3]
10	Ruvuma	62	37	59.7% [47.4-72.0]
11	Iringa	34	12	35.3% [19.0-51.6]
12	Mbeya	21	10	47.6% [25.7-69.5]
13	Singida	17	5	29.4% [7.1-51.8]
14	Tabora	18	8	44.4% [20.8-68.1]
15	Rukwa	18	8	44.4% [20.8-68.1]
16	Kigoma	27	14	51.9% [32.6-71.1]
17	Shinyanga	30	9	30.0% [13.3-46.7]
18	Kagera	35	20	57.1% [40.5-73.8]
19	Mara	53	12	22.6% [11.3-34.0]
20	Mwanza	8	5	62.5% [26.6-98.4]
21	Manyara	27	21	77.8% [61.8-93.8]
22	Njombe	14	7	50.0% [22.8-77.2]
23	Katavi	26	18	69.2% [51.1-87.3]
24	Simiyu	18	9	50.0% [26.2-73.8]
25	Geita	52	10	19.2% [8.4-30.1]
	Zanzibar	136	72	58.8% [50.8-66.7]
26	Unguja North	26	14	53.8% [34.3-73.4]
27	Unguja South	17	8	47.1% [22.6-71.5]
28	Town West	21	15	71.4% [51.6-91.3]
29	Pemba North	34	21	61.8% [45.2-78.4]
30	Pemba South	38	14	36.8% [21.3-52.4]
	National	893	442	48.2% [44.0-52.5]

Introduction of complementary food

Complementary foods (solid or semi-solid foods fed to infants in addition to breast milk) are recommended to be started at age 6 months. At national level, the survey shows that 89.5% of children from 6 to 8 months had a timely introduction of complementary food. TDHS 2010 reported that 94.7% of breastfeeding children aged 6-8 months of age had a timely introduction of complementary food.

Table 27: Introduction of complementary food by region, Mainland, Zanzibar and National (Infants 6-8 months)

	Region	N	Proportion of infants 6-8 months of age who received solid, semi-solid or soft foods	
			n	% [95% CI]
	Mainland	859	761	89.7% [87.6-91.7]
1	Dodoma	44	34	77.3% [64.7-89.8]
2	Arusha	21	21	100.0%
3	Kilimanjaro	18	18	100.0%
4	Tanga	46	45	97.8% [93.6-100.0]
5	Morogoro	31	24	77.4% [62.4-92.4]
6	Pwani	70	64	91.4% [84.8-98.0]
7	Dar-Es-Salaam	51	49	96.1% [90.7-100.0]
8	Lindi	38	36	94.7% [87.5-100.0]
9	Mtwara	40	37	92.5% [84.2-100.0]
10	Ruvuma	47	47	100.0%
11	Iringa	22	18	81.8% [65.3-98.3]
12	Mbeya	24	21	87.5% [74.0-100.0]
13	Singida	35	32	91.4% [82.0-100.0]
14	Tabora	22	22	100.0%
15	Rukwa	34	24	70.6% [55.0-86.2]
16	Kigoma	24	22	91.7% [80.4-100.0]
17	Shinyanga	18	16	88.9% [73.9-100.0]
18	Kagera	25	20	80.0% [64.0-96.0]
19	Mara	54	52	96.3% [91.2-100.0]
20	Mwanza	30	26	86.7% [74.3-99.1]
21	Manyara	32	23	71.9% [56.0-87.7]
22	Njombe	26	24	92.3% [81.9-100.0]
23	Katavi	26	20	76.9% [60.4-93.5]
24	Simiyu	36	31	86.1% [74.6-97.6]
25	Geita	45	35	77.8% [65.5-90.1]
	Zanzibar	196	172	85.9% [78.7-93.2]
26	Unguja North	40	37	92.5% [84.2-100.0]
27	Unguja South	39	37	94.9% [87.9-100.0]
28	Town West	37	31	83.8% [71.7-95.8]
29	Pemba North	41	30	73.2% [59.4-86.9]
30	Pemba South	39	37	94.9% [87.9-100.0]
	National	1,055	933	89.5% [87.5-91.5]

Average number of food groups consumed

The amounts of feeds are increased gradually from 6 to 23 months, which is the period of transition to eating the family diet.

Table 28: Average number of food groups consumed by age group and by sex (Children 6-23 months)

Background characteristic	N	Average number of food group consumed	
		Mean	[95% CI]
Age group			
6-8 months	1,055	2.1	[2.0-2.2]
9-11 months	976	2.6	[2.5-2.7]
12-17 months	1,632	2.9	[2.8-3.0]
18-23 months	1,397	3.0	[2.9-3.1]
Sex			
Male	2,528	2.7	[2.6-2.8]
Female	2,495	2.7	[2.6-2.8]

Table 29: Average number of food groups consumed by region, Mainland, Zanzibar and National (Children 6-23 months)

	Region	N	Average number of food group consumed	
			Mean	[95% CI]
	Mainland	4,220	2.7	[2.6-2.8]
1	Dodoma	222	2.3	[2.1-2.4]
2	Arusha	141	3.2	[2.9-3.4]
3	Kilimanjaro	80	4.1	[3.8-4.5]
4	Tanga	185	4.5	[4.3-4.7]
5	Morogoro	188	2.4	[2.2-2.6]
6	Pwani	298	3.3	[3.1-3.5]
7	Dar-Es-Salaam	187	3.5	[3.3-3.7]
8	Lindi	205	2.5	[2.4-2.7]
9	Mtwara	154	2.7	[2.6-2.9]
10	Ruvuma	256	3.0	[2.9-3.2]
11	Iringa	137	2.3	[2.1-2.5]
12	Mbeya	151	2.1	[2.0-2.3]
13	Singida	144	2.2	[2.0-2.4]
14	Tabora	138	2.4	[2.3-2.5]
15	Rukwa	159	2.1	[1.9-2.3]
16	Kigoma	148	2.8	[2.6-3.0]
17	Shinyanga	128	2.6	[2.4-2.8]
18	Kagera	181	2.5	[2.3-2.6]
19	Mara	250	2.4	[2.3-2.6]
20	Mwanza	99	2.2	[1.9-2.4]
21	Manyara	148	2.2	[2.0-2.3]
22	Njombe	92	2.8	[2.6-3.1]
23	Katavi	127	2.0	[1.8-2.1]
24	Simiyu	150	2.1	[1.9-2.3]
25	Geita	252	2.3	[2.2-2.4]
	Zanzibar	840	2.3	[2.1-2.4]
26	Unguja North	161	2.0	[1.9-2.2]
27	Unguja South	145	2.3	[2.1-2.4]
28	Town West	154	2.3	[2.1-2.4]
29	Pemba North	176	2.3	[2.1-2.5]
30	Pemba South	204	2.3	[2.2-2.5]
	National	5,060	2.7	[2.6-2.8]

Minimum Dietary Diversity

Table 30: Minimum Dietary Diversity by age group and by sex (Children 6-23 months)

Background characteristic	N	Proportion of children 6-23 months of age who received foods from ≥ 4 food groups during the previous day	
		n	% [95% CI]
Age group			
6-8 months	1,055	137	15.8% [12.8-18.9]
9-11 months	976	199	22.5% [19.0-25.9]
12-17 months	1,632	390	26.5% [23.8-29.3]
18-23 months	1,397	368	30.0% [26.7-33.3]
Sex			
Male	2,528	542	24.3% [21.9-26.7]
Female	2,495	549	24.9% [22.5-27.2]

The proportion of children aged 6-23 months who received foods from 4 or more food groups was 24.5% at national level (Table 31). The higher proportion were noted at Kilimanjaro and Tanga with respectively 66.3% and 79.5% and the lowest at Iringa, Mbeya, Singida, Tabora, Manyara and Katavi with less than 10%. The proportion in Zanzibar represents less than half of the proportion at national level with 12.1%. In 2010, the minimum dietary diversity was better with 56% at national level and 40% in Zanzibar.

Table 31: Minimum Dietary Diversity by region, Mainland, Zanzibar and National (Children 6-23 months)

	Region	N	Proportion of children 6-23 months of age who foods from ≥ 4 food groups during the previous day	
			n	% [95% CI]
	Mainland	4,220	994	24.8% [23.0-26.7]
1	Dodoma	222	32	14.4% [9.8-19.0]
2	Arusha	141	61	43.3% [35.1-51.5]
3	Kilimanjaro	80	53	66.3% [55.8-76.7]
4	Tanga	185	147	79.5% [73.6-85.3]
5	Morogoro	188	31	16.5% [11.2-21.8]
6	Pwani	298	137	46.0% [40.3-51.6]
7	Dar-Es-Salaam	187	97	51.9% [44.7-59.1]
8	Lindi	205	34	16.6% [11.5-21.7]
9	Mtwara	154	30	19.5% [13.2-25.8]
10	Ruvuma	256	86	33.6% [27.8-39.4]
11	Iringa	137	12	8.8% [4.0-13.5]
12	Mbeya	151	9	6.0% [2.2-9.7]
13	Singida	144	10	6.9% [2.8-11.1]
14	Tabora	138	8	5.8% [1.9-9.7]
15	Rukwa	159	22	13.8% [8.5-19.2]
16	Kigoma	148	37	25.0% [18.0-32.0]
17	Shinyanga	128	30	23.4% [16.1-30.8]
18	Kagera	181	37	20.4% [14.5-26.3]
19	Mara	250	34	13.6% [9.3-17.9]
20	Mwanza	99	14	14.1% [7.2-21.0]
21	Manyara	148	13	8.8% [4.2-13.4]
22	Njombe	92	25	27.2% [18.0-36.3]
23	Katavi	127	1	0.8% [0.0-2.3]
24	Simiyu	150	13	8.7% [4.1-13.2]
25	Geita	252	21	8.3% [4.9-11.8]
	Zanzibar	840	100	12.1% [8.7-15.5]
26	Unguja North	161	9	5.6% [2.0-9.2]
27	Unguja South	145	14	9.7% [4.8-14.5]
28	Town West	154	19	12.3% [7.1-17.5]
29	Pemba North	176	28	15.9% [10.5-21.3]
30	Pemba South	204	30	14.7% [9.8-19.6]
	National	5,060	1,094	24.5% [22.7-26.3]

Minimum Meal Frequency

Table 32: Minimum meal frequency by age group and by sex (Children 6-23 months)

Background characteristic	N	Children 6-23 months	
		n	% [95% CI]
Age group			
6-8 months	1,055	857	82.7% [80.0-85.3]
9-11 months	976	599	63.0% [59.2-66.8]
12-17 months	1,632	1,059	65.9% [62.9-69.0]
18-23 months	1,397	730	54.6% [51.2-58.0]
Sex			
Male	2,528	1,615	65.8% [63.2-68.3]
Female	2,495	1,608	65.7% [63.2-68.1]

The proportion of children aged 6-23 months who received solid, semi-solid or soft foods the minimum number of times or more was 65.7% at national level (Table 33). In 2010, the minimum meal frequency was lower with only 34.1% at national level.

Table 33: Minimum meal frequency by age group and for breastfed/non-breastfed children, by region, Mainland, Zanzibar and National

#	Region	N	Breastfed Children 6-23 months		Non-breastfed children 6-23 months		Children 6-23 months	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
	Mainland	3,450	2,526	73.4% [71.3-75.5]	239	35.1% [31.0-39.2]	2,765	66.0% [64.0-68.0]
1	Dodoma	190	109	57.4% [50.3-64.4]	6	19.4% [5.2-33.5]	115	51.8% [45.2-58.4]
2	Arusha	128	115	89.8% [84.6-95.1]	10	83.3% [61.3-100.0]	125	88.7% [83.4-93.9]
3	Kilimanjaro	75	73	97.3% [93.7-100.0]	4	80.0% [40.7-100.0]	77	96.3% [92.1-100.0]
4	Tanga	164	149	90.9% [86.4-95.3]	11	52.4% [30.5-74.3]	160	86.5% [81.5-91.4]
5	Morogoro	156	78	50% [42.1-57.9]	13	40.6% [23.3-57.9]	91	48.4% [41.2-55.6]
6	Pwani	235	219	93.2% [90.0-96.4]	28	45.9% [33.3-58.5]	247	82.9% [78.6-87.2]
7	Dar-Es-Salaam	143	137	95.8% [92.5-99.1]	27	73.0% [58.4-87.5]	164	87.7% [83.0-92.4]
8	Lindi	180	151	83.9% [78.5-89.3]	3	13.0% [0.0-27.1]	154	75.1% [69.2-81.1]
9	Mtwara	130	115	88.5% [82.9-94.0]	5	20.8% [4.2-37.5]	120	77.9% [71.3-84.5]
10	Ruvuma	216	184	85.2% [80.4-89.9]	8	20.5% [7.7-33.4]	192	75.0% [69.7-80.3]
11	Iringa	103	78	75.7% [67.4-84.1]	5	15.6% [2.8-28.4]	83	60.6% [52.4-68.8]
12	Mbeya	125	86	68.8% [60.6-77.0]	6	24.0% [6.9-41.1]	92	60.9% [53.1-68.7]
13	Singida	118	78	66.1% [57.5-74.7]	5	20.0% [4.0-36.0]	83	57.6% [49.5-65.7]
14	Tabora	106	77	72.6% [64.1-81.2]	3	9.4% [0.0-19.6]	80	58.0% [49.7-66.2]
15	Rukwa	137	70	51.1% [42.7-59.5]	2	10.0% [0.0-23.5]	72	45.3% [37.5-53.0]
16	Kigoma	124	48	38.7% [30.1-47.3]	4	17.4% [1.5-33.3]	52	35.1% [27.4-42.9]
17	Shinyanga	88	56	63.6% [53.5-73.7]	7	20.0% [6.5-33.5]	63	49.2% [40.5-57.9]
18	Kagera	158	60	38.0% [30.4-45.6]	1	4.8% [0.0-14.1]	61	33.7% [26.8-40.6]
19	Mara	176	155	88.1% [83.8-92.9]	38	51.4% [39.9-62.8]	193	77.2% [72.0-82.4]
20	Mwanza	84	75	89.3% [82.6-95.9]	4	26.7% [3.5-49.9]	79	79.8% [71.8-87.7]
21	Manyara	121	84	69.4% [61.2-77.7]	12	52.2% [31.3-73.1]	96	64.9% [57.1-72.6]
22	Njombe	73	62	84.9% [76.7-93.2]	6	31.6% [10.1-53.1]	68	73.9% [64.9-82.9]
23	Katavi	114	44	38.6% [29.6-47.6]	0	0.0%	44	34.6% [26.3-43.0]
24	Simiyu	125	103	82.4% [75.7-89.1]	8	32% [13.3-50.7]	111	74.0% [67.0-81.0]
25	Geita	181	120	66.3% [59.4-73.2]	23	32.4% [21.4-43.4]	143	56.7% [50.6-62.9]
	Zanzibar	697	446	59.4% [53.6-65.3]	34	26.4% [15.6-37.3]	480	54.4% [49.1-59.8]
26	Unguja North	140	99	70.7% [63.1-78.3]	1	5.3% [0.0-15.6]	100	62.1% [54.6-69.6]
27	Unguja South	124	81	65.3% [56.9-73.7]	5	25.0% [5.5-44.5]	86	59.3% [51.3-67.3]
28	Town West	140	71	50.7% [42.4-59.0]	4	30.8% [4.6-56.9]	75	48.7% [40.8-56.6]

#	Region	N	Breastfed Children 6-23 months		Non-breastfed children 6-23 months		Children 6-23 months	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
29	Pemba North	143	99	69.2% [61.6-76.8]	11	34.4% [17.6-51.1]	110	62.5% [55.3-69.7]
30	Pemba South	150	96	64.0% [56.3-71.7]	13	25.5% [13.4-37.6]	109	53.4% [46.6-60.3]
	National	4,147	2,972	73.0% [71.0-75.0]	273	34.9% [30.9-38.9]	3,245	65.7% [63.7-67.6]

Minimum Acceptable Diet

Table 34: Minimum Acceptable Diet by age group and by sex (Children 6-23 months)

Background characteristic	N	Children 6-23 months	
		n	% [95% CI]
Age group			
6-8 months	1,055	135	15.4% [12.4-18.4]
9-11 months	976	174	20.3% [16.9-23.7]
12-17 months	1,632	329	22.3% [19.6-25.0]
18-23 months	1,397	244	20.7% [17.7-23.6]
Sex			
Male	2,528	443	20.4% [18.0-22.7]
Female	2,495	436	19.9% [17.7-22.0]

The survey revealed that 20.0% of children 6-23 months received a minimum acceptable diet (Table 35). This result is very close to the national rate recorded in 2010: 21.0% (TDHS 2010).

