THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY AND CHILDREN

The 2019 School Malaria and Nutrition Survey (SMNS) Report

Mainland Tanzania

April 2021

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Abbreviations and Acronyms

C	degrees Celsius
ACT	artemisinin-based combination therapy
ADDO	accredited drug dispensing outlet
ALu	artemether-lumefantrine
ANC	antenatal care
AOR	adjusted odds ratio
asl	above sea level
BAZ	body mass index for age z-score
BMI	body mass index
CC	City Council
CI	confidence interval
DBS	dried blood spot
DC	District Council
DMFP	District Malaria Focal Person
DNuO	District Nutrition Officer
DSM	Dar es Salaam
g/dl	grams per deciliter
GOT	Government of the United Republic of Tanzania
Hb	hemoglobin
HAZ	height for age z-score
HDDS	household dietary diversity score
HF	health facility
HMIS	Health Management Information System
ID	identification
IDDS	individual dietary diversity score
IDSR	Integrated Disease Surveillance and Response
IHI	Ifakara Health Institute
IPAQ	International Physical Activity Questionnaire
IPTp	intermittent preventive treatment during pregnancy
IRM	insecticide-resistance management
IRS	indoor residual spraying
ITN	insecticide-treated net
kg/m^2	kilograms per square meter

km	kilometer
LLIN	long-lasting insecticidal net
m	meter
MC	Municipal Council
MEEDS	Malaria Epidemic Early Detecting System
MET	metabolic equivalent of task
MEWS	Malaria Early Warning System
MIS	Malaria Indicator Survey
mm	millimeter
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MRC	Mass Replacement Campaign
MRCC	Medical Research Coordinating Committee
mRDT	malaria rapid diagnostic test
NBS	National Bureau of Statistics
NIMR	National Institute for Medical Research
NMCP	National Malaria Control Program
NMSP	National Malaria Strategic Plan
P.	*Plasmodium*
PI	Principal Investigator
PMI	U.S. President's Malaria Initiative
PO-RALG	President's Office–Regional Administration and Local Government
QA	quality assurance
QC	quality control
RBM	Roll Back Malaria
RCH	reproductive and child health
RLT	Regional Laboratory Technologist
RMFP	Regional Malaria Focal Person
SD	standard deviation
SDG	Sustainable Development Goal
SMNS	School Malaria and Nutrition Survey
SMPS	School Malaria Parasitaemia Survey
SNP	School Net Program
SPS	Sentinel Population Surveillance
SUA	Sokoine University of Agriculture

TC	Town Council
TDHS-MIS	Tanzania Demographic and Health Survey and Malaria Indicator Survey
TES	therapeutic efficacy studies
TFNC	Tanzania Food and Nutrition Centre
THMIS	Tanzania HIV/AIDS and Malaria Indicator Survey
TMIS	Tanzania Malaria Indicator Survey
TNNS	Tanzania National Nutrition Survey
U5	under 5 years of age
UDSM	University of Dar es Salaam
WHO	World Health Organization

Foreword

The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC)—through the National Malaria Control Program (NMCP) and Nutrition Services (NS), in collaboration with the President's Office-Regional Administration and Local Government (PO-RALG)—conducted the School Malaria and Nutrition Survey (SMNS) between August and October 2019. The aim of the survey was to evaluate the prevalence of malaria and malnutrition among public primary school pupils in mainland Tanzania.

The 2019 SMNS was the third in a series of School Malaria Parasitemia Surveys (SMPS) conducted in Mainland Tanzania biennially since 2014/2015. In 2019 the MoHCDGEC decided to broaden the spectrum of assessment of health indicators by adding a nutrition component among pupils. Therefore, the SMNS provides a complementary approach to national representative population-based surveys including the Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) and the Tanzania National Nutrition Survey (TNNS).

The TDHS-MIS and TNNS are conducted every four or five years and provide information on malaria prevalence, and nutrition status among children aged 6 to 59 months and women of reproductive age (15–49 years old) up to the regional level. However, these population-based surveys are limited in scope and sample size. In comparison, the SMNS covers all councils in Mainland Tanzania and contains a sample size that is sufficient to estimate the prevalence of malaria and malnutrition at the council and sub-council levels after every two years. The SMNS targets and estimates malaria prevalence in primary school pupils aged between 5 and 19 years; thus, providing additional information for studies highlighting the malaria age–burden shift from children aged under five years to higher age groups.

On behalf of the MoHCDGEC, I encourage all stakeholders in health, education, and social welfare, including development partners, decision makers, implementing partners, health care workers, and the general population, to use the findings of this 2019 SMNS Report to facilitate future investments in malaria control interventions and nutritional services in Tanzania.

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Acknowledgments

The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) would like to thank all individuals, institutions, and partners who contributed to this maiden integrated School Malaria and Nutrition Survey (SMNS) conducted in Mainland Tanzania. Special gratitude goes to the Government of the United Republic of Tanzania, the President's Office-Regional Administration and Local Government (PO-RALG), and the Ministry of Education, Science and Technology for their support to conduct this survey. The MoHCDGEC acknowledges the Global Fund support on the implementation of this survey (design, orientation of field staff and data collection exercise), the United Nations Children's Fund (UNICEF) for technical and financial support, particularly on the nutrition aspect, and the U.S. President's Malaria Initiative (PMI) for providing financial and technical support on data management and report writing through RTI International.

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Dr. Aifello Wedson Sichalwe

CHIEF MEDICAL OFFICER

Executive Summary

Malaria and malnutrition pose numerous challenges to the health status and socioeconomic welfare of the population, particularly in low and middle-income countries, including Tanzania. Their effect includes high morbidity and mortality rates, school absenteeism and increased drop-out rates, growth impairment, and poor school performance. The School Malaria and Nutrition Survey (SMNS) complements other national surveys already conducted in Tanzania namely: the Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) and the Tanzania National Nutrition Survey (TNNS). The TDHS-MIS and TNNS provide information the demography, health, and nutritional status for children under five years and for women of reproductive age (between 15 and 49 years). The SMNS is further reaching with ten (10) times the sample size up to the council level, compared with other national representative studies.

General Objectives

The objective of the 2019 SMNS was to assess the prevalence of malaria, anemia, and malnutrition among pupils aged between 5 and 19 years in public primary schools in Mainland Tanzania.

Methodology

A cross-sectional survey was conducted between August and October 2019 in 26 regions and 184 councils in Mainland Tanzania. A total of 68,147 pupils aged between 5 and 19 years from 661 selected public primary schools and 6,814 heads of households were interviewed to collect malaria and nutrition-related information. Pupils were tested for malaria using malaria rapid diagnostic tests (mRDTs), while anthropometric measurements were collected by using electronic weighing scales and measuring boards. Measurements obtained (height and weight) were used to obtain z-scores which were used to classify individual children as normal, stunted, thin, overweight, or obese based on World Health Organization (WHO) cut-off points. Hemoglobin (Hb) measurements were collected by using a HemoCue machine and were used to classify individual pupils as having normal Hb or mild/moderate/severe anemia using WHO criteria. Descriptive statistics, including percentage, mean, minimum and maximum values, were produced by using STATA® version 14 software and presented in tables, maps, and graphs.

Key Findings

Malaria Prevalence

Overall malaria prevalence among school children aged between 5 and 19 years was 14.1% in Mainland Tanzania. However, marked heterogeneity was observed between children older than 12 years (17.6%) and those between 5 and 9 years (11.2%), between high (31.6%) and very low (0.1%) malaria burden strata, between rural (17.9%) and urban (4.1%) settings, and between lowland (12.3%) and mountainous (0.7%) areas. Across regions, the highest prevalence was recorded in Geita (49.4%) and the lowest was in Arusha (less than 0.1%). At the council level, the highest prevalence was recorded in Ushetu DC (73.0%), Liwale DC, (65.5%) and Mbogwe DC (63.3%). The highest prevalence across schools was observed in Nyamahuna primary school (79.2%) in Geita Town Council, Sinwankere primary school (75.4%) in Ushetu DC and Shibumba primary school (75.0%) in Nyang'hwale DC.

Mosquito Nets

Percentage of pupils who reported to own at least one mosquito net in their households was 89.3%, with marked variations across age groups and regions. The highest ownership of any mosquito nets was reported among older pupils aged between 12 and 16 years, though pupils aged between 17 and 19 years reported low use of any mosquito nets. Ownership of any mosquito nets at the household level was lower (83.2%) compared with the mosquito net ownership information reported by pupils. Similarly, the ownership of long-lasting insecticidal nets (LLINs) at household level was lower (73.1%). Most pupils (96.4%) reported to have slept under a mosquito net the night before the survey with marked variations across regions.

Knowledge of Malaria Prevention Methods and Exposure to Malaria Messages

Based on the findings from the SMNS, approximately 7 out of 10 pupils surveyed knew that mosquito nets are a recommended malaria prevention method; older pupils were more knowledgeable than their younger counterparts. In addition, pupils living in urban areas were more knowledgeable of malaria prevention methods compared with those from rural settings. Half (50.0%) of the surveyed pupils were not exposed to malaria prevention messages, whereas 30.0% had either heard or seen malaria-testing messages and 35.8% had either heard or seen treatment messages. In addition, 52.2% of pupils surveyed know that artemether-lumefantrine (ALu) is recommended as a first line antimalarial medicine.

Anemia

Thirty four percent (33.7%) of the pupils were anemic based on WHO classification standards. However, a marked heterogeneity was observed between late adolescents (56.6%) and children (33.1%) as well as between boys (35.1%) and girls (32.4%). Results further indicate anemia was more prevalent in rural areas (37.0%) compared to urban areas (25.6%). The highest prevalence was recorded among pupils in Pwani (53.3%), Mtwara (50.7%) and Simiyu 49.6% regions. The highest prevalence was observed in Tunduru DC (100.0%), Momba DC (94.0%), and Sengerema (93.0%) DC.

Nutrition

The sample size for the individual questionnaire and anthropometric measurements was 68,146 in each of the two target population groups: school-age children (5–9 years) and adolescents (10–19 years). However, stunting (height-for-age), was calculated for 67,767 school children and adolescents who had valid non-flagged height for age z-scores (based on children with valid dates of birth (month and year) and valid measurement of both height and weight) according to WHO international growth reference data for children and adolescents 5–19 years of age. Findings from the SMNS, revealed approximately 25.0% of pupils were stunted; it was observed that stunting was more prevalent in boys (28.4%), older children, (45.8%) and in rural areas (27.2%). Pupils from Njombe, Rukwa, Kigoma, and Kagera regions had the highest prevalence of stunting in the country.