Table 35: Minimum Acceptable Diet (MAD) by age group and for breastfed/non-breastfed children, by region, Mainland, Zanzibar and National

#	Region	N	Breastfed Children 6-23 months		Non-breastfed children 6-23 months		Children 6-23 months	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
	Mainland	4,220	724	21.8% [19.8-23.8]	92	12.9% [9.8-16.0]	816	20.4% [18.6-22.1]
1	Dodoma	222	17	8.9% [4.9-13.0]	3	9.4% [0.0-19.6]	20	9.0% [5.2-12.8]
2	Arusha	141	52	40.3% [31.8-48.8]	9	69.2% [43.1-95.4]	61	43.3% [35.1-51.5]
3	Kilimanjaro	80	48	64.0% [53.1-74.9]	3	60.0% [11.9-100.0]	51	63.8% [53.1-74.4]
4	Tanga	185	121	73.8% [67.0-80.5]	10	47.6% [25.7-69.5]	131	70.8% [64.2-77.4]
5	Morogoro	188	19	12.2% [7.0-17.3]	3	9.4% [0.0-19.6]	22	11.7% [7.1-16.3]
6	Pwani	298	102	43.0% [36.7-49.4]	20	31.7% [20.1-43.3]	122	40.9% [35.3-46.5]
7	Dar-Es-Salaam	187	68	45.3% [37.3-53.3]	16	36.4% [22.0-50.8]	84	44.9% [37.8-52.1]
8	Lindi	205	25	13.7% [8.7-18.8]	0	0.0%	25	12.2% [7.7-16.7]
9	Mtwara	154	24	18.5% [11.8-25.2]	3	12.5% [0.0-26.0]	27	17.5% [11.5-23.6]
10	Ruvuma	256	66	30.4% [24.3-36.6]	6	15.0% [3.8-26.2]	72	28.1% [22.6-33.6]

#	Region	N	Breastfed Children 6-23 months		Non-breastfed children 6-23 months		Children 6-23 months	
			n	% [CI 95%]	n	% [CI 95%]	n	% [CI 95%]
11	Iringa	137	10	9.5% [3.9-15.2]	0	0.0%	10	7.3% [2.9-11.7]
12	Mbeya	151	8	6.3% [2.1-10.6]	0	0.0%	8	5.3% [1.7-8.9]
13	Singida	144	4	3.4% [0.1-6.6]	2	7.7% [0.0-18.2]	6	4.2% [0.9-7.4]
14	Tabora	138	5	4.7% [0.7-8.8]	0	0.0%	5	3.6% [0.5-6.8]
15	Rukwa	159	15	10.8% [5.6-16.0]	1	4.5% [0.0-13.5]	16	10.1% [5.4-14.8]
16	Kigoma	148	22	17.6% [10.9-24.3]	2	8.3% [0.0-19.6]	24	16.2% [10.3-22.2]
17	Shinyanga	128	13	14.0% [6.9-21.1]	1	2.5% [0.0-7.4]	14	10.9% [5.5-16.4]
18	Kagera	181	19	11.9% [6.8-16.9]	0	0.0%	19	10.5% [6.0-15.0]
19	Mara	250	27	15.3% [10.0-20.7]	3	4.1% [0.0-8.6]	30	12.0% [8.0-16.0]
20	Mwanza	99	9	10.7% [4.1-17.4]	2	13.3% [0.0-31.2]	11	11.1% [4.9-17.3]
21	Manyara	148	8	6.4% [2.1-10.7]	0	0.0%	8	5.4% [1.7-9.1]
22	Njombe	92	20	27.4% [17.1-37.7]	2	10.5% [0.0-24.7]	22	23.9% [15.1-32.7]
23	Katavi	127	1	0.9% [0.0-2.6]	0	0.0%	1	0.8% [0.0-2.3]
24	Simiyu	150	8	6.4% [2.1-10.7]	2	8.0% [0.0-18.9]	10	6.7% [2.7-10.7]
25	Geita	252	13	7.2% [3.4-11.0]	4	5.6% [0.2-11.0]	17	6.7% [3.6-9.8]
	Zanzibar	840	57	8.8% [5.8-11.9]	9	5.2% [1.1-9.3]	66	8.4% [5.6-11.2]
26	Unguja North	161	6	4.2% [0.9-7.5]	0	0.0%	6	3.7% [0.8-6.7]
27	Unguja South	145	8	6.4% [2.1-10.7]	0	0.0%	8	5.5% [1.8-9.2]
28	Town West	154	14	9.9% [5.0-14.9]	0	0.0%	14	9.1% [4.5-13.6]
29	Pemba North	176	19	13.2% [7.6-18.7]	4	12.1% [0.8-23.4]	23	13.1% [8.1-18.1]
30	Pemba South	204	10	6.5% [2.6-10.5]	5	9.3% [1.4-17.1]	15	7.4% [3.8-10.9]
	National	5,060	781	21.4% [19.5-23.4]	101	12.8% [9.7-15.8]	882	20.0% [18.3-21.7]

5.5 Women Nutritional Status (15-49 years)

Description of sample and Review of data quality

Table 36: Description of the data (age, weight and height) collected from women aged 15 to 49 years by region, Mainland, Zanzibar and National

	Region	N	Age			Weight		Height	
			Missing Data		Median Age	Missing Data		Missing Data	
			N	%	Years	n	%	n	%
	Mainland	15,136	277	1.8%	28.7	75	0.5%	101	0.7%
1	Dodoma	628	17	2.7%	28.9	2	0.3%	2	0.3%
2	Arusha	621	14	2.3%	29.1	1	0.2%	2	0.3%
3	Kilimanjaro	488	9	1.8%	30.3	1	0.2%	1	0.2%
4	Tanga	616	3	0.5%	29.2	0	0.0%	1	0.2%
5	Morogoro	571	19	3.3%	28.0	10	1.8%	10	1.8%
6	Pwani	908	18	2.0%	28.8	2	0.2%	6	0.7%
7	Dar-Es-Salaam	1,007	14	1.4%	27.9	25	2.5%	25	2.5%
8	Lindi	823	16	1.9%	30.4	0	0.0%	4	0.5%
9	Mtwara	522	14	2.7%	29.2	1	0.2%	1	0.2%
10	Ruvuma	955	4	0.4%	29.2	0	0.0%	4	0.4%
11	Iringa	431	9	2.1%	28.5	1	0.2%	1	0.2%
12	Mbeya	500	23	4.6%	29.3	4	0.8%	10	2.0%
13	Singida	552	9	1.6%	29.3	10	1.8%	4	0.7%
14	Tabora	553	1	0.2%	28.0	0	0.0%	0	0.0%
15	Rukwa	569	23	4.0%	28.0	0	0.0%	1	0.2%
16	Kigoma	495	26	5.3%	28.3	14	2.8%	14	2.8%
17	Shinyanga	448	10	2.2%	27.9	1	0.2%	2	0.4%
18	Kagera	523	3	0.6%	29.0	1	0.2%	1	0.2%
19	Mwanza	774	4	0.5%	27.7	0	0.0%	0	0.0%
20	Mara	447	5	1.1%	28.6	0	0.0%	0	0.0%
21	Manyara	600	11	1.8%	29.0	0	0.0%	4	0.7%
22	Njombe	387	2	0.5%	29.3	1	0.3%	1	0.3%
23	Katavi	556	5	0.9%	28.3	0	0.0%	2	0.4%
24	Simiyu	479	13	2.7%	27.4	1	0.2%	2	0.4%
25	Geita	683	5	0.7%	27.1	0	0.0%	3	0.4%
	Zanzibar	3,263	70	2.1%	28.6	37	1.1%	43	1.3%
26	Unguja North	660	8	1.2%	28.5	6	0.9%	7	1.1%
27	Unguja South	610	4	0.7%	28.8	9	1.5%	12	2.0%
28	Town West	785	7	0.9%	28.6	7	0.9%	8	1.0%
29	Pemba North	578	23	4.0%	28.7	6	1.0%	7	1.2%
30	Pemba South	630	28	4.4%	28.7	9	1.4%	9	1.4%
	National	18,399	347	1.9%	28.7	112	0.6%	144	0.8%

The figure below shows the distribution of age in years of the sample of women 15 to 49 years. It appears on this figure that all age groups were represented in the sample. The average age of the surveyed women was 28.7 years. This age distribution shows peaks at certain age heaping level namely: 20, 30, 35 and 40 years who are numbers easily evoked by women to estimate their age.

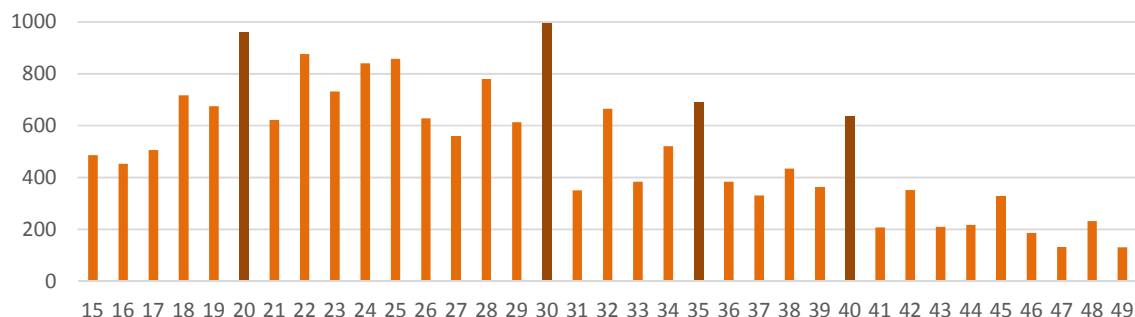


Figure 8: Distribution of age in years

The table below shows the distribution of the sample of women aged 15 to 49 years according to the status of pregnancy and the status on breastfeeding. Among all women surveyed, 1,460 were pregnant or 7.9% of the sample. The analysis of these results revealed that the proportion of pregnant women by region varied from 4.5% in Kilimanjaro to 14.3% in Tabora. Lactating women were 6,050 i.e. 32.9% of the sample. Pregnant and lactating women were 73 or 0.4% of the sample.

Table 37: Distribution of the sample of women aged 15 to 49 years by region, Mainland, Zanzibar and National

	Region	N	Non pregnant and non-lactating women		Pregnant women		Lactating women		Pregnant and Lactating women		Missing data / Don't know	
			n	%	n	%	n	%	n	%	n	%
	Mainland	15,136	8,675	57.3	1,185	7.8	5,025	33.2	59	0.4	192	1.3
1	Dodoma	628	275	43.8	59	9.4	285	45.4	0	0.0	9	1.4
2	Arusha	621	403	64.9	32	5.2	171	27.5	6	1.0	9	1.4
3	Kilimanjaro	488	343	70.3	22	4.5	121	24.8	1	0.2	1	0.2
4	Tanga	616	340	55.2	48	7.8	219	35.6	7	1.1	2	0.3
5	Morogoro	571	320	56.0	43	7.5	203	35.6	1	0.2	4	0.7
6	Pwani	908	512	56.4	48	5.3	341	37.6	2	0.2	5	0.6
7	Dar-es-Salaam	1,007	722	71.7	48	4.8	199	19.8	5	0.5	33	3.3
8	Lindi	823	526	63.9	41	5.0	253	30.7	0	0.0	3	0.4
9	Mtwara	522	338	64.8	28	5.4	152	29.1	3	0.6	1	0.2
10	Ruvuma	955	559	58.5	60	6.3	321	33.6	7	0.7	8	0.8
11	Iringa	431	241	55.9	32	7.4	154	35.7	0	0.0	4	0.9
12	Mbeya	500	284	56.8	34	6.8	172	34.4	1	0.2	9	1.8
13	Singida	552	273	49.5	62	11.2	200	36.2	1	0.2	16	2.9
14	Tabora	553	328	59.3	79	14.3	145	26.2	1	0.2	0	0.0
15	Rukwa	569	273	48.0	55	9.7	229	40.2	3	0.5	9	1.6
16	Kigoma	495	229	46.3	61	12.3	186	37.6	7	1.4	12	2.4
17	Shinyanga	448	267	59.6	49	10.9	125	27.9	2	0.4	5	1.1
18	Kagera	523	256	48.9	28	5.4	232	44.4	2	0.4	5	1.0
19	Mwanza	774	447	57.8	62	8.0	243	31.4	3	0.4	19	2.5
20	Mara	447	271	60.6	38	8.5	137	30.6	0	0.0	1	0.2
21	Manyara	600	337	56.2	54	9.0	196	32.7	3	0.5	10	1.7
22	Njombe	387	238	61.5	28	7.2	113	29.2	2	0.5	6	1.6
23	Katavi	556	309	55.6	45	8.1	199	35.8	0	0.0	3	0.5
24	Simiyu	479	243	50.7	55	11.5	170	35.5	0	0.0	11	2.3
25	Geita	683	341	49.9	74	10.8	259	37.9	2	0.3	7	1.0
	Zanzibar	3,263	1,915	58.7	275	8.4	1,025	31.4	14	0.4	34	1.0
26	Unguja North	660	376	57.0	48	7.3	230	34.8	0	0.0	6	0.9
27	Unguja South	610	366	60.0	47	7.7	185	30.3	1	0.2	11	1.8
28	Town West	785	526	67.0	50	6.4	198	25.2	6	0.8	5	0.6
29	Pemba North	578	308	53.3	61	10.6	196	33.9	4	0.7	9	1.6
30	Pemba South	630	339	53.8	69	11.0	216	34.3	3	0.5	3	0.5
	National	18,399	10,590	57.6	1,460	7.9	6,050	32.9	73	0.4	226	1.2

The figure below shows the distribution of pregnant women according to age groups. It appears on this curve as the highest proportion of pregnant women (11.1%) was in the 20-24 years age group while the lowest proportion of pregnant women (1.5%) was in the 45-49 years age group.

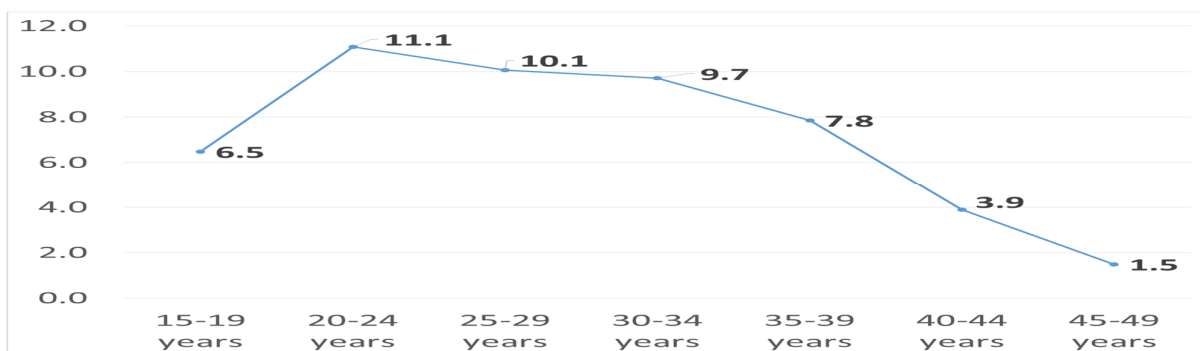


Figure 9: Percent of pregnant women by age groups

Nutritional status of non-pregnant women 15 to 49 years (Body Mass Index - BMI)

Eligible women with missing weigh and/or height, age and/or pregnancy status were excluded from the analysis. Women who were pregnant also were excluded from the analysis.

Table 38: Nutritional status of non-pregnant women 15 to 49 years according to BMI classification by region, Mainland, Zanzibar and National

Region	N	Severe thinness BMI <16.0		Thinness BMI <18.5		Normal range 18.5<BMI<25.0		Overweight ≥ 25.0		Obese ≥ 30.0		Mean BMI
		n	%	n	%	n	%	n	%	n	%	
Mainland	13,706	49	0.4%	734	5.4%	8,940	64.8%	2,729	19.9%	1,257	9.5%	23.7
Dodoma	561	2	0.4%	46	8.2%	369	65.8%	97	17.3%	46	8.4%	23.2
Arusha	575	1	0.2%	44	7.7%	304	52.9%	142	24.7%	83	14.6%	24.5
Kilimanjaro	464	1	0.2%	13	2.8%	246	53.0%	101	21.8%	101	22.2%	25.6
Tanga	559	3	0.5%	25	4.5%	365	65.3%	115	20.6%	50	9.1%	23.8
Morogoro	523	3	0.6%	28	5.4%	308	58.9%	121	23.1%	53	12.0%	24.2
Pwani	853	2	0.2%	56	6.6%	482	56.5%	184	21.6%	124	15.1%	24.5
Dar-Es-Salaam	922	7	0.8%	33	3.6%	434	47.1%	255	27.7%	178	20.9%	25.7
Lindi	779	1	0.1%	32	4.1%	515	66.1%	170	21.8%	57	7.8%	23.7
Mtwara	490	2	0.4%	22	4.5%	337	68.8%	94	19.2%	34	7.1%	23.3
Ruvuma	880	2	0.2%	42	4.8%	642	73.0%	149	16.9%	41	5.1%	23.1
Iringa	395	2	0.5%	13	3.3%	240	60.8%	105	26.6%	33	8.9%	24.1
Mbeya	456	0	0.0%	11	2.4%	286	62.7%	110	24.1%	42	10.7%	24.5
Singida	474	2	0.4%	40	8.4%	306	64.6%	99	20.9%	24	5.7%	23.0
Tabora	473	1	0.2%	35	7.4%	328	69.3%	81	17.1%	28	5.9%	23.0
Rukwa	504	1	0.2%	16	3.2%	377	74.8%	84	16.7%	25	5.2%	23.2
Kigoma	415	1	0.2%	31	7.5%	298	71.8%	59	14.2%	17	6.3%	22.5
Shinyanga	391	2	0.5%	21	5.3%	270	68.7%	77	19.6%	21	5.9%	23.1
Kagera	489	2	0.4%	41	8.4%	389	79.6%	48	9.8%	7	1.8%	21.8
Mara	690	2	0.3%	27	3.9%	463	67.1%	148	21.4%	50	7.2%	23.6
Mwanza	407	3	0.7%	31	7.6%	310	76.0%	48	11.8%	16	3.9%	22.2
Manyara	533	1	0.2%	47	8.8%	321	60.2%	108	20.3%	52	10.5%	23.6
Njombe	351	1	0.3%	11	3.1%	251	71.5%	70	19.9%	18	5.1%	23.5
Katavi	509	2	0.4%	21	4.1%	354	69.5%	98	19.3%	32	6.7%	23.4
Simiyu	413	2	0.5%	19	4.6%	305	73.8%	66	16.0%	21	5.1%	22.9
Geita	600	3	0.5%	29	4.8%	440	73.3%	100	16.7%	25	4.7%	22.8
Zanzibar	2,943	25	0.8%	257	9.2%	1,529	50.3%	678	23.1%	454	16.6%	24.6
Unguja North	606	5	0.8%	36	5.9%	317	52.3%	169	27.9%	79	13.0%	24.3
Unguja South	553	5	0.9%	41	7.4%	279	50.5%	126	22.8%	102	18.4%	24.8
Town West	725	5	0.7%	73	10.1%	326	45.0%	171	23.6%	150	20.7%	25.2
Pemba North	504	3	0.6%	53	10.5%	299	59.3%	95	18.8%	54	10.7%	23.5
Pemba South	555	7	1.3%	54	9.7%	308	55.5%	117	21.1%	69	12.4%	23.6
National	16,652	74	0.4%	991	5.5%	10,469	64.4%	3,407	20.0%	1,711	9.7%	23.7

Table 39: Nutritional status of non-pregnant women 15 to 49 years according to BMI classification by age group

Region	N	Severe thinness BMI <16.0		Thinness BMI <18.5		Normal range 18.5<BMI<25.0		Overweight ≥ 25.0		Obese ≥ 30.0		Mean BMI
		n	%	n	%	n	%	n	%	n	%	
Age group												
15-19 years	2,632	26	0.9%	291	10.2%	1,980	76.5%	273	10.8%	62	1.5%	21.7
20-24 years	3,531	12	0.3%	210	5.0%	2,515	73.1%	603	16.2%	191	5.4%	22.9
25-29 years	3,060	12	0.3%	156	4.7%	1,903	62.4%	700	23.3%	289	9.3%	23.9
30-34 years	2,599	6	0.2%	107	4.3%	1,522	60.1%	613	21.8%	351	13.5%	24.3
35-39 years	2,007	7	0.3%	85	3.6%	1,036	54.1%	530	26.2%	349	15.7%	25.0
40-44 years	1,541	5	0.3%	70	4.4%	849	57.8%	365	22.5%	252	15.0%	24.7
45-49 years	986	5	0.6%	57	7.0%	491	50.2%	248	24.6%	185	17.6%	25.0

Iron-Folic Acid Supplementation

Table 40: Percentage of women 15-49 years of age with children under five years of age who took an IFA supplementation during pregnancy for past birth, disaggregated by number of days, by region, Mainland, Zanzibar and National

Region	No IFA Supplementation		Missing Data/Don't know		Valid N	Number of days iron tablets or syrup taken during pregnancy for past birth							
						<60 days		60 – 89 days		90+ days		Missing data / Don't know	
	n	%	n	%		n	%	n	%	n	%	n	%
Mainland	4,357	30.6	3,061	21.8	7,189	3,013	41.2	970	13.6	1,217	17.4	1,989	27.8
Dodoma	76	13.1	94	16.2	411	233	56.7	63	15.3	64	15.6	51	12.4
Arusha	191	32.9	150	25.8	240	122	50.8	21	8.8	47	19.6	50	20.8
Kilimanjaro	231	49.3	20	4.3	218	99	45.4	32	14.7	67	30.7	20	9.2
Tanga	248	42.5	7	1.2	329	87	26.4	63	19.1	90	27.4	89	27.1
Morogoro	126	22.6	144	25.8	288	168	58.3	21	7.3	31	10.8	68	23.6
Pwani	275	31.3	85	9.7	518	228	44.0	66	12.7	73	14.1	151	29.2
Dar-Es-Salaam	152	15.4	507	51.4	328	134	40.9	46	14.0	67	20.4	81	24.7
Lindi	93	11.5	165	20.4	550	195	35.5	63	11.5	62	11.3	230	41.8
Mtwara	98	19.0	70	13.5	349	127	36.4	43	12.3	27	7.7	152	43.6
Ruvuma	209	22.4	140	15.0	582	293	50.3	60	10.3	162	27.8	67	11.5
Iringa	83	19.3	69	16.1	277	106	38.3	72	26.0	58	20.9	41	14.8
Mbeya	167	33.8	95	19.2	232	30	12.9	27	11.6	27	11.6	148	63.8
Singida	96	17.7	195	36.0	250	0	0.0	0	0.0	0	0.0	250	100.0
Tabora	326	61.2	7	1.3	200	126	63.0	18	9.0	10	5.0	46	23.0
Rukwa	153	27.4	167	29.9	239	99	41.4	45	18.8	34	14.2	61	25.5
Kigoma	99	20.5	139	28.8	245	74	30.2	39	15.9	83	33.9	49	20.0
Shinyanga	126	29.6	137	32.2	162	88	54.3	16	9.9	18	11.1	40	24.7
Kagera	112	22.0	124	24.4	273	80	29.3	44	16.1	105	38.5	44	16.1
Mara	193	46.7	74	17.9	146	203	60.4	79	23.5	33	9.8	21	6.3
Mwanza	256	35.2	136	18.7	336	3	2.1	4	2.7	2	1.4	137	93.8
Manyara	240	41.7	118	20.5	218	79	36.2	33	15.1	42	19.3	64	29.4
Njombe	136	37.2	39	10.7	191	74	38.7	26	13.6	63	33.0	28	14.7
Katavi	175	33.0	196	36.9	160	66	41.3	27	16.9	13	8.1	54	33.8
Simiyu	209	44.2	98	20.7	166	109	65.7	18	10.8	18	10.8	21	12.7
Geita	287	44.0	85	13.0	281	190	67.6	44	15.7	21	7.5	26	9.3
Zanzibar	885	37.3	851	23.3	1,252	461	40.3	309	23.1	289	20.6	193	16.0
Unguja North	146	23.5	194	31.2	282	85	30.1	48	17.0	87	30.9	62	22.0
Unguja South	124	21.9	196	34.6	247	87	35.2	32	13.0	77	31.2	51	20.6
Town West	409	56.1	98	13.4	222	116	52.3	22	9.9	34	15.3	50	22.5
Pemba North	113	21.6	191	36.5	219	77	35.2	99	45.2	34	15.5	9	4.1
Pemba South	93	17.0	172	31.4	282	96	34.0	108	38.3	57	20.2	21	7.4
National	5,242	30.9	3,912	21.9	8,441	3,474	41.2	1,279	13.8	1,506	17.5	2,182	27.5

5.6 Use of Iodized Salt

Salt was analyzed to determine if it was iodized. The test took place in 19 092 households, using Rapid Test Kit to detect the presence of potassium iodate. Between 0.6% and 12.6% of the households surveyed had no salt the day of the survey.