In addition, 11.7% of children aged between 5 and 9 years were underweight; the prevalence of underweight was slightly higher in boys (12.8%) than in girls (10.7%). Children from rural areas (12.6%) were more underweight than their counterparts from urban settings.

Dietary Intake

The mean individual dietary diversity scores (IDDS) and households (HDDS) were both low. Dietary intake was assessed by using a food frequency questionnaire that was later used to generate dietary diversity scores for participating households and primary school pupils. Heads of households were interviewed about their frequency in consuming specific food

groups during one week. Five food groups and eleven food groups were used to compute dietary diversity scores for primary school pupils and households respectively based on the most commonly used food groups.

On average, individuals (pupils) consumed only 2 out of 5 food groups per week while at the household levels, family members consumed 3.7 out of 11 food groups per week. There was less variability of IDDS and HDDS across sex and age group categories, however, the higher mean HDDS was seen among those with a higher level of education than their counterparts. Furthermore, a remarkable variation was seen across zones and regions, the higher levels of consumption of different food groups were consistently observed in eastern and northern zones and specifically in Dar es Salaam region. Mbeya region had the least dietary diversity score at both household and individual level. Starchy staples, oils/fat, pulses and legumes were frequently consumed by the majority of the households (5–7 times a week). Fruits and animal source foods such as meat, milk, and eggs were among the least consumed foods at the household level.

Physical Inactivity Level

Findings from the SMNS showed 42.0% of school children surveyed were physically inactive. The prevalence of physical inactivity was higher among girls (43.6%) than boys (40.7%). Across age groups, younger children (between 5 and 9 years) reflected a higher prevalence of lower physical activity (47.0%) than their adolescent counterparts (36.5%). School children living in urban areas reflected a higher prevalence of low physical activity (43.3%) compared with those from rural settings (41.7%).

Chapter One: Introduction

1.1 Burden of Malaria and Malnutrition

Malaria is a vector-borne disease transmitted by the bite of the female *Anopheles* mosquito and is caused by five different species of *Plasmodium* (*P*) parasites (i.e., *P. falciparum*, *P. vivax*, *P. malariae*, *P. ovale*, *P. knowlesi*). Malaria is among the global public health concerns affecting most tropical climate areas; the current global malaria incidence is estimated at 57 per 1,000 population at risk.[1] In 2018, a total of 228 million malaria cases and 405,000 malaria deaths were reported globally, with a significant number of children under 5 years of age (U5) impacted.[1] In addition, 93.0% of malaria cases recorded in 2018 occurred in Africa, with 15 countries in sub-Saharan Africa, including Tanzania, and India contributing approximately 85.0% of the global malaria burden (1). Approximately $2.7 billion is spent annually to reduce malaria through research, treatment, and prevention activities (2).

More than 90.0% of Tanzania's population were at risk of contracting malaria (3–5) between 2015 and 2019. However, the recent evidence shows that malaria incidence rates has declined from 150 cases in 2015 to 123 cases per 1,000 in 2019 (5). More findings indicate malaria prevalence among school children aged 5 to 16 years has declined from 21.6% (2015) to 15.8% (2017) in Mainland Tanzania (4,6). The prevalence of malaria in U5 has declined by 50% from 14.8% to 7.3% between 2015 and 2017 (7). Although the prevalence is declining over time across all age groups in population, it remains very heterogeneous across the country with the highest prevalence being reported consistently along the coastal belt and in regions bordering Lake Victoria, Nyasa, and Tanganyika, compared with the northern part and central corridor (7–9). The decline in malaria prevalence reported from different findings is due to implementation of malaria control measures countrywide. The common control methods include provision of long-lasting insecticide treated mosquito nets, indoor residual spraying, and larval source management.

Malnutrition in children can manifest in more than one form, including stunting, wasting, or the child being underweight or overweight. Child stunting—also known as chronic malnutrition—occurs during the first 1,000 days after conception and is related to factors, including socioeconomic status, dietary intake, infection, maternal nutritional status, infectious diseases, micronutrient deficiencies, and the environment.[10] Long-term effects of stunting on individuals include diminished cognitive and physical development, reduced productive capacity, poor health, and increased risk of degenerative diseases, such as diabetes (10,11). Maternal undernutrition, which is part of malnutrition, is an important underlying cause of neonatal and under 5 years of age (U5) mortality, resulting in increased chances of maternal death during delivery. Mothers, particularly adolescents with poor health and diminished nutritional status, are more likely to give birth to babies that have low birth weights, are born prematurely, are small for their gestational age, and/or have low micronutrient status.

Childhood chronic malnutrition affects 150.8 million U5 children globally, out of these children, 58.7 million (30.3%) live in Africa (10). In 2018, East Africa was ranked the highest among the five sub-regions, contributing 35.6% of global malnutrition cases (11). The Tanzania National Nutrition Survey (TNNS) provides information about pregnant women aged between 15 and 49 years and the prevalence of malnutrition (stunting, wasting, and underweight or overweight) among children U5, but lacks data for older children and adolescents. According to the TNNS 2018 report, the overall rates for children U5 were 31.8% for stunting, 14.6% for wasting, 3.5% for underweight, and 2.8% for overweight (12,13).

Anemia is a condition that occurs when the number of red blood cells is inadequate to carry sufficient oxygen to meet the body's physiological needs. Individual physiological needs may vary based on age, gender, and smoking behaviors among individuals living in elevations above sea level (ASL) and during stages of pregnancy (14,15). The there are many causes and determinants of anemia, but they are typically associated with markers of nutritional deficiencies and infections, thus indicating the importance of diet in addressing anemia. It is generally assumed that 50.0% of anemia cases are caused by iron and other nutrient deficiencies (e.g., folate, vitamin B12, and vitamin A). The main risk factor of iron deficiency among young children in developing countries, including Tanzania, is malnutrition. Other factors include high requirements of iron during child growth (16), parasitic infections, including malaria, and inherited or acquired disorders that affect hemoglobin synthesis, red cell production, or red blood cell survival, including sickle cell disease (14,15).

Globally, anemia is estimated to affect approximately 1.62 million people, or 25.0% of the global population (14). The 2018 Global Nutrition Report (15) revealed that none of the 194 countries assessed met Global Nutrition 2025 targets (10) for anemia. The 2017 Tanzania Malaria Indicator Survey (TMIS) report (7) revealed that 4.0% of children U5 in Tanzania were severely anemic; this percentage was slightly lower than data reported in the Tanzania HIV/AIDS and Malaria Indicator Survey (THMIS) from 2012 (16).

To reduce the burden of anemia and malnutrition, dietary diversity is recognized as a key element of high-quality diets. Increasing food variety across and within food groups is recommended by most dietary guidelines to ensure adequate intake of essential nutrients and to promote good health (17). Recognizing that dietary quality, dietary practices, and lifestyle are associated with increased risk of chronic disease, dietary recommendations promote increased dietary diversity and reduced intake of selected nutrients, including fats, refined sugars, and salt (17). A lack of dietary diversity is common in populations living in poor resource settings because their diets are mainly based on starchy staples and often include limited or no animal products and few fresh fruits and vegetables. Starchy staples tend to be low in many micronutrients and/or contain micronutrients that are not easily absorbed in the body.

Nearly 800 million people around the globe suffer from insufficient access to calories; an estimated 2 billion suffer from micronutrient malnutrition, mostly because of low intakes of vitamins and minerals (e.g., iron, zinc) (18). Nutritional deficiencies are responsible for a large health burden in terms of lost productivity, impaired physical and mental development, susceptibility to various diseases, and premature death. Nutritional deficiencies are not only the result of low quantities of food consumed, but also the result of poor dietary quality and diversity (19).

Despite the substantial reduction of malaria prevalence and undernutrition in Tanzania, these conditions remain among the major health challenges in the country (5,12,13). According to the literature, areas that are highly infected with malaria often have a high prevalence of micronutrient deficiencies (20–22). Understanding the magnitude of and interactions between malaria and malnutrition is critical to optimally design and implement interventions targeting their co-existence.

1.2 Control of Malaria and Malnutrition

1.2.1 Malaria Control

The 2017 MIS showed a decline between 2015/2016 (14.8%) and 2017 (7.3%) in national malaria prevalence averages in children U5, reflecting the current global decline in the disease (7,23). This decline was attributed to a country-wide rollout of malaria control interventions, including targeted indoor residual spraying (IRS), scale-up of insecticide-treated nets (ITNs), larval source management, the availability of malaria Rapid Diagnostic Test (mRDTs), and affordable and quality assured artemisinin-based combination therapies (ACTs) (4,24).

Additionally, intensified national surveillance systems have improved our understanding of Tanzania's malaria burden through improved reporting, data quality, and use of malaria information to monitor and control its activities at all levels (4). The knowledge has enabled stratification of geographical areas and localities according to the malaria burden. This classification is essential for the development and effective optimization of malaria burden reduction strategies and interventions. These efforts are aligned with the 2016–2030 Global Technical Strategy for Malaria elimination, which recommend that countries accelerate their efforts toward malaria elimination through interventions tailored to the local contexts (25). Malaria control strategies reinforce and update community knowledge and practice regarding appropriate malaria prevention and early testing and treatment and promote and influence social norms about healthy behaviors desired.

Reduction of Tanzania's malaria burden is aligned with the country's National Malaria Strategic Plan (NMSP) 2015–2020 with the goal of reducing malaria parasite prevalence from 10.0% in 2012 to 5.0% in 2017 and to less than 1.0% by 2020 (26). Although this goal has not yet been achieved, significant progress has been made, with a reduction in malaria prevalence of more than 50.0%. This achievement was likely recognized because of increased political will, mobilization of resources, and international initiatives, including the Sustainable Development Goals (SDGs) and the Roll Back Malaria Partnership to End Malaria, formerly known as Roll Back Malaria (RBM) (10,27–29). Despite Tanzania's progress in reducing malaria prevalence, additional focus is needed to frequently monitor parasite prevalence to obtain data for evaluating interventions and to facilitate informed decisions about malaria control.