Table 41: Consumption of iodized salt in households by region, Mainland, Zanzibar and National

	Region	N	Iodized salt PPM ≠ 0		Non iodized salt PPM = 0		No salt in the household	
			n	%	n	%	n	%
	Mainland	15,809	9,014	62.1% [60.3-63.8]	6,265	34.6% [32.8-36.3]	530	3.3% [3.0-3.7]
1	Dodoma	644	445	69.1%	159	24.7%	40	6.2%
2	Arusha	738	697	94.4%	10	1.4%	31	4.2%
3	Kilimanjaro	668	619	92.7%	33	4.9%	16	2.4%
4	Tanga	620	521	84.0%	95	15.3%	4	0.6%
5	Morogoro	615	440	71.5%	149	24.2%	26	4.2%
6	Pwani	864	769	89.0%	80	9.3%	15	1.7%
7	Dar-Es-Salaam	957	882	92.2%	29	3.0%	46	4.8%
8	Lindi	919	54	5.9%	845	91.9%	20	2.2%
9	Mtwara	644	81	12.6%	529	82.1%	34	5.3%
10	Ruvuma	997	249	25.0%	740	74.2%	8	0.8%
11	Iringa	459	398	86.7%	46	10.0%	15	3.3%
12	Mbeya	522	482	92.3%	29	5.6%	11	2.1%
13	Singida	635	203	32.0%	409	64.4%	23	3.6%
14	Tabora	635	124	19.5%	502	79.1%	9	1.4%
15	Rukwa	608	129	21.2%	445	73.2%	34	5.6%
16	Kigoma	528	467	88.4%	44	8.3%	17	3.2%
17	Shinyanga	436	130	29.8%	301	69.0%	5	1.1%
18	Kagera	554	275	49.6%	265	47.8%	14	2.5%
19	Mara	570	286	50.2%	264	46.3%	20	3.5%
20	Mwanza	441	417	94.6%	1	0.2%	23	5.2%
21	Manyara	682	395	57.9%	239	35.0%	48	7.0%
22	Njombe	451	302	67.0%	141	31.3%	8	1.8%
23	Katavi	600	367	61.2%	191	31.8%	42	7.0%
24	Simiyu	431	148	34.3%	271	62.9%	12	2.8%
25	Geita	591	134	22.7%	448	75.8%	9	1.5%
	Zanzibar	3,283	2,335	71.5% [67.3-75.6]	681	21.5% [17.6-25.4]	267	7.0% [5.9-8.2]
26	Unguja North	683	500	73.2%	123	18.0%	60	8.8%
27	Unguja South	631	495	78.4%	99	15.7%	37	5.9%
28	Town West	634	484	76.3%	136	21.5%	14	2.2%
29	Pemba North	642	378	58.9%	183	28.5%	81	12.6%
30	Pemba South	693	478	69.0%	140	20.2%	75	10.8%
	National	19,092	11,349	62.2% [60.4-64.0]	6,946	34.4% [32.6-36.1]	797	3.4% [3.1-3.8]

5.7 Handwashing Practices

Table 42: Percentage of household that have soap and who report having used soap for handwashing at least at two critical times during past 24 hours (including “after defecating”), by region, Mainland, Zanzibar and National

	Region	N	Percentage of household that have soap		Percentage of household who report having used soap for handwashing at least at two critical times during past 24 hours	
			n	%	n	%
	Mainland	15,771	14,297	91.1% [90.4-91.8]	1,675	11.5% [10.2-12.7]
1	Dodoma	643	502	78.1%	100	22.4%
2	Arusha	738	691	93.6%	43	6.3%
3	Kilimanjaro	662	646	97.6%	71	11.2%
4	Tanga	620	619	99.8%	330	53.9%
5	Morogoro	615	540	87.8%	107	20.0%
6	Pwani	863	817	94.7%	466	58.9%
7	Dar-Es-Salaam	952	920	96.6%	222	24.5%
8	Lindi	917	741	80.8%	45	6.7%
9	Mtwara	643	532	82.7%	16	3.1%
10	Ruvuma	996	964	96.8%	44	4.6%
11	Iringa	459	431	93.9%	1	0.2%
12	Mbeya	517	483	93.4%	2	0.4%
13	Singida	629	541	86.0%	3	0.6%
14	Tabora	635	569	89.6%	0	0.0%
15	Rukwa	608	482	79.3%	24	5.3%
16	Kigoma	525	447	85.1%	17	4.3%
17	Shinyanga	436	405	92.9%	0	0.0%
18	Kagera	554	506	91.3%	35	7.2%
19	Mara	570	558	97.9%	15	2.7%
20	Mwanza	440	398	90.5%	31	8.1%
21	Manyara	681	557	81.8%	2	0.4%
22	Njombe	451	439	97.3%	71	16.4%
23	Katavi	599	542	90.5%	18	3.5%
24	Simiyu	427	378	88.5%	8	2.2%
25	Geita	591	589	99.7%	4	0.7%
	Zanzibar	3,269	2,928	91.0% [89.2-92.8]	288	13.2% [10.4-16.0]
26	Unguja North	674	589	87.4%	1	0.2%
27	Unguja South	627	535	85.3%	2	0.4%
28	Town West	634	597	94.2%	114	19.9%
29	Pemba North	642	594	92.5%	40	7.0%
30	Pemba South	692	613	88.6%	131	21.6%
	National	19,040	17,225	91.4% [90.7-92.1]	1,963	11.7% [10.5-13.0]

5. Discussion

Children Nutritional Status

Chronic malnutrition

For Mainland, based on the WHO classification, the survey results show a level of chronic malnutrition considered "very high", exceeding the 40% threshold in 9 regions (Iringa, Njombe, Kagera, Dodoma, Ruvuma, Rukwa, Kigoma, Katavi and Geita) among which 3 regions are above 50%: Iringa (51.3%), Njombe (51.9%) and Kagera (51.9%) (Figure 10 and 11).

**Comparison of Chronic Malnutrition in Tanzania - Mainland
(Regions 1-12) - TDHS 2010 versus NNS SMART 2014**

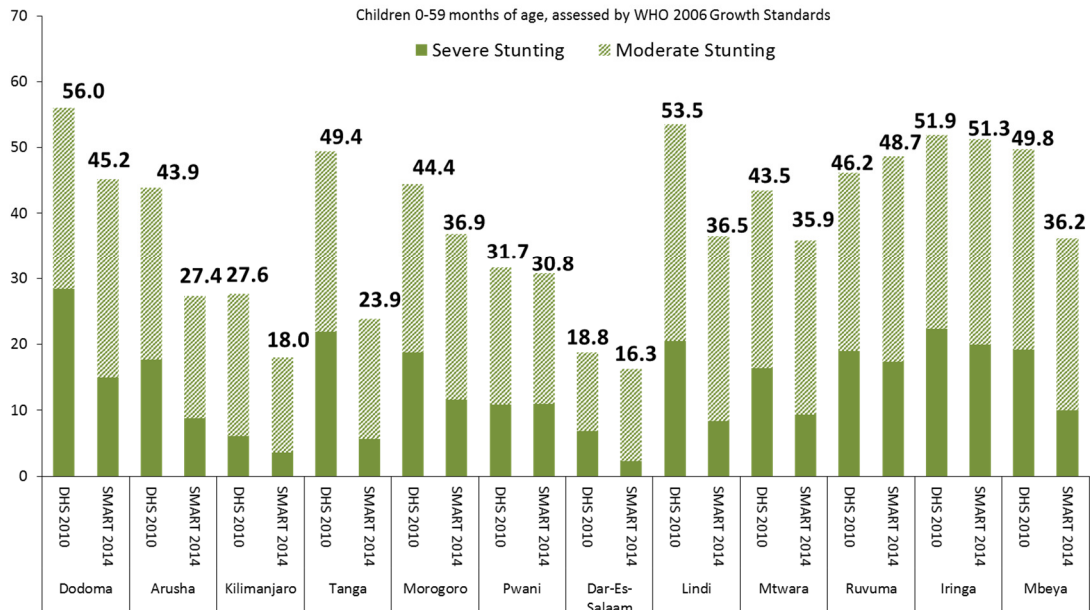


Figure 10: Prevalence of Chronic Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 1-12)

**Comparison of Chronic Malnutrition in Tanzania - Mainland
(Regions 13-25) - TDHS 2010 versus NNS SMART 2014**

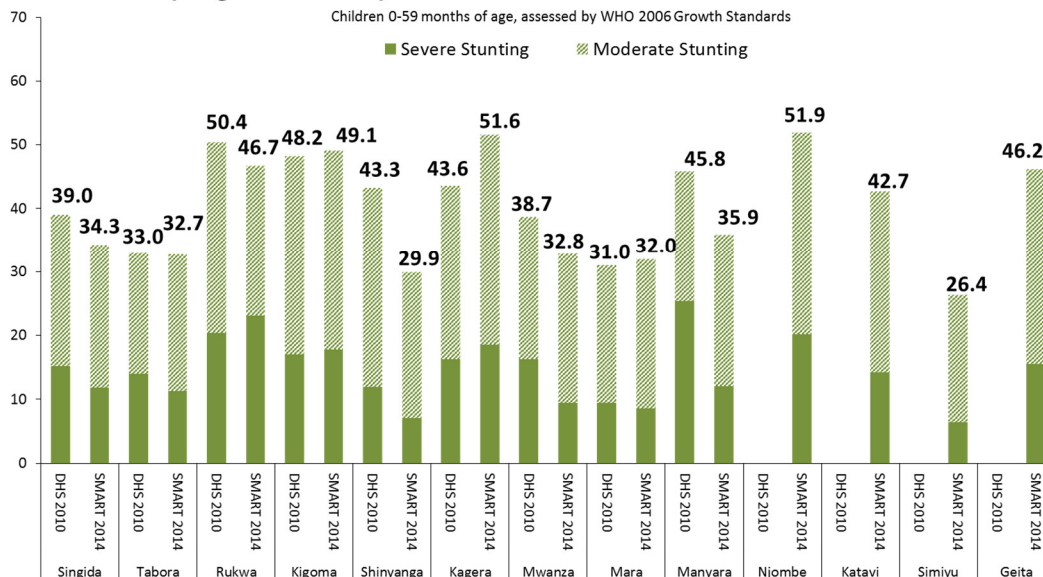


Figure 11: Prevalence of Chronic Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 13-25)

In all regions, stunting rates are lower than in 2010 except for Ruvuma (46.2% to 48.7%), Kigoma (48.2% to 49.1%), Kagera (43.6% to 51.6%) and Mara (31.0% to 32.0%) (Figure 10 and 11).

For Zanzibar, stunting rates are ranging from 20.6% in Town West to 30.4% in Unguja North (Figure 12). In all 5 regions, prevalence of chronic malnutrition are lower than in TDHS.

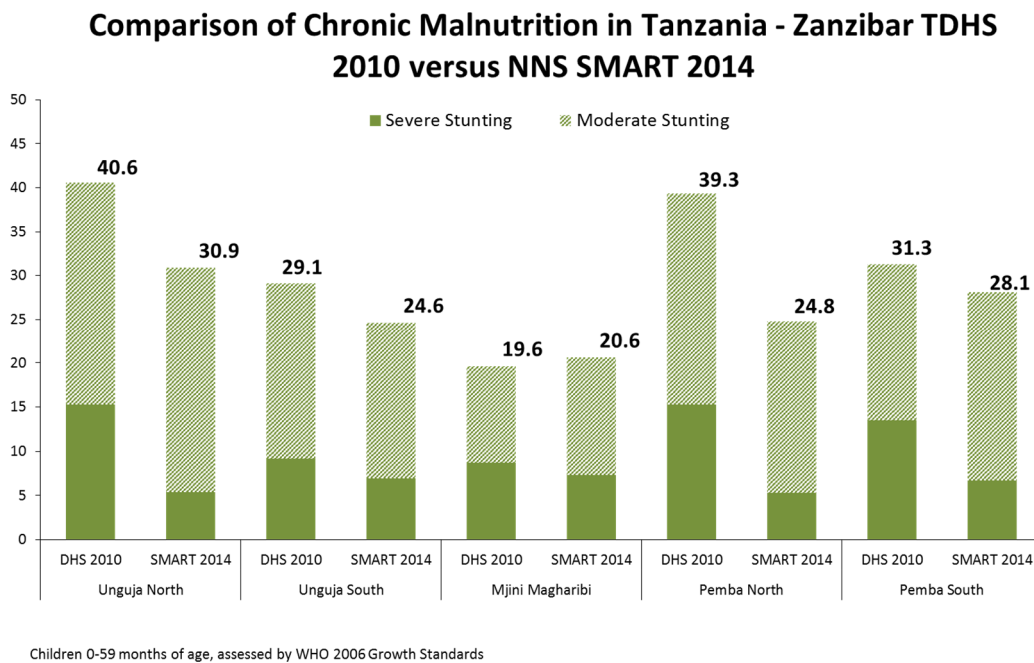


Figure 12: Prevalence of Chronic Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Zanzibar)

At national level, stunting was identified in 34.7% (33.7-35.7) of children 0-59 months of age which is a “high” rate according to WHO classification. Severe stunting was found in 11.5% of children countrywide. In 2010, TDHS found a prevalence of stunting of 42.0% (“very high” level).

According to those results, more than 2,700,000 children under five years of age are stunted in Tanzania. Nutrition interventions should be prioritized in the regions with the higher number of stunted children and the higher prevalence of chronic malnutrition. These regions are Kagera, Kigoma, Dodoma, Mbeya and Mwanza.

These prevalence reflects the existence of long term undernutrition and highlights the need to prioritize stunting prevention interventions. Programming for stunting prevention interventions will require a comprehensive and long-term approach. It has been estimated that the prevalence of chronic malnutrition can be reduced by about a third if effective interventions are implemented on a large scale (2008 Lancet series on Maternal and Child Undernutrition). The most effective interventions in preventing stunting occur during the window of opportunity, from the time of pregnancy until the end of the first two years of life of the child.

According to this survey, stunting prevalence starts at 16.0% in the first month of life. Chronic malnutrition increases quickly until it reaches a peak at 26 months of age (46.4%). By this age, the majority of the damage of malnutrition in childhood is done and cannot be reserved. Prevalence of stunting in age group 12-23 months and 24-35 months were found to be the higher with respectively 39.3% and 43.6%.

Acute Malnutrition

For Mainland, based on the WHO classification, the survey results show a level of Global Acute Malnutrition (GAM) considered “acceptable”, not exceeding the 5% threshold in all regions except for Dodoma with 5.2%. The lowest rate of Global Acute Malnutrition (GAM) 0.7% was found in Iringa. The highest rates of GAM were found in Dodoma, Tanga (4.8%), Mara (4.9%) and Singida (4.7%). 9 cases of bilateral edema were identified in the total survey sample. (Figure 13 and 14)

In all regions, wasting rates are equal or lower than in 2010 except for Mbeya (1.2% to 2.0%) and Kigoma (3.2% to 3.9%) (Figure 13 and 14).