1.2.2 Prevention of Malnutrition

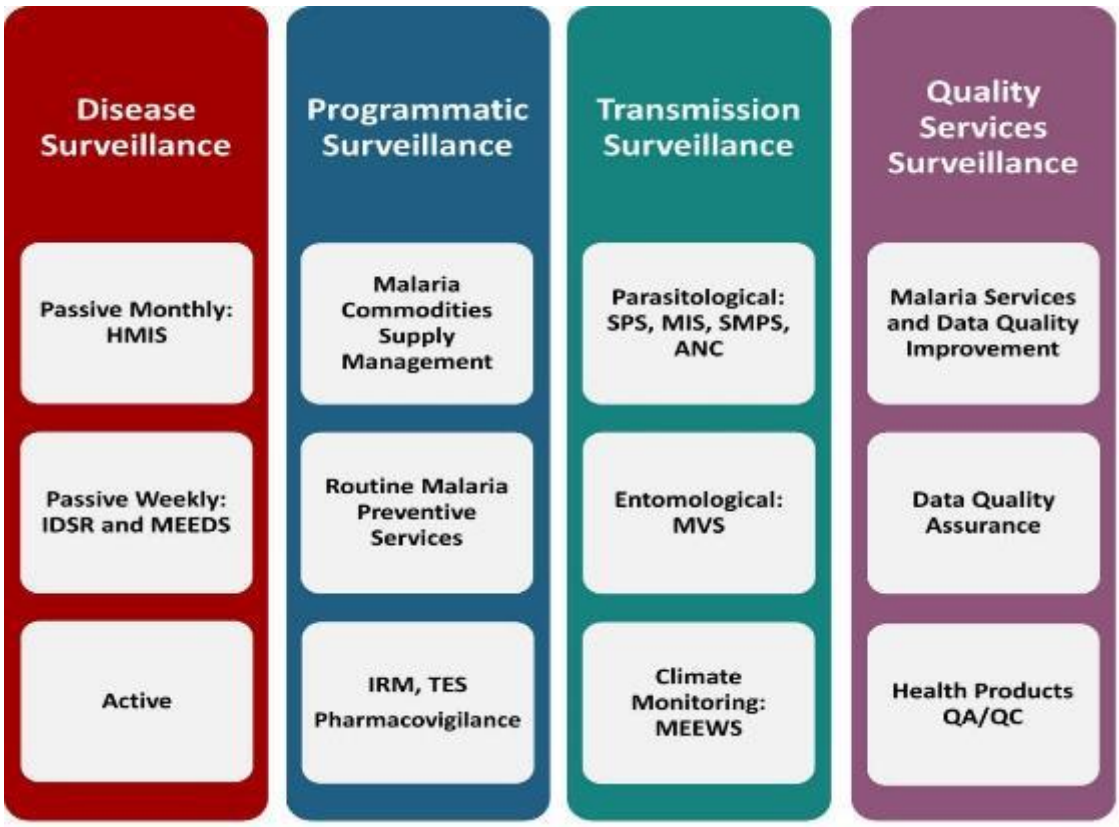
The Government of the United Republic of Tanzania's (GOT's) commitment to nutrition through formal adoption of national multisectoral nutrition action plan (NMNAP) (2016–2021) has resulted in the deployment of several interventions to reduce malnutrition in Tanzania (30). Some interventions include efforts to promote optimal nutrition for mothers, infants, young children, and adolescents and to prevent and control micronutrient deficiencies. Other interventions include the management of acute malnutrition, the management of diet, as related to non-communicable diseases, and the promotion of multi-sectoral nutrition-sensitive interventions (30). In recent years, Tanzania has made notable progress in reducing all forms of malnutrition among children U5, particularly regarding chronic malnutrition or stunting, from 34.0% in 2015 to 31.8% in 2018 (12,23). This progress aligns with the global goal to reduce stunting prevalence in children to 28.0% by 2021 (30). Despite progress made in reducing undernutrition, overnutrition—particularly overweight and obesity—is on the rise in Tanzania. This trend highlights the co-existence of these multiple forms of malnutrition. Nutrition and health data for children and adolescents (e.g., aged between 5 and 19 years) are lacking and require the additional focus of interventions and strategies.

1.3 Justification for the School Survey

The inception of the RBM initiative in 1998 stimulated and increased partnerships, commitments to, and investments in malaria control (31). This partnership steered the scale-up of cost-effective preventive and curative interventions for malaria control in Tanzania. As a result, evidence regarding malaria epidemiology and prevalence in Tanzania suggests a shift from high to moderate and moderate to low malaria endemicity and from younger children to older ones (7,8,32). The major issues challenging the National Malaria Control Program (NMCP) include determining the magnitude of malaria prevalence among older children aged between 5 and 19 years, sustaining the gains already achieved, and further reducing malaria burden in a continuum of control and, ultimately, elimination of malaria. Understanding these variations is key to accelerate control efforts by optimizing the allocation of interventions and measuring disease impacts.

To address this, the NMCP introduced a comprehensive Surveillance Framework (**Figure 1**) within the National Guidelines for Malaria Surveillance and Response (33,34). The aim of the framework is to strengthen the need for information in the current malaria epidemiological transition and transform this information into knowledge for malaria control interventions in the country.

Figure 1. Comprehensive Surveillance Framework for malaria



Source: National Guidelines of the Malaria Surveillance and Response 2017 (NMCP)

Note: ANC = antenatal care; HMIS = Health Management Information System; IDSR = integrated disease surveillance and response; IRM = insecticide-resistance monitoring; MEEDS = Malaria Epidemic Early Detecting System; MEEWS = Malaria Epidemic Early Warning System; MIS = Malaria Indicator Survey; QA = quality assurance; QC = quality control; SMPS = School Malaria Parasitemia Survey; SPS = Sentinel Population Surveillance; TES = Therapeutic Efficacy Studies.

The four major pillars of the comprehensive Surveillance Framework are disease, programmatic, transmission, and quality services. The disease surveillance pillar collects data about passive routine reporting. The programmatic surveillance pillar collects information about commodities, preventive services, therapeutic efficacy, insecticide susceptibility, and pharmacovigilance. The transmission surveillance pillar brings together parasitological, entomological, and climatic information. The quality services surveillance pillar in health facilities (HFs) is monitored through quality improvement indicators, including data audits.

The SMPS is designed to complement the TDHS-MIS and increase spatial sampling to provide more precise transmission estimates below the regional level by using schools as sentinel sites. The SMPS falls under the transmission pillar of the comprehensive Surveillance Framework. School malaria prevalence surveys were first used 60 years ago in Africa (35). In recent years, school-based malaria surveillance surveys have been undertaken in Kenya (36), Côte d'Ivoire (37), the Gambia (38), Ethiopia (39), and the Democratic Republic of the Congo (40).

Tanzania is the only country to formalize repetitive, systematic, school-based malaria surveillance since 2014 (8). SMPS findings provide a practical approach for gathering nationwide representative data among school-aged children at the council and sub-council levels. The findings can then be used to improve appropriate malaria risk stratification of areas and age groups and can support targeted control measures.

The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), through Nutrition Services, the Tanzania Food and Nutrition Centre (TFNC), and other collaborators, conduct national surveys to assess nutritional status in Mainland Tanzania. The most recent TNNS from 2018 covered children U5 and women of reproductive age (between 15 and 49 years).12 However, the scope of the survey falls short in assessing nutrition information among other age groups, particularly school-aged children and adolescents in vulnerable age groups. This absence of nutrition indices among school-aged children and adolescents necessitated Nutrition Services to conduct the study and to guide decisions and strategies to curb malnutrition in Tanzania.

Previous SMPSs conducted in 2015 and 2017 assessed malaria prevalence among school-aged children and adolescents in Mainland Tanzania. Assessment of hemoglobin (Hb) concentrations to determine the prevalence of anemia is an important indicator for malaria in order to determine the severity of the disease; malnutrition (nutrient deficiency) was not obtained during these rounds. It is evident that malaria and malnutrition are public health concerns, particularly in sub-Saharan Africa—including Tanzania—because it primarily affects young children and adolescents. As a result, it was of paramount importance to integrate the two components that seem to pose health and nutrition challenges among school-aged children and adolescents. This integrated approach has increased the scope of the current school survey as compared with previous SMPS rounds and effective use of resources.

1.4 Objectives

1.4.1 Overall Objective

The overall objective of the SMNS was to assess the prevalence of malaria, anemia, and malnutrition and their associated factors among public primary school pupils aged between 5 and 19 years in Mainland Tanzania.

1.4.2 Specific Objectives

The specific objectives of the SMNS were to:

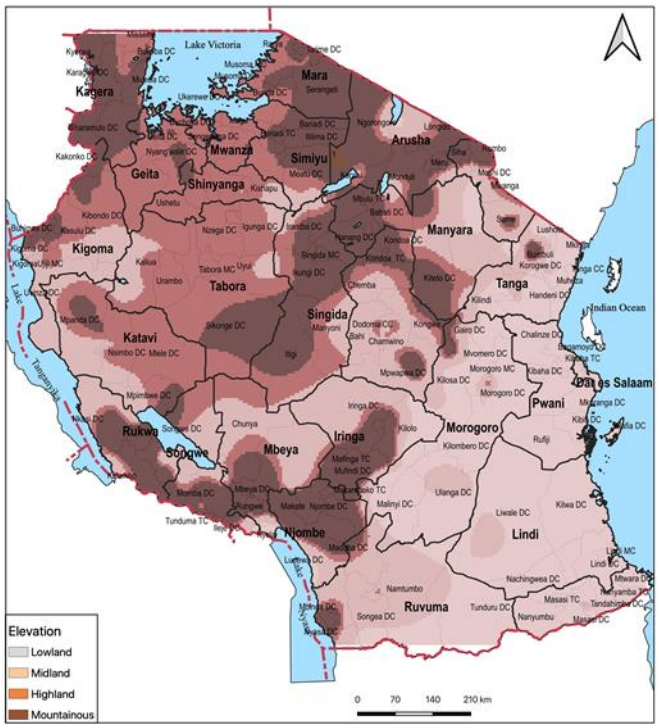
1. Determine the prevalence of malaria among pupils in mainland Tanzania.
2. Describe the ownership and use of mosquito nets among pupils and selected households.
3. Assess the knowledge of malaria prevention and treatment among pupils and selected households.
4. Determine the prevalence of anemia among pupils in public primary schools.
5. Determine the prevalence of malnutrition-stunting, wasting, and underweight (and overweight) among pupils in public primary schools.
6. Assess the dietary intake and eating habits among pupils and members of selected households.
7. Assess the exposure to nutrition information among pupils in public primary schools.
8. Determine the physical activity levels among pupils in public primary schools.

Chapter Two: Methodology

2.1 Study Area

Tanzania is among the East African countries covering approximately 945,087 square kilometers (km2) of which 883,749 km^2 are land area and 59,050 km^2 are inland waterbodies, with several lakes, rivers, and a portion of the Indian Ocean. Tanzania lies south of the equator between 1–12 degrees south and 29–41 degrees east. The country shares borders with the Indian Ocean to the east and with the following eight countries: Kenya and Uganda to the north; Rwanda, Burundi, the Democratic Republic of the Congo, and Zambia to the west; and Malawi and Mozambique to the south (41).

Figure 2. Regional boundaries indicating elevation levels



Tanzania is characterized by diverse and complex topographical features extending from a narrow coastal belt of the Western Indian Ocean with an extensive plateau and altitudes ranging from 1,000 to 2,000 meters (m) ASL. Country elevation has been categorized as lowland (less than 750 m ASL), midland (between 750 and 1,250 m ASL), highland (between 1,250 and 1,750 m ASL), and mountainous (greater than 1,750 m ASL) (Figure 2).

Tanzania experiences unimodal and bimodal rainfall, depending on the location. The northern parts of the country, including areas around the Lake Victoria basin, northern coast, and areas around Kilimanjaro Mountain experience bimodal rainfall; the first rainfall occurs between March and May and the other occurs between October and December. Central, southern, and western parts of Tanzania are characterized by unimodal rainfall that occurs between November and April. The temperature ranges between 10 degrees Celsius (°C) and 20°C in the highlands and is usually higher than 20°C in the lowlands throughout the year. The hottest months are between November and February, and the coldest months are between May and August (41).

Administratively, Mainland Tanzania consists of 26 regions and 184 councils. Regions are formed by a number of councils with an average of six to eight. These councils are either cities, municipalities, townships, or rural (i.e., district councils [DCs]). Councils are further subdivided into wards, which differ in numbers depending on the size of the council. Regions are grouped depending on their geographical proximity; when combined, they form zones. A zone is formed from two to six regions, totaling eight zones in Mainland Tanzania (41). The zones are Northern (Kilimanjaro, Tanga, and Arusha), Western (Tabora and Kigoma), Southern (Lindi and Mtwara), Southwest Highland (Mbeya, Rukwa, Katavi, and Songwe), Eastern (Dar es Salaam, Pwani, and Morogoro), Southern Highland (Iringa, Njombe, and Ruvuma), Lake

(Kagera, Mwanza, Geita, Mara, Simiyu, and Shinyanga), and Central (Dodoma, Singida, and Manyara).

The country is classified into five geographical areas or localities according to the malaria burden: namely very low, low, moderate, and high malaria burden. This council level classification aims to provide a more granular malaria burden definitions potential for adoption and operationalization of different interventions.

According to the 2012 national census, the 2019 projected population of Mainland Tanzania was 55,890,747. Of that population, 20,122,292 (37.1%) were children and adolescents aged between 5 and 19 years (3). Tanzania's economy relies on agriculture, tourism, forestry, fishing, mining, and the energy industry. The 2019 SMNS was conducted in all regions and councils of Mainland Tanzania.

2.2 Study Design

The SMNS was a cross-sectional survey designed to collect information from public primary school pupils and households.

2.3 Study Population and Eligibility Criteria

The target population for the SMNS was all pupils aged 5 to 19 years from public primary schools and households from communities around these schools: all 26 regions and 184 councils of Mainland Tanzania took part in the survey. All enrolled pupils aged between 5 and 19 years who were present during the day of the survey were eligible to participate. Heads of households or representative members of selected households nearby the sampled schools were also eligible to participate in the SMNS.

2.4 Sample Size Determination and Sampling Technique

2.4.1 Sample Size Determination

The sample size was estimated at the council level to provide a plausible estimate of health indicators for each council and sub-council, and the respective council sample sizes were aggregated to obtain the national sample. The council malaria prevalence estimates from the 2017 SMPS (9), enrolled public primary school pupils population in a council (3), a margin of error of 0.5, significance level of 5%, and design effect of 2.5 were used to estimate a council sample size. The design effect was used to account for malaria transmission heterogeneity at the council level. A total of 68,174 primary school pupils was estimated from 661 schools in all 184 councils based on the stated criteria above. In addition, a sub-sample of 33.0% of the enrolled pupils in each selected school was randomly selected to determine individual hemoglobin concentrations to establish anemia status among pupils. Ten percent (10%) of the sampled pupils per school were used to select the equivalent number of households nearby the selected schools. A total of 6,800 households were sampled and enrolled in the survey.

2.4.2 Sampling Technique

All regions and councils were included in the survey. Each council was further stratified based on geographical characteristics (e.g., altitude and topography), population density (population size per km2), economic activities (e.g., irrigation and mining), and proximity (30 kilometers [km] apart).

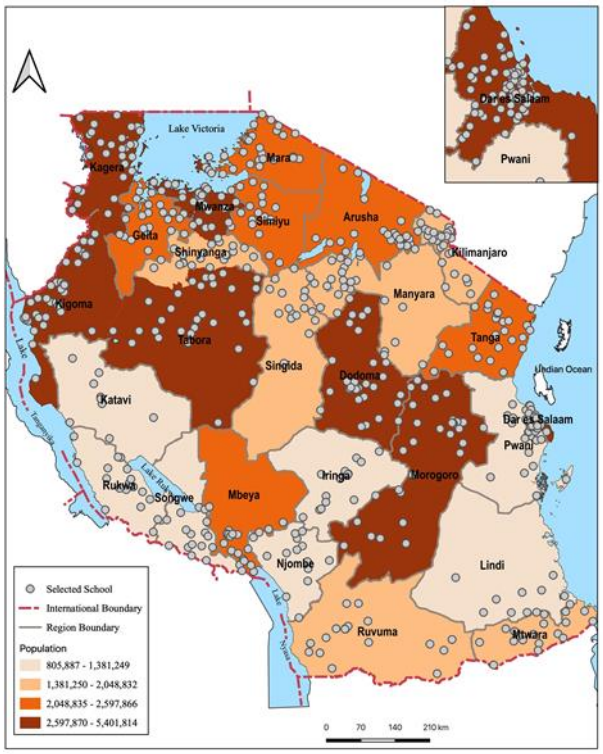
For each council several strata were established based on the stratification variables stated above to ensure that the study captured the heterogeneity of malaria transmission and nutrition indicators (Figure 3). Due to financial resources and logistical reasons one primary school was planned to be selected in a single ward from each stratum. Since several wards

were scattered around stratum, one ward and a subsequent village/street hosting a school was selected randomly.

A three-stage cluster sampling was used to select a representative school and ultimately pupils for survey as shown in the sequence below:

- Stage 1—Random selection of representative wards from each stratum
- Stage 2—Random selection of representative streets/villages from selected wards
- Stage 3—Random selection of pupils and heads of households from each selected school and household

Figure 3. SMNS-sampled schools by regional population density



Pupils were selected systematically by using class rosters and considering a 1:1 ratio of girls and boys from Standards 1 through 7. Based on proportional allocation to the primary school population size by using a master pupil list from the President's Office Regional Administration and Local Government (PO-RALG), each school was assigned a specific number of pupils to be sampled ranging from a minimum of 60 to maximum of 120 pupils. Additionally, within each stratum, a sample of households equal to 10.0% of the sampled pupils were randomly selected to participate in the subsequent household survey. These households were drawn from within the respective village and street where most of the pupils reside; however, matching the pupils with the household was not done for this survey.

2.5 Fieldwork

2.5.1 Fieldwork Staff Training

A 4-day orientation workshop for field teams was conducted in the four centers of Mbeya, Dar es Salaam, Dodoma, and Mwanza regions. These training centers were picked to ensure a small field team was well trained, the training was manageable, and reduced travel expenses and logistic issues for the participants due the geographical locations of the regions. Six to seven regions were organized to form a team, depending on the number of councils and their proximity. The training centers, which are bolded, within the respective regions were as follows: Center 1 (Iringa, Katavi, Mbeya, Njombe, Rukwa, Ruvuma, and Songwe), Center 2 (Arusha, Dodoma, Kigoma, Kilimanjaro, Manyara, and Singida), Center 3 (Geita, Kagera, Mara, Mwanza, Shinyanga, Simiyu, and Tabora), and Center 4 (Dar es Salaam, Lindi, Morogoro, Mtwara, Pwani, and Tanga) (Figure 4). A total of 920 field teams and national supervisors were oriented on various aspects, such as data collection procedures, (Annex 1: Information sheet ("Taarifa muhimu ya Utafiti", Annex 3: Protocol for mRDT: Testing and Quality Assurance and Control, and Annex 7: Fieldwork Process) and tools (Annex 2: Survey

tools), quality assurance and quality control (Annex 5: Job Aide) and submission of data to the central server located at NMCP (electronic data) and how to send filled forms manually to NMCP (Annex 6: Handover form ("Fomu ya Makabidhiano") and SOPs (Annex 4: Malaria RDT Standard Operating Procedure [SOP]) for carrying out testing. Training details are discussed in Annex 7.

2.5.2 Data Collection Tools, Equipment, and Supplies

The SMNS used the following four tools:

- School identification form
- Designated mRDT, Hb, and dried blood spot (DBS) register form
- Pupil questionnaire
- Household questionnaire.

Please see **Annex 2: Survey Tools** for additional details.

Figure 4. The 2019 SMNS field training centers

In addition, several equipment and supplies were used throughout the survey. The equipment included electronic tablets, electronic weighing scales (seca® brand), height measuring boards (Shorrboard®), HemoCue machines and microcuvettes, thermometers, mRDTs, and 3-millimeter (mm) Whatman® filter papers. The supplies included antimalarial drugs, latex examination gloves, locally purchased packets of biscuits, and bottled juice. For more details, see Annex 7: Fieldwork Process under the Survey Equipment and Supplies survey.

2.5.3 Pre-Testing of Data Collection Tools

For the SMNS, pre-testing of data collection tools—particularly the pupil and household questionnaires—was conducted during orientation workshop sessions in the different training centers. The aim of the pre-testing effort was to familiarize users with the tools, determine the tools' applicability, check for consistency among the tools, and estimate the time needed to conduct an interview. Pre-testing was conducted with 16 pupils from two selected primary schools and 10 households from their respective communities around the school. Feedback from the pre-testing sessions provided an insight which facilitated improvement of the tools and fieldwork processes.