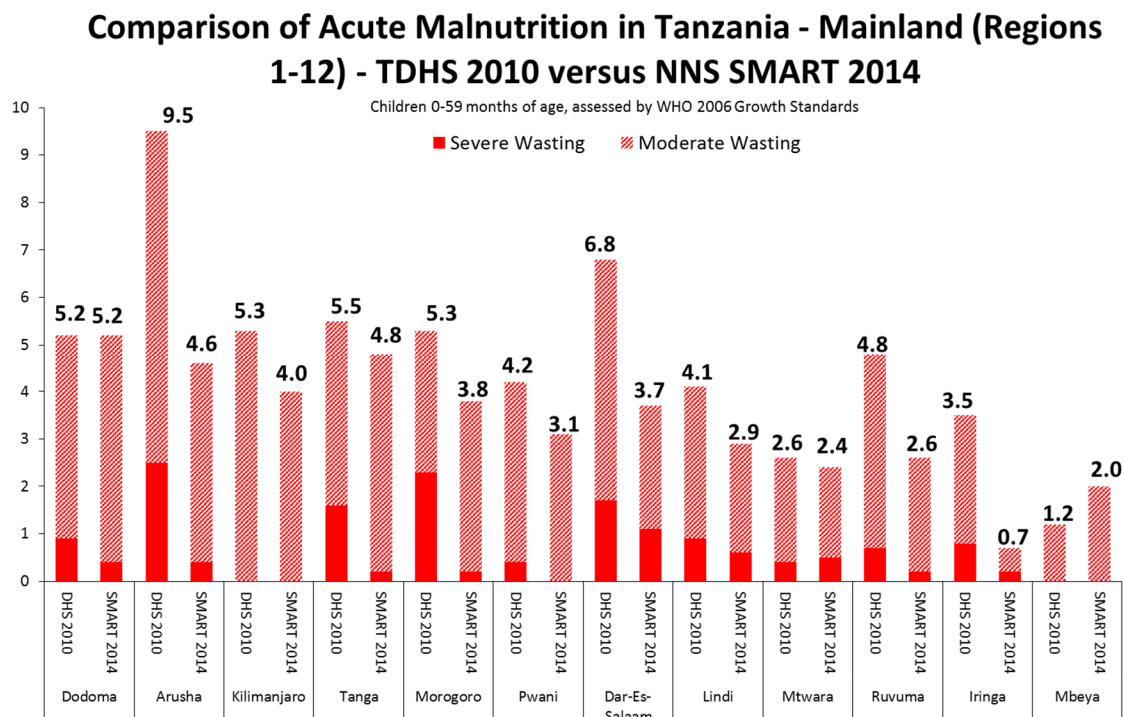


Figure 13: Prevalence of Acute Malnutrition (Global, Moderate and Severe) according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 1-12)

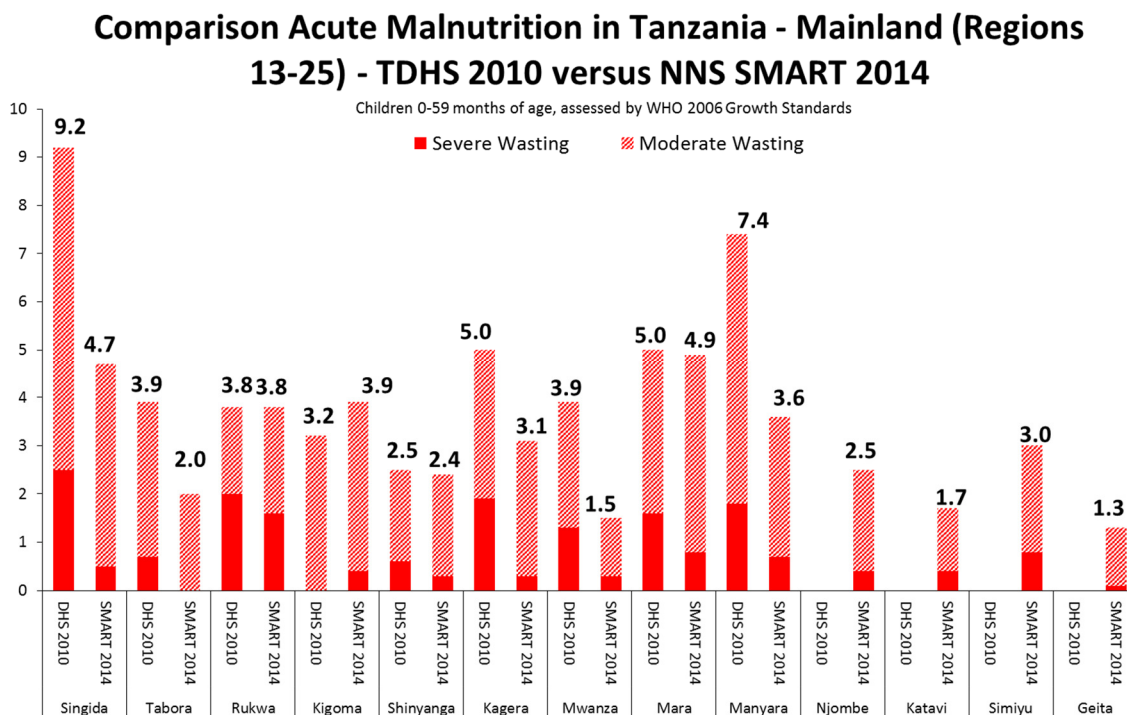


Figure 14: Prevalence of Acute Malnutrition according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Mainland – Regions 13-25)

For Zanzibar, wasting rates are ranging from 6.3% in Town West to 7.5% in Unguja South (Figure 15). In all 5 regions, prevalence of chronic malnutrition are lower than in TDHS. The GAM rate for Zanzibar decreased from 12.0% in 2010 to 7.2%.

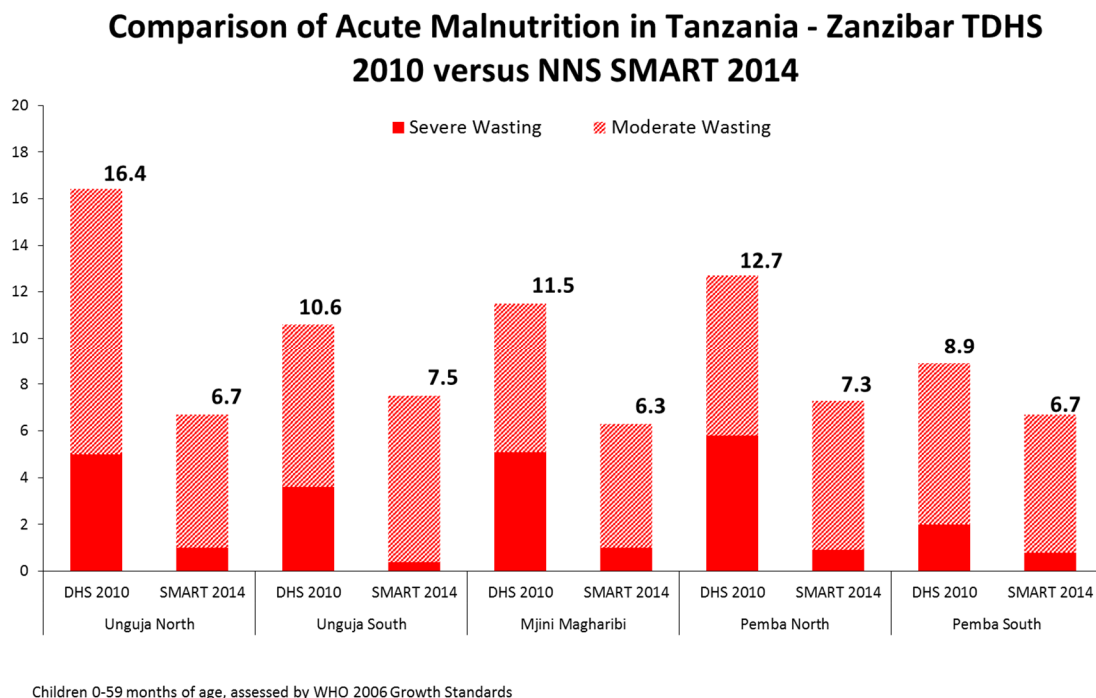


Figure 15: Prevalence of Acute Malnutrition (Global, Moderate and Severe) according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 by region (Zanzibar)

According to the WHO classification, the results of the survey showed a level of Global Acute Malnutrition considered "acceptable" (not exceeding the 5% threshold) with 3.8%. The prevalence of GAM is lower than the 2010 levels (4.8%).

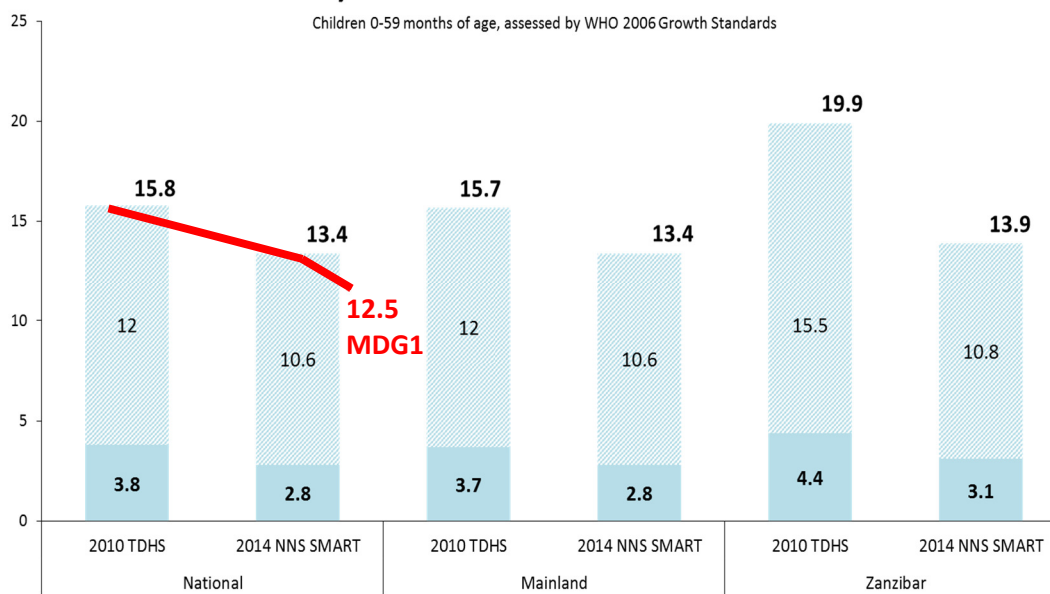
According to previous results, it is expected that there will be approximately 340,000 moderately acute malnourished children and more than 105,000 severely acute malnourished children in Tanzania.

Underweight

Regarding the prevalence of underweight, the level can be considered "Medium" by WHO cut-offs for level of public health significance (10-20%). At national level, the prevalence of underweight is used for monitoring the MDG1 "Eradicate extreme poverty and hunger". Tanzania is very close to reach the target for 2015 (12.5%) with a national prevalence of 13.4% (12.7-14.1) (Figure 16).

Weight-for-Age is a composite index of Height-for-Age and Weight-for-Height. It takes into account both acute and chronic malnutrition. While underweight is used for monitoring the MDGs (MDG1), it is no longer in use for monitoring individual children as it cannot detect children who are stunted with a normal weight and does not detect acute malnutrition that threatens children's lives. Investments should be made to allow measurement of children length/height for timely nutrition intervention.

Comparison of Underweight in Tanzania (National, Mainland and Zanzibar) - TDHS 2010 versus NNS SMART 2014



Children 0-59 months of age, assessed by WHO 2006 Growth Standards

Figure 16: Prevalence of Underweight (Global, Moderate and Severe) according to WHO Growth Standards 2006 among children 0 to 59 months of age – NNS SMART 2014 versus TDHS 2010 (National, Mainland and Zanzibar)

Trends in nutritional status of children for the period 1991-92 to 2014 are shown in Figure 17. For the purpose of comparison to assess trends, all results are coming from the WHO Global Database on Child Growth and Malnutrition where WHO Growth Standards have been used to recalculate prevalence.

Figure 17 shows a downward trend in stunting. Stunting declined of 7 percentage points between 1991-1992 and 2010 but sharply declined (8 percentage points) between 2010 and 2014 surveys. A similar pattern is observed for underweight which dropped by 25.1% (1991-1992) in 13.4% (2014). The prevalence of wasting has remained basically the same in Tanzania during these last ten years with a rate between 4 and 5%.

Trends in Nutritional Status of Children Under Age 5 1991 - 2014

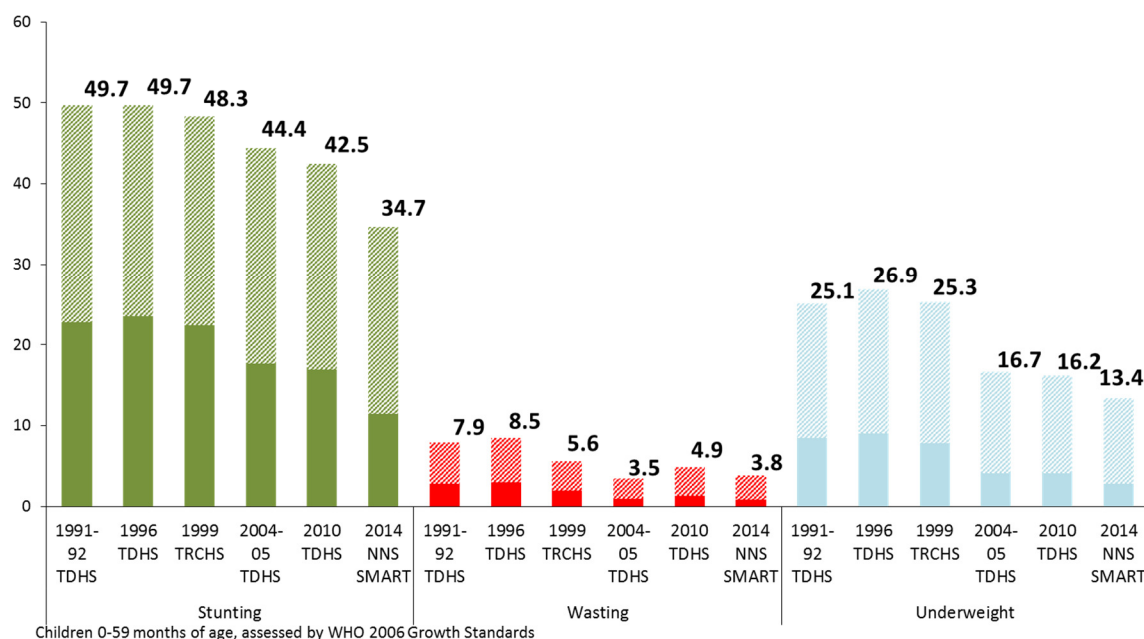


Figure 17: Trends in nutritional status of children under age 5 according to WHO Growth Standards 2006

Vitamin A Supplementation and Deworming

Children with lack of micronutrient intake and mal-absorption can suffer serious lifelong repercussions. The causes of vitamin and mineral deficiencies are multiple and interconnected. The basic causes of micronutrient deficiencies are related to diet, where poor people are highly affected as they do not consume sufficient amount of nutrient rich foods. Varied diets would resolve most vitamin and mineral deficiencies, which is complex and achieved in long-term as it goes with development and practice changes. However, many lives can be saved and improved through a range of cost-effective interventions, among which supplementation is one. Vitamin A is a fat soluble vitamin which can be stored in liver for 4-6 months. Therefore, periodic supplementation of Vitamin A supplements is one method to tackle this problem. Improving the Vitamin A status of deficient children through supplementation enhances their resistance to disease and can significantly reduce mortality, therefore it can be considered as a central element of the child survival program.

In addition to EPI program at health facility level, vitamin A supplementation is among the services provided on bi-annual basis during national campaign. The last campaign occurred from 18th of October to 24th of October 2014. Both the blue and red capsules were used to show the caretakers to help the mother to recall and the potential recall bias is expected to be low.

The proportion of all children aged 6-59 months who had received vitamin A in the last 6 months was 72.2% (70.6-73.7) which is better than in 2010 (61.0%). About 28.0% of the children did not receive vitamin A supplement, which is alarming. Coverage of vitamin A supplementation decreased in Zanzibar from 79.0% in 2010 to 61.0%.

A high coverage of vitamin A supplementation was noted at Arusha, Kagera and Unguja North (>90%) and the lowest at Mwanza, Singida, Manyara and Town West with less than 50%.

Worm infection in children causes significant Vitamin A mal-absorption which can aggravate malnutrition and anemia rates and contribute to retarded growth. Where Vitamin A-rich foods are already marginal in the diet, worm infestation can tip the balance towards vitamin A deficiency. Chronic worm infection also leads to malabsorption of Vitamin A, a different mechanism which has the same end result of the Vitamin A status of the child. Therefore, deworming has a paramount importance in contributing for reduction of child morbidity and mortality. For these reasons, deworming is recommended for children from 12 to 59 months of age as children in this age group are considered as a potential risk of acquiring the disease. As deworming also helps to enhance the iron status of children which eventually helps children to exercise their intellectual ability to the fullest.

Deworming was conducted simultaneously with vitamin A supplementation in October 2014. The proportion of all children aged 12-59 months who had received deworming in the last 6 months was 70.6% (69.0-72.2) at national level. The coverage is directly correlated with Vitamin A coverage which probably happened due to effectiveness of the integrated campaign organized in October 2014 at national level. Coverage of deworming increased from 50.0% in 2010 to 70.6%. There is a slight diminution of the coverage for Zanzibar from 72.0% in 2010 to 68.4%.

A high coverage of deworming was noted at Kagera and Unguja North (>90%) and the lowest at Mwanza, Singida and Manyara with less than 50%.

IYCF Practices

More than 30 studies from around the world, in the developing and developed countries alike, have shown that optimal and appropriate breastfeeding and complementary feeding practices dramatically reduces the risk of dying in infants and young children.

98.4% of children 0-23 months reported to have been ever breastfed. This is higher than the national rate of 96.9% (TDHS 2010).

Early initiation of breastfeeding has the potential to prevent 22% of newborn deaths. The survey revealed that 50.8% of children 0-23 months initiated breastfeeding within 1 hour. This result is very close to the national rate recorded in 2010: 48.7% (TDHS 2010). Early initiation of breastfeeding rate increased from 49.9% in 2010 to 61.7% in 2014 for Zanzibar.

WHO recommends mothers to exclusive breastfeed infants for first six months of life to achieve optimal growth, development and good health. At national level, less than 42% of infants under six months of age were exclusively breastfed. The 2010 TDHS shows the proportion of children exclusively breastfed was 49.8%. In Zanzibar, less than 20% of infants under six months of age were exclusively breastfed which is low.

The survey revealed that 90.0% of children 12-15 months were fed breast milk during the day prior to survey. This result is very close to the national rate recorded in 2010: 94.0% (TDHS 2010). Less than 50% of children 20-23 months were still breastfed (51.0% -TDHS 2010).

Breastfeeding is one of the most effective ways to ensure child health and survival. If every child was breastfed within an hour of birth, given only breast milk for their first six months of life, and continued breastfeeding up to the age of two years, about 800 000 child lives would be saved every year.

Adequate breastfeeding counselling and support are essential for mothers and families to initiate and maintain optimal breastfeeding practices.

Complementary foods (solid or semi-solid foods fed to infants in addition to breast milk) are recommended to be started at age 6 months. At national level, the survey shows that 89.5% of children from 6 to 8 months had a timely introduction of complementary food. TDHS 2010 reported that 94.7% of breastfeeding children aged 6-8 months of age had a timely introduction of complementary food.

The proportion of children aged 6-23 months who received foods from 4 or more food groups was 24.5% at national level. The higher proportion were noted at Kilimanjaro and Tanga with respectively 66.3% and 79.5% and the lowest at Iringa, Mbeya, Singida, Tabora, Manyara and Katavi with less than 10%. The proportion in Zanzibar represents less than half of the proportion at national level with 12.1%.

In 2010, the minimum dietary diversity was better with 56% at national level and 40% in Zanzibar.

The proportion of children aged 6-23 months who received solid, semi-solid or soft foods the minimum number of times or more was 65.7% at national level. In 2010, the minimum meal frequency was lower with only 34.1% at national level.

The survey revealed that 20.0% of children 6-23 months received a minimum acceptable diet. This result is very close to the national rate recorded in 2010: 21.0% (TDHS 2010).

Women Nutritional Status

Body Mass Index (BMI) is used to classify underweight, overweight and obesity in adult. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m²). BMI are not age dependent and same cut-offs is used for both sex. In developing countries it indicates that malnourished individuals, that is, women with a Body Mass Index (BMI) below 18.5 kg/m², show a progressive increase in mortality rates. (Gupta 1999). Maternal under nutrition is one of the main contributory factors for low birth weight babies. Babies who are undernourished in the womb face risk of dying during their early months and years. Those who survive have are likely to remain undernourished throughout their lives, and to suffer a higher incidence of chronic disease. Children born underweight also tend to have cognitive disabilities and a lower IQ, affecting their performance in school and their job opportunities at adults which eventually affects the country.

At national level, 5.5% of women 15-49 years of age were considered being in thinness (with 0.4% of severe thinness). A high prevalence of thinness was found at Pemba North (10.5%), Town West (10.1%), Pemba South (9.7%) and Manyara (8.8%). Prevalence of thinness were higher in age groups 15-19 years and 45-49 years with respectively 10.2% and 7.0%.

From 2010 to 2014, prevalence of thinness decreased from 11.4% (TDHS) to 5.5% at national level.

In contrast to the prevalence of thinness, 20% of women were found overweight and 9.7% of women were above the cut off point for obesity. In 2010, TDHS found respectively 15.2% and 6.2% for the prevalence of overweight and obesity. A high prevalence of obesity, around 20.0% was found at Kilimanjaro (21.8%), Dar-Es-Salaam

(19.2%), Town West (20.7%) and Unguja South (18.4%). Prevalence of overweight and obesity were higher in age groups 35-39 years and 45-49 years.

At national level, 30.9% of women 15-49 years of age with children under five years of age had not taken an iron-folic acid supplementation during pregnancy for past birth (40.7% in TDHS 2010). Majority of women took this supplementation less than 60 days.

Use of Iodized Salt

At national level, use of iodized salt the day prior to survey to cook the meal was 62.2%. Ten regions presented a percentage of use of iodized salt below 50% ranging from 5.9% in Lindi to 49.6% in Kagera. These regions are Lindi, Mtwara, Tabora, Rukwa, Geita, Ruvuma, Shinyanga, Singida, Simiyu and Kagera. Only 5 regions are above 90%: Dar-Es-Salaam, Mbeya, Kilimanjaro, Arusha and Mwanza.

For Zanzibar, use of iodized salt was ranging from 58.9% and 69.0% in Pemba North and South respectively to 78.4% in Unguja South.

At national level, more than one third of the households had a non-iodized salt the day of the survey (34.6% in Mainland and 21.5% in Zanzibar). Between 0.6% and 12.6% of the surveyed households had no salt the day of the survey (3.3% for Mainland and 7% for Zanzibar).

Handwashing Practices

An essential component of proper handwashing is the use of soap, without which it is difficult to reduce incidents of diarrhea. Soap eliminates diarrhea-inducing pathogens from the skin. Research in refugee settings has shown that in households where soap was present, fewer children had diarrheal diseases regardless of whether they actually used soap.

At national level, use of soap was 91.4%. Availability of soap was ranging from 78.1% in Lindi to 99.8% in Mwanza. For Zanzibar, use of soap was ranging from 85.3% and 87.4% in Pemba North and South respectively to 94.2% in Unguja South.

Household members knowing the critical times for handwashing does not imply that they actually practice such behavior. The 24-hour recall is another way to solicit a more accurate answer about handwashing practices without actually observing the behavior. At minimum the respondent should mention two critical times for handwashing, and this should include "after defecating."

At national level, only 11.7% of the interviewed households members report having used soap for handwashing at least at two critical times during past 24 hours (including "after defecating") (11.5% in Mainland and 13.2% in Zanzibar). Several regions in Mainland are below 1%. These regions are: Iringa, Mbeya, Singida, Tabora, Shinyanga and Geita. The highest rates were found in Tanga and Pwani with respectively 53.9% and 58.9%.

For Zanzibar, it was ranging from 0.2% and 0.4% in Unguja North and Unguja South to 21.6% and 19.9% in Pemba South and Town West respectively.

6. Conclusion and Recommendations

Stunting was found at 34.7% at national level. It reflects the existence of chronic nutrition related problem in the country. The repercussion of chronic malnutrition is serious which ends up in reducing adulthood productivity, which eventually affects the development of the nation as a whole. It is concluded that malnutrition is pressing major development challenge in the country. It is difficult to address the problem within short period as it requires ranges of interventions which should be supported by positive behavioral and practice change of the community at large.

Chronic malnutrition is the cumulative effect through time and the country cannot afford to see children getting malnourished further which interfere with their growth and contribute to stunting. Therefore, it is recommended to continue and scale up the existing nutrition program to address children in risk of mortality.

All forms of malnutrition were found high in the first two years of age. This period particularly, 6-23 is a critical age of onset of malnutrition where majority of childhood damages occurred. It is irreversible after this period. Therefore, it is highly recommended to consider children in this age group through improving infant and young child feeding practices and maternal education towards behavioral and practice changes and to achieve them it is recommended to:

- ✓ Invest in the establishment of community, health and nutrition system workplaces and public places for promoting, supporting and protecting exclusive breastfeeding for the first six months of life and continued breastfeeding up to two years of age and beyond;
- ✓ Support community-based programs to provide information and counseling on optimal and appropriate complementary feeding practices;
- ✓ Educate pregnant women about the importance of prenatal care and protect maternal nutrition and health to prevent low birth weight babies;
- ✓ Promote regular growth monitoring and include measurement of length/height (not just weight) in nutrition programs;
- ✓ Invest in a mass communication campaign for development based on preventive activities: nutrition of pregnant women, promotion of exclusive breastfeeding, complementary feeding and continued breastfeeding, good hygienic practices, the production and consumption of available complementary foods;

Vitamin A supplementation and deworming coverage was found not optimal in this survey and to have effective preventions it is encouraged to continue the integrated programs that used to provide the service to get high coverage. Regions with low performance should be encouraged to be improved for subsequent distribution rounds. Efforts should be made to improve coverage of vitamin A supplementation and deworming (80% target) like for examples:

- ✓ Raising awareness of mothers on micronutrient supplementation and deworming campaigns;
- ✓ Strengthening distribution channels of vitamin A and deworming supplies and monitoring and evaluation of campaigns;
- ✓ Planning the achievement of mass activities around supplementation and deworming at least twice a year

It is also recommended to:

- ✓ Develop a plan to fight against overweight and obesity.
- ✓ Strengthen action towards universal iodization of salt in all regions, especially in the 10 regions below 50%. Improve nutritional education to prevent overweight and obesity

Finally, in order to monitor the effect of present and future interventions on trends of malnutrition, it is recommended that a follow-up SMART survey be implemented in September-November 2016 following the same methodology as the present investigation.

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Annexes

Annex 1 – Anthropometric Questionnaire

National Nutrition Survey with SMART Methods Tanzania Sept. – Nov. 2014



Verbal Consent

“Hello, my name is _____, we are working with the Ministry of Health and Social Welfare (MoHSW), the Ministry of Health Zanzibar and the Tanzania Food and Nutrition Centre (TFNC) to conduct a nutrition survey. The objectives of this survey are to assess nutritional status of children aged 0-59 months and women aged 15-49 years, IYCF practices, micronutrient interventions (coverage of vitamin A and iron/folic acid supplementation, deworming and iodized salt) and handwashing practices. I would like, if you permit to ask you questions about these topics and measure children (weight, height, MUAC and edema) and women (weight and height). All information that we collect will be kept completely confidential. Do you have any questions? May I begin?”

Region	District	Ward/Shehia	Village/Street
_____	_____	_____	_____

Survey Date (DD/MM/YYYY)	Team Number	Cluster Number	HH Number
_ _ / _ _ / _ _ _ _	_ _	_ _ _ _	_ _

Availability of Iodized Salt – For all selected households

Code for Salt	Salt Result
1= Iodized Salt PPM ≠ 0 2= Non-iodized Salt PPM = 0 8= No salt in the household SALT	_

Handwashing Practices – For all selected households

No	Question	Answer Codes	
WH1	Do you have soap? <i>ONLY ASK FOR THE AVAILABILITY OF SOAP, NOT OTHER CLEANING AGENTS LIKE DETERGENTS, ASH, SAND SOAP</i>	Found in handwashing place..... 1 Brought by caretaker within 1 min..... 2 No 3	<input type="checkbox"/> IF ANSWER IS 3 STOP NOW
WH2	Have you used soap today or yesterday? YESTSP	Yes 1 No 2	<input type="checkbox"/> IF ANSWER IS 2 STOP NOW
			Y N
WH3	When you used soap today or yesterday, what did you use it for? <i>IF FOR WASHING MY OR MY CHILDREN'S HANDS IS MENTIONED, PROBE WHAT WAS THE OCCASION, BUT DO NOT READ THE ANSWERS. ASK TO BE SPECIFIC, ENCOURAGE "WHAT ELSE" UNTIL NOTHING FURTHER IS MENTIONED AND CHECK ALL THAT APPLY</i> CRITIMES	Washing clothes 3A Washing cooking pots or dishes 3B Washing my body 3C Washing my children 3D Washing child's bottoms..... 3E Washing my children's hands..... 3F Washing hands after defecating..... 3G Washing hands after cleaning child 3H Washing hands before feeding child 3I Washing hands before preparing food ... 3J Washing hands before eating..... 3K Other..... 3L	1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2

Anthropometry - For all children under five years of age (0-59 months)

ID#	First name of the child	Sex	Birthdate	Age in months	Weight (kg)	Height (cm)	Bilateral Edema	MUAC (mm)	Measure	Clothes	Vit. A in past 6 months	Deworming in past 6 months
		M=male F=female	DD/MM/YYYY	<i>Fill only if no birthdate</i>	(00.0)	(000.0)	Y=Yes N=No	(000) <i>Left arm</i> <i>ONLY 6-59 months</i>				