2.5.4 Data Collection

Field work was conducted by National Facilitators, National Supervisors, a regional field team (data collectors), and drivers. National Facilitators and National Supervisors were drawn from the following participating institutions: the NMCP, the National Institute for Medical Research

(NIMR), the Ifakara Health Institute (IHI), the National Bureau of Statistics (NBS), President's Office Regional Administrative and Local Government (PO-RALG), the Tanzania Food and Nutrition Center (TFNC), the MoHCDGEC, and the University of Dar es Salaam (UDSM). The composition and roles of field teams are presented in **Annex 7: Field Work Process**. A detailed list of the field teams, National Supervisors and Facilitators, and investigating team is under **Annex 10: Investigators for the 2019 School Malaria and Nutrition Survey.**

Data were collected by 184 field teams, with each team consisting of five people per council. Each team was provided with survey equipment and supplies, one vehicle from the council, and a driver. The team consisted of a Malaria Focal Person, a Nutrition Officer, a School Health Programme Coordinator, and two laboratory technicians who used mRDTs and a HemoCue machine to test pupils for the presence of malaria parasites, Hb concentration, and collection of blood samples for DBSs. Supervisors were responsible for data quality assurance and quality control through sampling of used mRDT cassettes, comparing it with what is documented in the designated malaria test register, reviewing data to for its completeness, quality, and consistency prior to submission to the NMCP's server.

2.6 Ethical Considerations

Ethical clearance for the SMNS was obtained from the National Health Research Ethics Committee, which is a sub-committee of the Medical Research Coordinating Committee of the NIMR (reference number NIMR/HQR.8a/vol. ix/3171). The Principal Investigator and some Co-Investigators obtained certificates of the protection of human subjects. Other Co-Investigators, National Supervisors, and field staff were trained on how to ensure the protection of human subjects.

Prior to the pupils' sampling, interviewing, testing, measurements, and sample collecting; a meeting that included field teams, members of school committees (parents are members of the committees as well), the head teacher, teachers, and other school members, was conducted at each school. The aims of the meetings were to explain the SMNS and obtain consent for their participation. School committees had the opportunity to ask questions and were informed that participation in the survey was completely voluntary and that participants could withdraw at any time. The school committee consented on behalf of parents and guardians who were not members of the committee. Additionally, some members of the school committee and parents and guardians who were not members of the school committee were invited to witness the exercise. For household interviews, the enumerator read the consent statement as required to the participants, who were then required to provide written consent before the interview began.

All interviews were conducted in a quiet location, selected to ensure privacy and confidentiality. All respondents were informed about the nature of the study, its risks and benefits, and their rights to terminate the interview at any time and to refuse to answer any questions they deemed sensitive.

Pupils were assigned a unique identification number; confidentiality was observed throughout the SMNS with no respondent names shared during the survey process or in any subsequent reports. All pupils diagnosed with malaria were treated with ALu; pupils with signs and symptoms of severe malaria and/or hemoglobin less than 8.0 g/dl were referred to the nearest HF for further management.

2.7 Data Management

2.7.1 Data Entry

Data entry was performed by trained Data Entry Clerks who were monitored and guided by Data Entry Supervisors for three weeks at the Dodoma Region Hospital conference room. This activity was preceded with the sorting of the DBS samples and questionnaires, organizing them according to region, council, and school. The Data Entry Clerks were provided an overview of the survey and data collection tools used, variables collected, and coding. After this training, data were entered in Epi-data software version 3.1; the templates were created to ensure that erroneous values and typing errors were restricted during data entry. Internal quality assurance was assured through the entire process. More details are found under Annex 9: Data Management.

2.7.2 Data Cleaning

Data cleaning was conducted by a well-trained team of statisticians and epidemiologists, including screening for duplicates; identifying incomplete, misspelled, or irrelevant data; and identifying and correcting inconsistent values. Microsoft Excel and STATA version 14 were used for this process.

A team of laboratory technicians separated, labeled, and repacked DBS samples according to their mRDT results. A total of 67,907 samples were arranged in serial order and verified by identification number. More details are found under Annex 9: Data Management.

2.7.3 Data Analysis

Data were analyzed using Microsoft Excel and STATA version 14 software. The units of analysis were public primary school pupils aged between 5 and 19 years and selected households. Descriptive analysis (e.g., percentage, mean, maximum, minimum, and frequency) was used to summarize numeric and categorical variables. Locations of sampled schools, malaria prevalence, anemia prevalence, mosquito net ownership and use, and nutrition status were generated using QGIS 3.10. More details are found under Annex 9: Data Management.

2.8 Study Variables and Indicators

2.8.1 Malaria Prevalence

Malaria prevalence was used to assess the proportion of pupils with positive malaria test results among all pupils tested by mRDT. The proportions were presented as percentages and used to assess the magnitude of malaria infections among pupils across age groups, sex (boys and girls), urban-rural settings, regions, councils, and low and highlands areas.

2.8.2 Knowledge of Malaria Prevention

Pupils aged between 9 and 19 years were asked about their knowledge of methods used to prevent malaria and identify some of the recommended methods if they were aware. This indicator was used to assess the adoption of recommended malaria prevention behaviors among primary school pupils. The proportion of pupils who mentioned at least one preventive method more often among all interviewed pupils was compared across regions, councils, geographical zones, rural-urban settings, and sex.

2.8.3 Exposure to Malaria Messages

Pupils aged between 9 and 19 years were asked whether they had ever heard or seen malaria prevention, testing, and treatment messages. If so, the pupils were asked to describe the sources of information. This indicator was used to assess communication channels through

which malaria prevention testing and treatment messages were obtained by pupils. The proportion of pupils who mentioned that they were aware of at least one communication channel among all interviewed pupils was compared in different demographic variables, e.g., regions, councils, geographical zones, and rural-urban settings.

2.8.4 Mosquito Net Ownership and Use

Mosquito net ownership and use was assessed by comparing the proportion of pupils who reported at least one mosquito net at their home or family across different demographic variables. At the household level, long-lasting insecticidal net (LLIN) ownership was assessed by determining the number of LLINs observed in a household compared with any mosquito net identified in the household.

2.8.5 Anemia

Hemoglobin concentration among primary school pupils was measured at study sites by using a drop of blood obtained via finger prick and then stored in microcuvettes, which were inserted into the hemoglobinometer to determine the Hb concentration. Readings were documented immediately and adjusted for altitude in specific localities. The severity of anemia was defined based on WHO cut-off points (**Table 1**).

The WHO guidelines for Hb concentrations for the diagnosis of anemia in children and adolescents are presented below:

Table 1. Anemia cut-off points

Anemia Status[a]	Hb level (g/dl)			
	School Children aged 5–9 years	**School Adolescents aged 10–14 years [b]**		**School adolescents aged 15–19 years**
		If age = 10–11 years	***If age = 12–14 years***	
Any anemia	<11.0 g/dl	<11.0 g/dl	<12.0 g/dl	Girls: <12.0 g/dl Boys: <13.0 g/dl
Mild	11.0–11.4 g/dl	11.0–11.4 g/dl	11.0–11.9 g/dl	Girls: <11.0–11.9 g/dl Boys: <11.0–12.9 g/dl
Moderate	8.0–10.9 g/dl	8.0–10.9 g/dl	8.0–10.9 g/dl	8.0–10.9 g/dl
Severe	<8.0 g/dl	<8.0 g/dl	<8.0 g/dl	<8.0 g/dl

[a] Individual Hb values were adjusted for altitude greater than 1,000 m ASL. (42)
[b] According to Hb concentration for diagnosis of anemia and assessment of severity, WHO, 2011: Cut-off for adolescents aged 10 to 11 years are different from those aged 12 to 14 years.

The WHO cut-off points described in Table 1 were used to classify individual pupils with any form of anemia. The classifications were based on the young children, early and late adolescence; and by sex (boys and girls) of the pupils as shown on Table 1. The proportion of pupils with any mild, moderate, or severe anemia were compared across age groups (between 5 and 9, 10 and 14, and 15 and 19 years), sex, residency, zones, and regions.

2.8.6 Stunting

Standardized z-scores for height of children aged between 5 and 19 years

Standardized z-scores were computed from height for age measurements by using WHO AnthroPlus® (43). Observed standardized scores were used to classify individual pupils at three levels as indicated in Table 2. The three classifications are stunting (chronic malnutrition), moderate stunting (moderate chronic malnutrition), and severe stunting (severe

chronic malnutrition). Stunting, or being too short for one's age or failure to grow both physically and cognitively, is the result of chronic or recurrent malnutrition (11). The proportion of pupils with chronic, moderate, and severe malnutrition was compared across age groups, residence (urban-rural), sex, regions, altitude, geographical zones, and councils.

Table 2. Standardized z-scores for weight and height

Score Cut-off Points	Indicator Classification	Intensity
Stunting	Height for age z-score (HAZ) <-2 standard deviations (SDs)	Stunting
	HAZ <-2 and ≥-3 SDs	Moderate stunting
	HAZ <-3 SDs	Severe
Overweight or underweight	Body mass index for age z-score (BAZ) <-2 SDs	Thinness
	BAZ <-3 SDs	Severe thinness
	BAZ >1 SD	Overweight
	BAZ >2 SDs	Obesity

Underweight for children aged between 5 and 19 years

Body mass index (BMI) is defined as a quotient of the body weight in kilograms per square meters (kg/m2). An individual was classified as thin if the BMI for age z-scores was below -2 SDs and severely thin if BMI for age z-score was less than -3 SDs (Table 2). The proportion of pupils who were thin or had severe thin conditions were compared across age groups, sex, and residence.

Overweight for children aged between 5 and 19 years

An individual was classified as thin if BMI the z-score was above 1 SD and as obese if the BMI for age z-score was greater than 2 SDs. The proportion of pupils classified as obese or thin among all interviewed were compared across set categories of age groups, sex, residence, councils, regions, and zones (Table 2).

Physical Activity Level

In order to determine the level of physical activity among school children and adolescents, the International Physical Activity Questionnaire (IPAQ) was used. IPAQ describes physical activity in energy expenditure units—minutes per week. Metabolic equivalent of task (MET) is used to estimate the metabolic cost (energy expenditure as reflected by oxygen consumption) of physical activity—resting metabolic rate.