Survey Date (DD/MM/YYYY)	Team Number	Cluster Number	HH Number
_ _ / _ _ / _ _ _ _	_ _	_ _ _ _	_ _

Anthropometry - For all women from 15-49 years of age

*** Women with children under age 5***

ID#	First name of the woman	Age in years	Weight (kg) (00.0)	Height (cm) (000.0)	Pregnancy Status	Lactating Status	*During your last pregnancy, were you given or you buy any iron syrup/iron or iron/folate tablets?*	*During the whole pregnancy, for how many days did you take iron syrup/iron or iron/folate tablets?*
							1= Yes 2= No 8= Don't know	1= Yes 2= No 998= Don't know
								_ _ _
								_ _ _
								_ _ _
								_ _ _
								_ _ _
								_ _ _
								_ _ _



**National Nutrition Survey with SMART Methods Tanzania
Sept. – Nov. 2014**



Infant and Young Child Feeding (IYCF) practices – For all children under two years of age (0-23 months)

This questionnaire is to be administered to the mother or the main caregiver who is responsible for feeding the child. The child should be between 0 and 23 months of age

Survey Date (DD/MM/YYYY)	Cluster Number	Team Number	HH Number	Child ID Number
_ _ / _ _ / _ _ _ _	_ _ _ _	_ _	_ _	_

No	QUESTION	ANSWER CODES	
IF1	Sex <i>TAKE FROM THE PREVIOUS QUESTIONNAIRE- DO NOT ASK MOTHER AGAIN</i> SEX	Male 1 Female 2	_
IF2	Birthdate <i>TAKE FROM THE PREVIOUS QUESTIONNAIRE- DO NOT ASK MOTHER AGAIN</i> BIRTHDAT	DD/MM/YYYY..... _ _ / _ _ / _ _ _ _	
IF3	Child's age in months <i>TAKE FROM THE PREVIOUS QUESTIONNAIRE- DO NOT ASK MOTHER AGAIN</i> MONTHS		_ _
IF4	Did you ever breastfeed [NAME] ? EVERBF	Yes 1 No 2 Don't know 8	_ IF ANSWER IS 2 or 8 GO TO IF7
IF5	How long after birth did you first put [NAME] to the breast? INITBF	Immediately (<60 min) 1 Between 1 and 23 hours 2 More than 24 hours 3 Don't know 8	_
IF6	Was [NAME] breastfed yesterday during the day or at night? YESTBF	Yes 1 No 2 Don't know 8	_

IF7	<p>Now I would like to ask you about liquids that [NAME] may have had yesterday during the day and at night. I am interested in whether your child had the item even if it was combined with other foods. Yesterday, during the day or at night, did [NAME] receive any of the following?</p> <p><i>ASK ABOUT ALL LIQUIDS. IF ITEM WAS GIVEN, CIRCLE '1'. IF ITEM WAS NOT GIVEN, CIRCLE '2'. IF CAREGIVER DOES NOT KNOW, CIRCLE '8'. EVERY LINE MUST HAVE A CODE.</i></p>			
		Yes	No	DK
	7A. Plain water WATER	7A.....1	2	8
	7B. Infant formula, like Infacare, Nan, Lactogen, S26 INFORM	7B.....1	2	8
	7C. Milk such as tinned, powdered, or fresh animal milk, like Nido, Cowbell, Tangafresh MILK	7C.....1	2	8
	7D. Juice or juice drinks, like Ceres JUICE	7D.....1	2	8
	7E. Clear broth BROTH	7E.....1	2	8
	7F. Sour milk or yogurt, like home-made yogurt, Asas, Tangafresh YOGURT	7F.....1	2	8
	7G. Thin porridge THINPOR	7G.....1	2	8
	7H. Tea or coffee with milk WHTEACOF	7H.....1	2	8
	7I. Any sodas or other sweet drinks, like Azam, Pepsi, Twist , local herbs, gripe water, clear tea with no milk, black coffee, togwa WATLQD	7I.....1	2	8
IF8	<p>Please describe everything that [NAME] ate yesterday during the day or night, either at home or outside the home.</p> <p>a) Think about when [NAME] first woke up yesterday. Did [NAME] eat anything at that time? <i>IF YES: Please tell me everything [NAME] ate at that time. PROBE: Anything else? UNTIL RESPONDENT SAYS NOTHING ELSE. IF NO, CONTINUE TO QUESTION b).</i></p> <p>b) What did [NAME] do after that? Did [NAME] eat anything at that time? <i>IF YES: Please tell me everything [NAME] ate at that time. PROBE: Anything else? UNTIL RESPONDENT SAYS NOTHING ELSE. REPEAT QUESTION b) ABOVE UNTIL RESPONDENT SAYS THE CHILD WENT TO SLEEP UNTIL THE NEXT DAY.</i></p> <p><i>IF RESPONDENT MENTIONS MIXED DISHES LIKE A PORRIDGE, SAUCE OR STEW, PROBE:</i></p> <p>c) What ingredients were in that [MIXED DISH]? <i>PROBE: Anything else? UNTIL RESPONDENT SAYS NOTHING ELSE.</i></p>			

AS THE RESPONDENT RECALLS FOODS, UNDERLINE THE CORRESPONDING FOOD AND CIRCLE '1' IN THE COLUMN NEXT TO THE FOOD GROUP. ONCE THE RESPONDENT FINISHES RECALLING FOODS EATEN, READ EACH FOOD GROUP WHERE '1' WAS NOT CIRCLED, ASK THE FOLLOWING QUESTION AND CIRCLE '1' IF RESPONDENT SAYS YES, '2' IF NO AND '8' IF DON'T KNOW:

Yesterday during the day or the night, did [NAME] drink/eat any [FOOD GROUP ITEMS]?

Yes No DK

8A. Porridge, staff porridge, bread, rice, noodles, sweet potatoes and Irish potatoes, white yams, cassava, millet, sorghum, pastries, cakes, biscuits, plantains CEREAL	8A.....1 2 8
8B. Beans, peas, lentils, peanuts, cashew nuts, pumpkin seeds, soy, sesame, green grams, Bambara nuts, groundnuts, pigeon peas LEGNUT	8B.....1 2 8
8C. Dairy Products: Yogurt, cheese DAIRYFD	8C.....1 2 8
8D. Any meat such as beef, pork, lamb, goat, chicken, duck pigeon, liver, kidney, heart or other organ meats, fresh or dried fish, sardines, seafood, prawns crabs, insects FLESHFD	8D.....1 2 8
8E. Eggs EGGS	8E.....1 2 8
8F. Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside, any dark green leafy vegetables (spinach, pumpkin leaves, cassava leaves, etc.), ripe mangoes, ripe papayas, foods made with red palm oil, red palm nut or red palm sauce VITAFRUIT	8F.....1 2 8
8G. Any other fruits and vegetables OTHFRUIT	8G.....1 2 8
IF9 How many times did [NAME] eat solid, semi-solid, or soft foods other than liquids yesterday during the day or at night? FDTIMES	Number of times _ _ _ Don't know..... 98

Annex 3 – Persons Involved in the Tanzania 2014 National Nutrition Survey

Principal Investigators

Dr Joyceline E. Kaganda – Acting Managing Director – TFNC
Dr Vincent Assey – MoHSW
Dr Mohammed J.U. Dahoma – MoH Zanzibar

Steering Committee Members

Obey Assery – PMO
Dr Joyceline Kaganda – TFNC
Geoffrey Chiduo – TFNC
Dr Sabas Kimboka – TFNC
Dr Elifatio Towo – TFNC
Dr Vincent Assey – MoHSW
Dr Mohammed J.U. Dahoma – Zanzibar MoH
Mlemba Abbassy Kamwe – NBS
Sudha Sharma – UNICEF
Biram Ndiaye – UNICEF
Martha Nyagaya – Irish Aid
Lisha Lala – DFID
Philip Mann – UN-REACH
Roger Wanyama – WFP
Dr Stevens Isiaka Alo – WHO

Technical Committee Members

Aneth Vedastus – TFNC
Elizabeth Lyimo – TFNC
Luitfrid Nnaly – TFNC
Samson Ndimanga – TFNC
Tufingene Malambugi – MoHSW
Asha Hassan – MoH Zanzibar
Fahima Mohammed – OCGS
Deogratus Malamsha – NBS
Richard Mwanditani – UNICEF

SMART Survey Consultant

Fanny Cassard – UNICEF

Trainers

Fanny Cassard – UNICEF
Collins Lotuk & Imelda Awino – ACF-Canada

Supervisors

Samson Ndimanga – TFNC (Kagera/Kigoma)
Alice Kipanga – RNO Rukwa (Katavi/Rukwa)
Tufingene Malambugi – MoHSW (Mwanza/Geita)
Chacha Magige Nyabisaga – RNO Simiyu (Simiyu/Mara)
Mariam Athuman Mwita – RNO Shinyanga (Shinyanga/Tabora)
Waibe J.M Mwita – RNO Iringa (Iringa/Mbeya)
Teda Sinda – RNO Singida (Singida/Manyara)
Lewis E Mahembe – RNO Mbeya (Njombe/Ruvuma)
Jehovaness John Mollel – RNO Pwani (Tanga/Pwani)
Sauli Epimack – RNO Singida (Kilimanjaro/Arusha)
Happy M. Moses – RNO Morogoro (Morogoro/Dodoma)
Aneth Vedastus – TFNC (Mtwara/Lindi)
Asha Hassan – MoH Zanzibar (Unguja)
Fahima Mohammed – OCGS (Unguja)
Shemsa Nassos Msellem – MoH Zanzibar (Pemba)

Team 1 – Kagera/Kigoma

Team Leader	Felician F. Maduhu	Replacement	Josephat Juma
Measurer	Elieth Deogratias		
Assistant Measurer	Mariam Ally		

Team 2 – Kagera/Kigoma

Team Leader	Mary A. Baraka
Measurer	Denis Mbinga
Assistant Measurer	Masele Michael Maganga

Team 3 – Katavi/Rukwa

Team Leader	Tunsume P. Mwafumbila
Measurer	Doris Lunyungu
Assistant Measurer	Baraka J. Mollel

Team 4 – Katavi/Rukwa

Team Leader	Amani Mwakipesile
Measurer	Mariam Nakwa
Assistant Measurer	Emmanuel A. Mbindile

Team 5 – Mwanza/Geita

Team Leader	Faith Temu
Measurer	Sebastian T. Kabora
Assistant Measurer	Oscar Paul

Team 6 – Mwanza/Geita

Team Leader	Dennis Madeleke
Measurer	Ladislau William Magaso
Assistant Measurer	Amos R.

Team 7 – Simiyu/Mara

Team Leader	January E. Dalushi
Measurer	Oswin C. Mulwa
Assistant Measurer	Aneth Folgence

Team 8 – Simiyu/Mara

Team Leader	Raphael G. Mtaho
Measurer	Joseph Nchambi
Assistant Measurer	Abel E. Gyunda

Team 9 – Shinyanga/Tabora

Team Leader	Zidikheri Mziray
Measurer	Neema Juma
Assistant Measurer	James Japhet

Team 10 – Shinyanga/Tabora

Team Leader	Mario S. Venance	Replacement	Solana Agustino
Measurer	Avelina France		
Assistant Measurer	John Ngimba		

Team 11 – Mbeya/Iringa

Team Leader	Benson D. Sanga
Measurer	Win Eliah White
Assistant Measurer	Zakaria Msumary

Team 12 – Mbeya/Iringa

Team Leader	Regina Shigongo
Measurer	Alexander Sagaya
Assistant Measurer	Zaina Muhamadi

Team 13 – Singida/Manyara

Team Leader	Cosmas M. Ngafa	Replacement	Elafaraja
Measurer	Julius Nkuu		
Assistant Measurer	Winfrida Chacha		

Team 14 – Singida/Manyara

Team Leader	Florence P. Mkome	Replacement	Siriri Makonga
Measurer	Stanley S. Masaki		
Assistant Measurer	Khamis Ramadhani		

Team 15 – Njombe/Ruvuma

Team Leader	Hadija Nsari
Measurer	Josephine Kazungu
Assistant Measurer	Daina Mgeni

Team 16 – Njombe/Ruvuma

Team Leader	Redempta Kagaruki
Measurer	Andrew M. Masele
Assistant Measurer	Irene Mayeji Kitolu

Team 17 – Tanga/Pwani

Team Leader	Bertha Mwakabale	Replacement	Bruno Emmanuel Ndazi
Measurer	Mwamini Mziray		
Assistant Measurer	Asha Yusuph		

Team 18 – Tanga/Pwani

Team Leader	Bonza K. Mshana	Replacement	Davide Shayo
Measurer	Josephine J. Swai		
Assistant Measurer	Emiliana D. Sumaye		

Team 19 – Kilimanjaro/Arusha

Team Leader	Jubilate Temu	Replacement	Franck Sengi
Measurer	Abu Ngoye		Edna Ndau
Assistant Measurer	Jackeline Nususrupia		Prisca Emmanuel

Team 20 – Kilimanjaro/Arusha

Team Leader	Rose Mauya
Measurer	Regina Shine Leon
Assistant Measurer	Sabuni Joseph A.

Team 21 – Morogoro/Dodoma

Team Leader	Prisca Shirati	Replacement	Aswile John
Measurer	Agnes Mtulo		
Assistant Measurer	Range Mwita		

Team 22 – Morogoro/Dodoma

Team Leader	Doris R. Munis
Measurer	Amina Moh'd Ali
Assistant Measurer	Maryam Salehe Moh'd

Team 23 – Mtwara/Lindi

Team Leader	Kingolo Sayi
Measurer	Victoria S. Ngatunga
Assistant Measurer	Herieth Joseph

Team 24 – Mtwara/Lindi

Team Leader	Eveline Festo Kabtina	Replacement	Fabian
Measurer	Maduhu Mlyahodi		Salehe Seleman
Assistant Measurer	Veronica Baluwa		

Team 25 – Mtwara/Lindi

Team Leader	Ally F. Mvungi
Measurer	Salvatore I. Chinguile
Assistant Measurer	Yussuf Said Yussuf

Team 26 – Unguja

Team Leader	Fatma Said Khamis
Measurer	Asha Khamis Salehe
Assistant Measurer	Abdalla Haji Mgeni

Team 27 – Unguja

Team Leader	Fatma Ally Said
Measurer	Mohamed N. Salim
Assistant Measurer	Ahmada Khamis Ahmada

Team 28 – Unguja

Team Leader	Khadija Ramadhan
Measurer	Abdallah Nassoro Msellem
Assistant Measurer	Latifa Kh. Ameir

Team 29 – Pemba

Team Leader	Harusi Massoud
Measurer	Mwajine Khamis Mjaka
Assistant Measurer	Sabiha Khalfan Said

Team 30 – Pemba

Team Leader	Fatma Khatibu Haji
Measurer	Tetuni Haroub Shehe
Assistant Measurer	Shaib litbar Mzee

Annex 4 – Plausibility Check report

Plausibility check for: TZN_1014_NATIONAL_VF.as

Standard/Reference used for z-score calculation: WHO standards 2006

(If it is not mentioned, flagged data is included in the evaluation. Some parts of this plausibility report are more for advanced users and can be skipped for a standard evaluation)

Overall data quality

Criteria	Flags*	Unit	Excel.	Good	Accept	Problematic	Score
Flagged data (% of in-range subjects)	Incl	%	0-2.5 0	>2.5-5.0 5	>5.0-7.5 10	>7.5 20	0 (1,8 %)
Overall Sex ratio (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	0 (p=0,679)
Overall Age distrib (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	10 (p=0,000)
Dig pref score - weight	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	0 (1)
Dig pref score - height	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	0 (4)
Dig pref score - MUAC	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	0 (3)
Standard Dev WHZ .	Excl	SD	<1.1 and >0.9 0	<1.15 and >0.85 2	<1.20 and >0.80 6	>=1.20 or <=0.80 20	0 (1,05)
Skewness WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	0 (-0,02)
Kurtosis WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	0 (-0,06)
Poisson dist WHZ-2	Excl	p	>0.05 0	>0.01 1	>0.001 3	<=0.001 5	5 (p=0,000)
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	15 %

The overall score of this survey is 15 %, this is acceptable.

There were no duplicate entries detected.

Percentage of children with no exact birthday: 4 %

Anthropometric Indices likely to be in error (-3 to 3 for WHZ, -3 to 3 for HAZ, -3 to 3 for WAZ, from observed mean - chosen in Options panel - these values will be flagged and should be excluded from analysis for a nutrition survey in emergencies. For other surveys this might not be the best procedure e.g. when the percentage of overweight children has to be calculated):

Percentage of values flagged with SMART flags: WHZ: 1,8 %, HAZ: 3,9 %, WAZ: 1,4 %

Age distribution:

Month 1 : #####
Month 2 : #####
Month 3 : #####
Month 4 : #####
Month 5 : #####
Month 6 : #####
Month 7 : #####
Month 8 : #####
Month 9 : #####
Month 10 : #####
Month 11 : #####
Month 12 : #####
Month 13 : #####
Month 14 : #####
Month 15 : #####
Month 16 : #####
Month 17 : #####
Month 18 : #####
Month 19 : #####
Month 20 : #####
Month 21 : #####
Month 22 : #####
Month 23 : #####
Month 24 : #####
Month 25 : #####
Month 26 : #####
Month 27 : #####
Month 28 : #####
Month 29 : #####
Month 30 : #####
Month 31 : #####
Month 32 : #####
Month 33 : #####
Month 34 : #####
Month 35 : #####
Month 36 : #####
Month 37 : #####
Month 38 : #####
Month 39 : #####
Month 40 : #####
Month 41 : #####
Month 42 : #####
Month 43 : #####
Month 44 : #####
Month 45 : #####
Month 46 : #####
Month 47 : #####
Month 48 : #####
Month 49 : #####
Month 50 : #####
Month 51 : #####
Month 52 : #####

Month 53 : #####
 Month 54 : #####
 Month 55 : #####
 Month 56 : #####
 Month 57 : #####
 Month 58 : #####
 Month 59 : #####
 Month 60 : #####

Age ratio of 6-29 months to 30-59 months: 1,03 (The value should be around 0.85).

Statistical evaluation of sex and age ratios (using Chi squared statistic):

Age cat.	mo.	boys	girls	total	ratio boys/girls
0 to 11	12	2067/1785,0 (1,2)	2056/1774,0 (1,2)	4123/3559,0 (1,2)	1,01
12 to 23	12	1826/1740,0 (1,0)	1819/1729,0 (1,1)	3645/3470,0 (1,1)	1,00
24 to 35	12	1777/1687,0 (1,1)	1784/1676,0 (1,1)	3561/3363,0 (1,1)	1,00
36 to 47	12	1585/1660,0 (1,0)	1536/1650,0 (0,9)	3121/3310,0 (0,9)	1,03
48 to 59	12	1260/1642,0 (0,8)	1266/1632,0 (0,8)	2526/3274,0 (0,8)	1,00
0 to 59	60	8515/8488,0 (1,0)	8461/8488,0 (1,0)		1,01

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0,679 (boys and girls equally represented)
 Overall age distribution: p-value = 0,000 (significant difference)
 Overall age distribution for boys: p-value = 0,000 (significant difference)
 Overall age distribution for girls: p-value = 0,000 (significant difference)
 Overall sex/age distribution: p-value = 0,000 (significant difference)

Digit preference Weight:

Digit .0 : #####
 Digit .1 : #####
 Digit .2 : #####
 Digit .3 : #####
 Digit .4 : #####
 Digit .5 : #####
 Digit .6 : #####
 Digit .7 : #####
 Digit .8 : #####
 Digit .9 : #####

Digit preference score: **1** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
 p-value for chi2: 0,000 (significant difference)

Digit preference Height:

Digit .0 : #####
 Digit .1 : #####
 Digit .2 : #####
 Digit .3 : #####
 Digit .4 : #####
 Digit .5 : #####
 Digit .6 : #####

Digit .7 : #####
 Digit .8 : #####
 Digit .9 : #####

Digit preference score: **4** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
 p-value for chi2: 0,000 (significant difference)

Digit preference MUAC:

Digit .0 : #####
 Digit .1 : #####
 Digit .2 : #####
 Digit .3 : #####
 Digit .4 : #####
 Digit .5 : #####
 Digit .6 : #####
 Digit .7 : #####
 Digit .8 : #####
 Digit .9 : #####

Digit preference score: **3** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
 p-value for chi2: 0,000 (significant difference)

Evaluation of Standard deviation, Normal distribution, Skewness and Kurtosis using the 3 exclusion (Flag) procedures

	no exclusion	exclusion from reference mean (WHO flags)	exclusion from observed mean (SMART flags)
WHZ			
Standard Deviation SD: (The SD should be between 0.8 and 1.2)	1,16	1,15	1,05
Prevalence (< -2)			
observed:	4,3%	4,3%	3,4%
calculated with current SD:	4,7%	4,5%	3,1%
calculated with a SD of 1:	2,6%	2,6%	2,5%
HAZ			
Standard Deviation SD: (The SD should be between 0.8 and 1.2)	1,45	1,40	1,18
Prevalence (< -2)			
observed:	35,7%	35,6%	35,5%
calculated with current SD:	36,2%	35,6%	34,6%
calculated with a SD of 1:	30,5%	30,3%	32,0%
WAZ			
Standard Deviation SD: (The SD should be between 0.8 and 1.2)	1,13	1,11	1,03
Prevalence (< -2)			
observed:	14,4%	14,3%	13,8%
calculated with current SD:	16,3%	15,8%	14,1%
calculated with a SD of 1:	13,3%	13,3%	13,2%

Results for Shapiro-Wilk test for normally (Gaussian) distributed data:

WHZ	p= 0,000	p= 0,000	p= 0,000
HAZ	p= 0,000	p= 0,000	p= 0,000
WAZ	p= 0,000	p= 0,000	p= 0,000

(If p < 0.05 then the data are not normally distributed. If p > 0.05 you can consider the data normally distributed)

Skewness

WHZ	-0,26	-0,12	-0,02
HAZ	0,63	0,45	0,07
WAZ	0,02	-0,04	0,00

If the value is:

-below minus 0.4 there is a relative excess of wasted/stunted/underweight subjects in the sample

-between minus 0.4 and minus 0.2, there may be a relative excess of wasted/stunted/underweight subjects in

the sample.

- between minus 0.2 and plus 0.2, the distribution can be considered as symmetrical.
- between 0.2 and 0.4, there may be an excess of obese/tall/overweight subjects in the sample.
- above 0.4, there is an excess of obese/tall/overweight subjects in the sample

Kurtosis

WHZ	2,28	0,99	-0,06
HAZ	5,32	1,55	-0,35
WAZ	2,59	0,87	-0,05

Kurtosis characterizes the relative size of the body versus the tails of the distribution. Positive kurtosis indicates relatively large tails and small body. Negative kurtosis indicates relatively large body and small tails.

If the absolute value is:

- above 0.4 it indicates a problem. There might have been a problem with data collection or sampling.
- between 0.2 and 0.4, the data may be affected with a problem.
- less than an absolute value of 0.2 the distribution can be considered as normal.

Test if cases are randomly distributed or aggregated over the clusters by calculation of the Index of Dispersion (ID) and comparison with the Poisson distribution for:

- WHZ < -2: ID=7,09 (p=0,000)
- WHZ < -3: ID=1,11 (p=0,263)
- Oedema: ID=1,32 (p=0,052)
- GAM: ID=7,18 (p=0,000)
- SAM: ID=1,48 (p=0,010)
- HAZ < -2: ID=66,90 (p=0,000)
- HAZ < -3: ID=22,90 (p=0,000)
- WAZ < -2: ID=27,80 (p=0,000)
- WAZ < -3: ID=5,17 (p=0,000)

Subjects with SMART flags are excluded from this analysis.

The Index of Dispersion (ID) indicates the degree to which the cases are aggregated into certain clusters (the degree to which there are "pockets"). If the ID is less than 1 and p > 0.95 it indicates that the cases are UNIFORMLY distributed among the clusters. If the p value is between 0.05 and 0.95 the cases appear to be randomly distributed among the clusters, if ID is higher than 1 and p is less than 0.05 the cases are aggregated into certain cluster (there appear to be pockets of cases). If this is the case for Oedema but not for WHZ then aggregation of GAM and SAM cases is likely due to inclusion of oedematous cases in GAM and SAM estimates.

Are the data of the same quality at the beginning and the end of the clusters?

Evaluation of the SD for WHZ depending upon the order the cases are measured within each cluster (if one cluster per day is measured then this will be related to the time of the day the measurement is made).

Time point	SD for WHZ															
	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3
01: 1,42 (n=60, f=3)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
02: 1,15 (n=60, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
03: 0,95 (n=59, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
04: 1,33 (n=60, f=2)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
05: 1,12 (n=59, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
06: 1,09 (n=57, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
07: 0,90 (n=55, f=0)	####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
08: 1,25 (n=54, f=2)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
09: 1,26 (n=54, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
10: 0,93 (n=52, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
11: 0,93 (n=50, f=0)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
12: 1,14 (n=48, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
13: 1,11 (n=48, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
14: 1,16 (n=48, f=0)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
15: 1,07 (n=48, f=0)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
16: 1,44 (n=47, f=2)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
17: 1,01 (n=46, f=0)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
18: 1,35 (n=46, f=2)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
19: 0,97 (n=46, f=0)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
20: 0,99 (n=47, f=1)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
21: 0,96 (n=45, f=0)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

```

22: 1,08 (n=44, f=1) #####
23: 1,40 (n=46, f=1) #####
24: 1,14 (n=46, f=1) #####
25: 1,45 (n=44, f=2) #####
26: 1,14 (n=45, f=1) #####
27: 1,09 (n=44, f=0) #####
28: 1,12 (n=45, f=0) #####
29: 1,08 (n=45, f=1) #####
30: 1,21 (n=44, f=0) #####
31: 1,05 (n=45, f=1) #####
32: 1,04 (n=45, f=1) #####
33: 1,23 (n=45, f=1) #####
34: 1,29 (n=45, f=1) #####
35: 1,13 (n=44, f=1) #####
36: 1,30 (n=45, f=2) #####
37: 1,26 (n=45, f=0) #####
38: 1,37 (n=45, f=3) #####
39: 0,94 (n=45, f=0) #####
40: 1,02 (n=45, f=0) #####
41: 1,11 (n=42, f=1) #####
42: 1,08 (n=43, f=0) #####
43: 1,30 (n=41, f=1) #####
44: 1,12 (n=43, f=1) #####
45: 1,11 (n=43, f=0) #####
46: 1,06 (n=43, f=0) #####
47: 1,69 (n=43, f=4) #####
48: 0,95 (n=42, f=0) #####
49: 1,26 (n=42, f=2) #####
50: 1,13 (n=43, f=0) #####
51: 1,20 (n=43, f=1) #####
52: 1,05 (n=43, f=1) #####
53: 1,16 (n=43, f=0) #####
54: 0,96 (n=43, f=0) #####
55: 1,12 (n=40, f=1) #####
56: 1,23 (n=43, f=1) #####
57: 1,26 (n=43, f=1) #####
58: 1,09 (n=43, f=1) #####
59: 1,25 (n=43, f=3) #####
60: 1,16 (n=42, f=2) #####
61: 1,21 (n=42, f=1) #####
62: 1,28 (n=42, f=1) #####
63: 1,20 (n=41, f=2) #####
64: 1,22 (n=42, f=1) #####
65: 1,32 (n=41, f=1) #####
66: 1,30 (n=41, f=1) #####
67: 0,97 (n=42, f=0) #####
68: 1,51 (n=41, f=2) #####
69: 0,97 (n=42, f=0) #####
70: 1,30 (n=42, f=1) #####
71: 1,09 (n=42, f=1) #####
72: 1,15 (n=42, f=2) #####
73: 1,44 (n=41, f=3) #####
74: 1,06 (n=41, f=0) #####
75: 1,50 (n=40, f=2) #####
76: 1,12 (n=40, f=1) #####
77: 1,28 (n=40, f=1) #####
78: 1,18 (n=39, f=1) #####
79: 1,25 (n=39, f=1) #####
80: 1,22 (n=38, f=2) #####
81: 1,18 (n=37, f=0) #####
82: 1,39 (n=38, f=2) #####
83: 1,27 (n=37, f=1) #####
84: 1,56 (n=36, f=3) #####
85: 0,80 (n=38, f=0) #####
86: 1,27 (n=38, f=1) #####
87: 1,01 (n=38, f=0) #####
88: 0,94 (n=37, f=0) #####
89: 0,87 (n=37, f=0) #####
90: 1,03 (n=37, f=0) #####
91: 1,23 (n=36, f=0) #####
92: 1,19 (n=36, f=0) #####
93: 1,22 (n=36, f=0) #####
94: 1,11 (n=36, f=1) #####
95: 1,22 (n=36, f=2) #####
96: 1,23 (n=35, f=0) #####
97: 0,90 (n=35, f=0) #####
98: 1,01 (n=35, f=0) #####
99: 1,17 (n=35, f=0) #####

```

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)