Selected items from the survey were used in the study concerning school children and adolescents' physical activity, which was adopted from the short version of the IPAQ. The short version of the IPAQ contains seven questions covering all types of physical activity: physical activity associated with the occupation performed or at school; physical activity at home and around the house; moving to various places; and mobility during free time devoted to recreation, playing games, sports, or other muscular work.

Only the physical activity lasting longer than 30 minutes was estimated, without rest breaks, and within the previous seven days.

The following was recorded in the study: frequency, duration, and intensity of physical activity (Assuming that a moderate physical activity means physical effort with slightly accelerated—with respect to resting—respiration and slightly accelerated heart rate. An intensive physical activity is a hard-physical effort which forces strongly intensified respiration and considerably

accelerated heart rate), as well as frequency and duration of walking daily. Weekly physical activity was calculated by summing-up the MET obtained during intense and moderate physical activity and while walking during the entire week. In the methodology of the assessment of the level of weekly physical activity by means of the IPAQ, the following three categories were selected:

1. Insufficient (LOW) physical activity – when the total energy expenditure does not reach 600 MET min/week. Those individuals who do not meet criteria for categories 2 or 3 are considered low/inactive.
2. Sufficient (MODERATE) physical activity – when the total energy expenditure ranges within 600–1,500 MET min/week, assuming that this expenditure is the effect of 3 or more days of intense physical activity for a minimum of 20 minutes daily; 5 or more days of moderate physical activity or marching-walking for at least 30 minutes; or combinations of intensive or moderate physical activity jointly burning more than 600 MET min/week.
3. High (HIGH) physical activity – when the total energy expenditure exceeds 1,500 MET min/week, and results from at least 3 days of intensive effort of approximately 30 minutes daily, or practically an everyday half-an-hour moderate physical activity or walking.

Dietary intake

Dietary intake was assessed by using a food frequency questionnaire that was later used to generate dietary diversity scores for participating households and primary school pupils. Heads of households were interviewed about their frequency in consuming specific food groups during one week.

Household Dietary Diversity and Individual Dietary Diversity

Information about household dietary diversity was obtained by counting food groups reported in the food frequency questionnaire. Itemized foods were categorized into 11 food groups—developed and aligned with Food and Agriculture Organization of the United Nations (FAO) guidelines—to calculate HDDSs (Table 3). Only five food groups were used to compute dietary diversity scores for primary school pupils based on those used most commonly and found in Tanzania (Table 4).

Table 3. Food groups to measure household dietary diversity

Number	Food group
1	Starchy staple foods
2	Roots and tubers
3	Fruits
4	Vegetables
5	Milk and milk products
6	Legumes, nuts, and seeds
7	Fish and other seafood
8	Meat
9	Eggs
10	Sweets (sugar and honey)
11	Oil and fats

Table 4. Food groups to measure Individual dietary diversity

Number	Food group
1	Cereal, green banana, roots, and tubers
2	Fruits
3	Vegetables
4	Pulses, nuts, and animal source foods
5	Sugar, fats, and oils

Analysis of Dietary Diversity Scores

Each food group consumed was assigned a number depending on the frequency of consumption. Typical dietary consumption is normally considered when a food item is consumed frequently, not just in one day (44). For analytical purposes, a score of 1 was given if a household or an individual consumed food from specific food groups five to seven times per week. The HDDS was scored between 0 and 11, and the individual dietary diversity score (IDDS) was scored between 0 and 5.

Exposure to Nutrition Messaging

Pupils aged between 9 and 19 years were asked whether they had seen or heard nutrition messages. If so, the pupils were asked to provide the source. This indicator was used to assess communication channels through which nutrition messages were received by pupils. The number of pupils who mentioned at least one communication channel was compared with all respondents to determine the percentage of pupils exposed.

2.8.7 Demographic Characteristics

This subsection discusses respondents' demographic characteristics, including age and sex; body temperature; malaria epidemiological strata; altitude; types of residence; geographical zones; regions, councils, and schools; and education level of parents. Each characteristic is discussed in the remainder of this subsection of the report.

Age and Sex

The age of each pupil was recorded and used to create different age groups according to epidemiological and established global standards. Four age groups were created to describe malaria metrics among pupils: between 5 and 9 years, 9 and 12 years, 12 and 16 years, and 17 and 19 years. Based on WHO standards, three age groups were created to record hemoglobin measurements: between 5 and 9 years, 10 and 14 years, and 15 and 19 years. Three age groups were also created to measure pupils' knowledge of and exposure to malaria prevention methods and messages: between 9 and 11 years, 12 and 16 years, and 17 and 19 years. Pupils were also grouped to measure their awareness of nutrition messaging: between 10 and 14 years and 15 and 19 years.

Body Temperature

The body temperature measurements of each pupil were recorded, and two categories were created to classify an individual with and without fever. A pupil whose body temperature was 37.5°C or higher was classified as having a fever, whereas a pupil with a body temperature between 36.5°C and 37.4°C were classified as normal.

Malaria Epidemiological Strata

There are four geographical areas or localities classified by their burden of malaria infection in Mainland Tanzania: high, moderate, low, and very low malaria epidemiological strata (45).

Altitude

Altitude was used to measure malaria and anemia prevalence between lowland and highland areas. Cut-off values for altitude were used to generate four classifications: lowland (less than 750 m ASL), midland (between 750 and 1,250 m ASL), highland (between 1,250 and 1,750 m ASL), and mountainous (greater than 1,750 m ASL) areas.

Types of Residence

The schools visited were grouped into rural and urban settings according to respective councils, i.e., district council, township authorities, municipals, and cities. Pupils within each school were grouped accordingly.

Geographical Zones

As part of the SMNS, the 26 regions were re-grouped according to the eight geographical zones mentioned above:

- Western (Kigoma and Tabora)
- Northern (Arusha, Kilimanjaro, and Tanga)
- Central (Dodoma, Manyara, and Singida)
- Southern highlands (Iringa, Njombe, and Ruvuma)
- Southern (Lindi and Mtwara)
- Southwest Highlands (Katavi, Mbeya, and Rukwa)
- Lake (Geita, Kagera, Mara, Mwanza, Shinyanga, and Simiyu)
- Eastern (Dar es Salaam, Morogoro, and Pwani).

Regions, councils, and schools

Malaria prevalence was characterized by regions, councils, and schools by using maps to assess the spatial distribution of malaria infection in Tanzania. Patterns of malaria infection across these administration areas allow for comparison and assessment of the disease across different data sources and time points. List of all regions, councils, and surveyed schools is found in Annex 11: List of the 2019 Surveyed Schools.

Education level of parents

The household education level was assessed based across the following indicators: no education, incomplete primary education, primary education, and secondary and college/university education.

Chapter Three: Results

3.1 Demographic Characteristics

3.1.1 Pupil Characteristics

Out of the 68,147 pupils sampled, 34,194 (50.2%) girls and 33,952 (49.8%) boys were interviewed, tested for malaria infection, and measured across various metrics (e.g., anthropometric measurements, and temperature). The mean age of all participants was 10.7 years.

A detailed summary of the number of schools and pupils recruited for the survey by region is summarized in Table 5. The highest average number of pupils interviewed and tested for malaria infection per council was 1,745 in Dar es Salaam (ranging between 379 and 2,951), and the lowest average number was in Pwani (ranging between 81 and 293). The highest average number of pupils per school was 121 (ranging between 67 and 188) in Dar es Salaam compared with 81 pupils (ranging between 60 and 126) per school in Pwani.

Table 5. Summary of surveyed schools and pupils by region

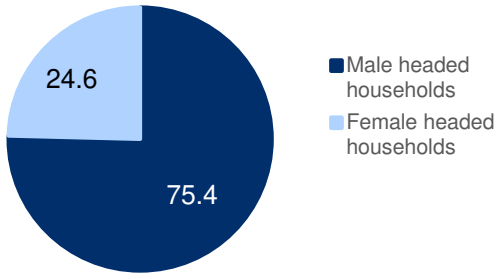
Region	Number of Councils per Region	Pupils per Council		Number of Schools Surveyed per Region	Pupils per School		Age (in Years)		Percentage (%) of Boys in Sample
		Mean	Minimum–Maximum		Mean	Minimum–Maximum	Mean	Minimum–Maximum	
Arusha	7	489	260–851	32	107	61–135	11	5–19	50.0
Dar es Salaam	5	1,745	379–2,951	72	121	67–188	10	5–19	49.4
Dodoma	8	371	140–1,048	31	96	60–118	11	5–19	50.1
Geita	6	352	141–667	21	100	60–134	11	5–19	50.2
Iringa	5	323	130–468	15	108	61–132	10	5–19	49.7
Kagera	8	427	205–898	33	104	68–136	11	5–19	49.6
Katavi	5	164	63–286	10	82	60–115	11	5–19	49.5
Kigoma	8[a]	426	195–776	44[a]	111	63–372	11	5–19	50.2
Kilimanjaro	7	457	235–901	30	107	71–142	10	5–18	50.2
Lindi	6	185	77–294	12	92	71–120	11	5–17	47.9
Manyara	7	427	176–661	28	107	70–158	11	5–19	49.8
Mara	9	285	99–418	26	99	66–134	11	5–18	49.0
Mbeya	7	309	127–797	23	98	59–212	10	5–18	49.7
Morogoro	9	370	133–701	31	108	64–149	10	5–17	49.7
Mtwara	9	192	85–394	19	91	60–129	10	5–16	50.1
Mwanza	8	487	365–816	37	108	69–213	11	5–19	50.1
Njombe	6	194	125–299	13	90	60–137	10	5–16	49.6
Pwani	9	154	81–293	17	81	60–126	11	5–18	50.3
Rukwa	4	435	236–718	17	102	71–126	11	5–18	51.4
Ruvuma	8	234	122–396	22	85	60–129	11	5–19	49.7
Shinyanga	5	332	219–440	19	105	63–138	11	5–19	50.6
Simiyu	6	336	132–462	19	106	63–140	11	5–19	49.4
Singida	7	235	94–438	17	97	67–133	11	6–19	51.7
Songwe	6	367	217–857	17	108	69–134	11	5–19	49.1
Tabora	8	406	100–644	31	108	60–170	11	5–19	49.9
Tanga	11	228	78–483	25	100	59–138	10	5–17	48.9
Total	**184**	**382**		**661**	**101**		**10.7**		**49.8**

[a] Includes refugee camps from Kakonko, Kibondo, and Kasulu DCs (14 schools).

3.1.2 Household Characteristics

Information on the socioeconomic characteristics of the household respondents in the 2019 SMNS provides context to interpret demographic indicators. This part presents information on the demographic and socioeconomic characteristics of the 2019 SMNS household respondents, such as sex, marital status, education, and current economic activity of household heads. In addition, the section presents households' information on source of drinking water, sanitation, and housing characteristics. A total of 6,753 households or household heads were interviewed in the 2019 SMNS.

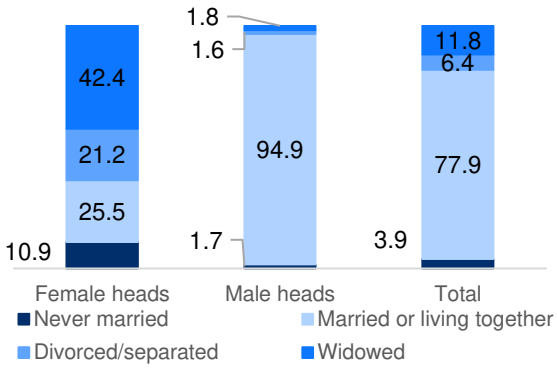
Figure 5. Percentage distirbution of household heads



3.1.3 Respondent Characteristics

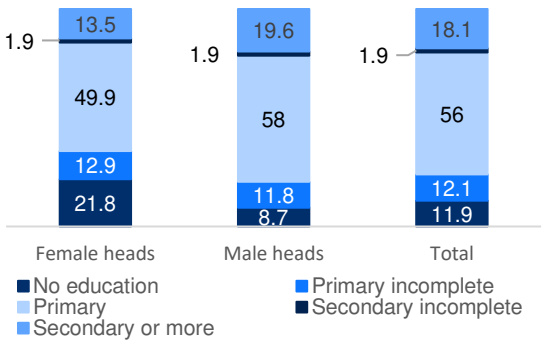
Figure 5 presents the distribution of interviewed households by sex of head of household according to the 2019 SMNS. Results show that 75.4% of the surveyed households are headed by males while 24.6% of the households are headed by females.

Figure 6. Percentage distribution of heads of households by marital status



Results further reveal that 3.9% percent of household heads have never married. Comparing males and female head of households, it can be observed that 25.5% of female heads and 94.9% of male heads are currently married or living together with a partner as if married (Figure 6). However, female heads are more likely to report that they are widowed (42.4%) than male heads (1.8%).

Figure 7. Percentage distribution of heads of households by highest level of education



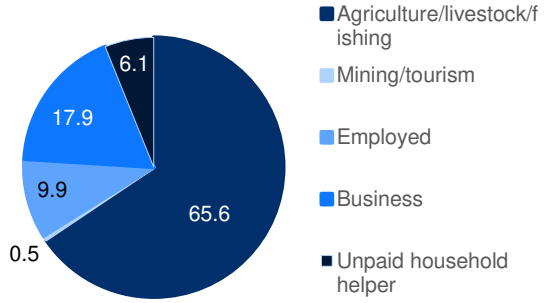
With respect to the educational background status of household heads, overall, 11.9% of household heads have never been to school. Among female-headed households, results show that 21.8% of them have no education, whereas among male headed households, results depict that 8.7% of them have no education (Figure 7).

Household heads in the 2019 SMNS were asked to mention their current

main economic activities they are engaged in. Results depict that 65.6% of the surveyed household heads were currently engaged in agricultural, livestock, and fishery occupations. The second common occupation was business related occupations, with 17.9% of household heads were currently working on business related activities (Figure 8).

3.1.4 Sources of Drinking Water

Figure 8. Percentage distribution of household heads by current economic activities



in the 2019 SMNS were asked to mention sources of water they use to get drinking water. Survey results show that three quarters of the surveyed households use water from improved water sources. Improved sources of drinking water include piped water, public taps, standpipes, tube-wells, boreholes, protected dug wells and springs, rainwater, and bottled water. Female-headed households are more likely to use water from improved sources than male-headed households (78.6 % versus 73.9%, respectively). Households whose heads have no education have the lowest percentage of getting water from improved water sources compared to households whose heads have other levels of education. Use of improved water sources among surveyed households ranges from low (60.9%) in Lake zone to high (92.3%) in Eastern zone (**Table 6**).

Table 6. Percent distribution of households by source of drinking water

Background Characteristics	Type of Water Sources			
	Unimproved/surface water source (%)	Improved water source (%)	Total (%)	Number of Households
Sex of household head				
Male	26.1	73.9	100	5,090
Female	21.4	78.6	100	1,663
Highest level of education of household head				
No education	33.1	66.9	100	798
Primary incomplete	28.6	71.4	100	810
Primary	26	74	100	3,763
Secondary incomplete	13.8	86.2	100	130
Secondary or more	15.3	84.7	100	1,215
Don't know	18.9	81.1	100	37
Zone				
Central	25.7	74.3	100	758
Eastern	7.7	92.3	100	1,341
Lake	39.1	60.9	100	1,576
Northern	20.7	79.3	100	911
Sothern Highlands	17.8	82.2	100	428

Background Characteristics	Type of Water Sources			
	Unimproved/surface water source (%)	Improved water source (%)	Total (%)	Number of Households
Southwest Highlands	21.3	78.7	100	656
Southern	33.3	66.7	100	282
Western	34.1	65.9	100	801
Total	**25**	**75**	**100**	**6,753**

3.1.5 Sanitation

Survey results indicate that, more than 4 in 10 (43.6%) surveyed households use an improved toilet facility. Improved toilet facilities include any non-shared toilet of the following types: flush/pour flush toilets to piped sewer systems, septic tanks, and pit latrines; ventilated improved pit (VIP) latrines; pit latrines with slabs; and composting toilets. Results further show that about 13% of interviewed households use a limited sanitation (improved but shared) facility. About 42% of interviewed households use a non-improved toilet facility and 1.7% of households have no toilet facility. Households headed by females are slightly more likely to use improved toilet facilities than households headed by males (44.5% versus 43.3%, respectively). Households whose heads have no education have the lowest percentage of using improved toilet facilities compared to households whose heads have other levels of education. Use of improved toilet facility among interviewed households ranges from a low of 28% in Southern zone to a high of 56.4% in Southwest Highlands zone (**Table 7**).

Table 7. Percent distribution of households by type of toilet facilities

Background characteristics	TYPE OF TOILET FACILITIES					
	Improved sanitation (%)	Limited sanitation (%)	Unimproved sanitation (%)	Open defecation	Total (%)	Number of Households
Sex of household head						
Male	43.3	12	43	1.7	100	5,089
Female	44.5	15.5	38.4	1.7	100	1,662
Highest level of education of household head						
No education	28.2	5.8	61.3	4.8	100	798
Primary incomplete	36.2	9.4	52.8	1.6	100	810
Primary	41.9	12.4	44.1	1.6	100	3,761
Secondary incomplete	55.4	23.8	20.8	0	100	130
Secondary or more	63.2	19.3	17.1	0.3	100	1,215
Don't know	32.4	32.4	35.1	0	100	37
Zone						
Central	44.1	5.7	47.2	3	100	757
Eastern	50.2	30.6	18.9	0.3	100	1,341
Lake	31.8	8.4	56.5	3.3	100	1,575
Northern	57	10.5	30.6	1.9	100	911
Sothern Highlands	55.4	10.5	33.9	0.2	100	428
Southwest Highlands	56.4	15.5	27.1	0.9	100	656
Southern	28	3.9	67.4	0.7	100	282
Western	29	3.4	66.3	1.4	100	801
Total	43.6	12.8	41.8	1.7	100	6,751

3.1.6 Housing Construction

The 2019 SMNS also collected information on other housing characteristics, including flooring, ceiling, and materials for screening on external windows. Results reveal that most of the interviewed households were living in dwellings with floors made of cement (49.3%) followed by earth (46.1 %). On the other hand, results show that more than 7 in 10 (76.5%) use nothing to cover the ceilings of their dwellings. Only 18.5% of the surveyed households use boards or gypsum as ceiling material. Similarly, survey results show that more than 3 in 10 (38.5%) of the surveyed households use nothing to screen the external windows of their dwellings. It was observed that 47.1 % of the interviewed households use wire mesh as the screening material for the external windows, **Table 8.**

Table 8. Percentage distribution of households by construction material

Housing Characteristics	Percent
Flooring material	
Earth/sand	46.1
Animal dung	0.6
Wood/planks	0.3
Cement	49.3
Tiles/vinyl	2.8
Other	0.8
Missing	0.1
Total	100
Ceiling material	
Nothing	76.5
Board/gypsum	18.5
Wood	1.5
Cement	1.1
Grass/mud	1.7
Other	0.6
missing	0.1
Total	100
Material for screening on external windows	
Nothing	38.5
Wire mesh	47.1
Old bed net	0.6
Plastic bag	2.2
Other	11.5
Missing	0.1
Total	100
Number of households	6,753

3.2 Malaria Prevalence

Out of the 68,146 pupils between the ages of 5 and 19 years who were tested for malaria by using SD Bioline Pf/Pan mRDT, 9,626 had positive malaria test results, indicating an overall national average malaria prevalence of 14.1% among primary school pupils in Mainland Tanzania in 2019 (Table 9). However, this result was very heterogeneous across age groups,

place of residence, sex of child, altitudes, malaria epidemiological strata, regions, geographical zones, and councils as shown in Table 9.

3.2.1 Age and Sex

Results indicate that malaria prevalence was 15.4% among boys and 12.8% among girls. More findings showed pupils in higher age groups had higher malaria prevalence compared to lower age groups. Across the age groups, higher malaria prevalence (17.6%) was observed among pupils aged 12 years and older compared with 11.2% prevalence among pupils aged younger than 9 years (Table 9).

3.2.2 Body Temperature

Among the pupils who recorded high body temperatures (≥37.5°C) in the survey; 37.5% of them had malaria infection compared with 13.2% of those with normal body temperatures (Table 9).

3.2.3 Malaria Epidemiological Strata

Malaria prevalence was highest (31.6%) in areas with high malaria epidemiological strata and lowest (0.1%) in very low malaria epidemiological strata (Table 9).

3.2.4 Altitude

Malaria infection was more prevalent (20%) in midland (between 750 and 1,250 m ASL) compared with 0.7% in mountainous areas (greater than 1,750 m ASL) (Table 9).

3.2.5 Geographical Zones

The highest malaria prevalence was observed in the southern (29.9%), western (28.1%), and lake (26.1%) zones compared with the central zone (0.5%) (Table 9).

3.2.6 Regions

Malaria prevalence varied across regions, with the highest recorded in Geita (49.4%) and Mtwara (35.4%) and lowest recorded in Arusha (0.03%). Out of the 26 regions in Mainland Tanzania, 10 (38.5%) recorded a malaria prevalence of less than 10.0% (Table 9 and Figure 9). Out of the 26 regions, 14 (53.8%) recorded malaria prevalence ranging between 10.0% and 30.0%.

3.2.7 Councils

Malaria prevalence greater than 60.0% was observed in Ushetu (73.0%), Liwale (65.8%), and Mbogwe (63.3%) district councils (Figures 10 and 11). Out of 184 councils, 32 (17.4%) recorded no malaria infections (0.0%). Furthermore, out of 184 councils, 8 (4.3%) had more than 50.0% of pupils with malaria infections—most of them were located around Lake Victoria, Western zone, Lake Tanganyika, Rufiji River Basin, Southern zone, and along the coast of the Indian Ocean (Figure 11).

3.2.8 Schools

Out of 661 primary schools involved in the survey, 59 (8.9%) recorded malaria prevalence of more than 50.0%. The top three primary schools with the highest malaria prevalence were Nyamahuna Primary School (78.9%) in Geita Town council, Sinwakere Primary School (75.6%) in Ushetu DC, and Shibumba Primary School (73.7%) in Nyang'hwale DC. A total of 227 (34.5%) schools recorded a malaria prevalence of less than 1.0%, with most of these schools located in Arusha, Kilimanjaro, and Manyara regions (Figure 11).

Table 9. Malaria prevalence among school-aged pupils

Demographic Characteristics	Percentage (%) of Pupils with Positive Malaria Tests	Number of Pupils Tested for Malaria
Age (in Years)		
5 to <9	11.2	15,904
9 to <12	13.7	24,733
12 to 16	16.1	27,076
17 to 19	22.9	433
Sex		
Girls	12.8	34,194
Boys	15.4	33,952
Body Temperature		
Normal	13.2	65,418
Fever	37.5	2,727
Malaria Epidemiological Strata		
High	31.6	23,941
Low	1.7	19,346
Moderate	12.8	13,369
Very low	0.1	11,490
Altitude		
<750 m ASL	12.3	19,220
750–1,250 m ASL	20	26,644
1,250–1,750 m ASL	9.9	19,344
>1,750 m ASL	0.7	2,938
Types of Residence		
Rural	17.9	49,347
Urban	4.1	18,799
Geographical Zones		
Central	0.5	7,599
Eastern	6.4	13,443
Lake	26.1	15,995
Northern	4.9	9,131
Southern highlands	7.2	4,653
Southwest highlands	10.5	6,557
Southern	29.9	2,837
Western	28.1	7,931
Regions		
Arusha	0.03	3,421
Dar es Salaam	1.4	8,725
Dodoma	0.7	2,967
Geita	49.4	2,109
Iringa	0.5	1,614
Kagera	26.1	3,419
Katavi	28.4	818
Kigoma	28.2	4,681
Kilimanjaro	0.1	3,202
Lindi	21.4	1,107

Demographic Characteristics	Percentage (%) of Pupils with Positive Malaria Tests	Number of Pupils Tested for Malaria
Manyara	0.2	2,987
Mara	25.2	2,563
Mbeya	4.3	2,166
Morogoro	13.5	3,334
Mtwara	35.4	1,730
Mwanza	23.7	3,896
Njombe	0.2	1,166
Pwani	21.1	1,384
Rukwa	16.2	1,739
Ruvuma	17.2	1,873
Shinyanga	23.2	1,992
Simiyu	10.6	2,016
Singida	0.7	1,645
Songwe	4.5	1,834
Tabora	28.0	3,250
Tanga	17.7	2,508
Total	**14.1**	**68,146**

Figure 9. Malaria prevalence by region

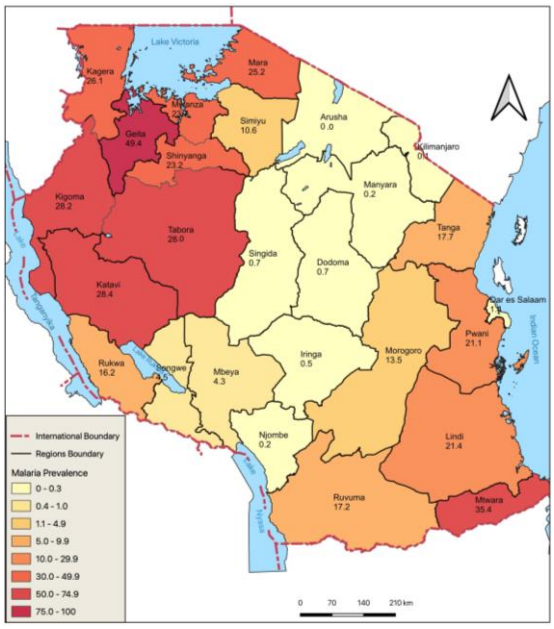


Figure 10. Malaria prevalence by council

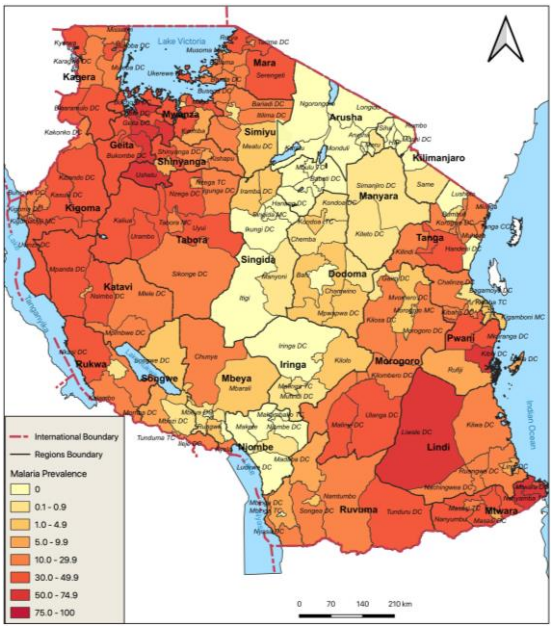
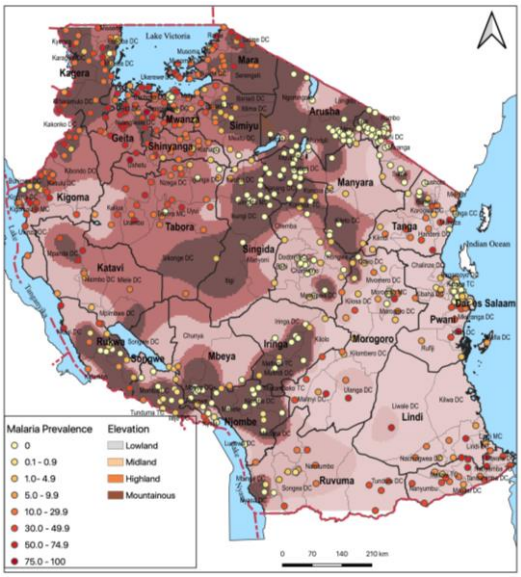


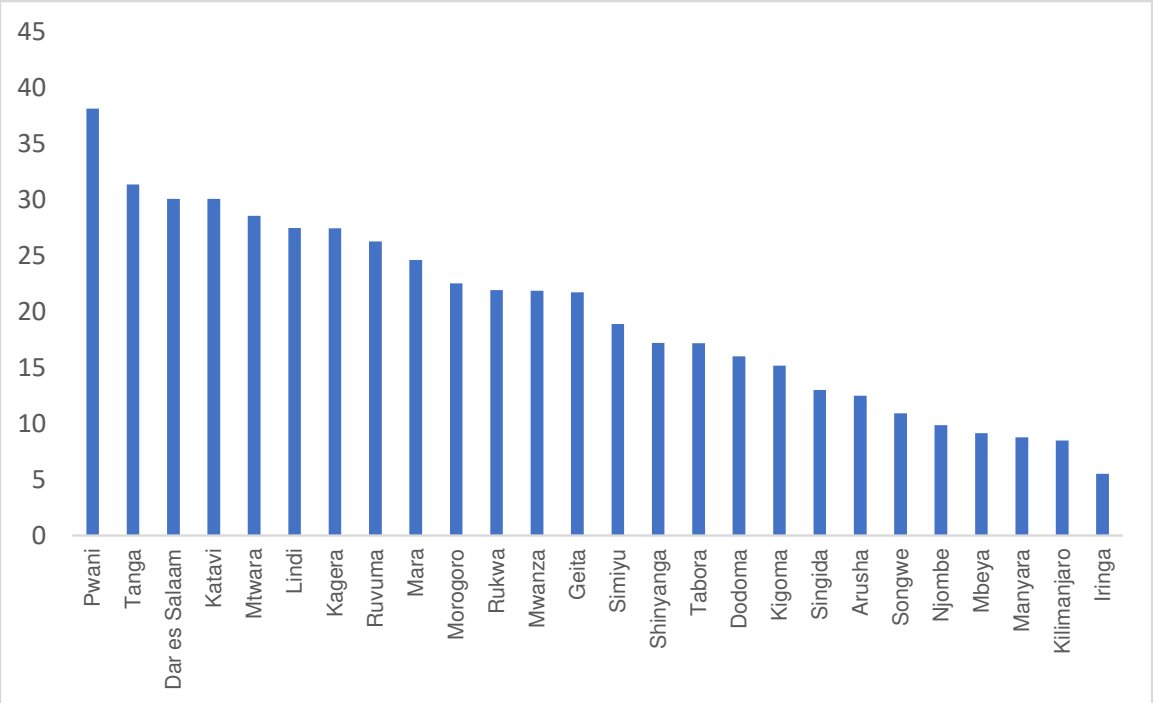
Figure 11. Malaria prevalence among schools across regions



3.3 History of Fever

Out of the pupils surveyed, 20.2% reported having a fever or history of fever two weeks before the survey with high variations across the regions. The highest proportion of pupils who reported fever or had history of fever in the two weeks before the survey was observed in the Pwani region, while the lowest was reported in the Iringa region (Figure 12).

Figure 12. History of fever two weeks before the survey

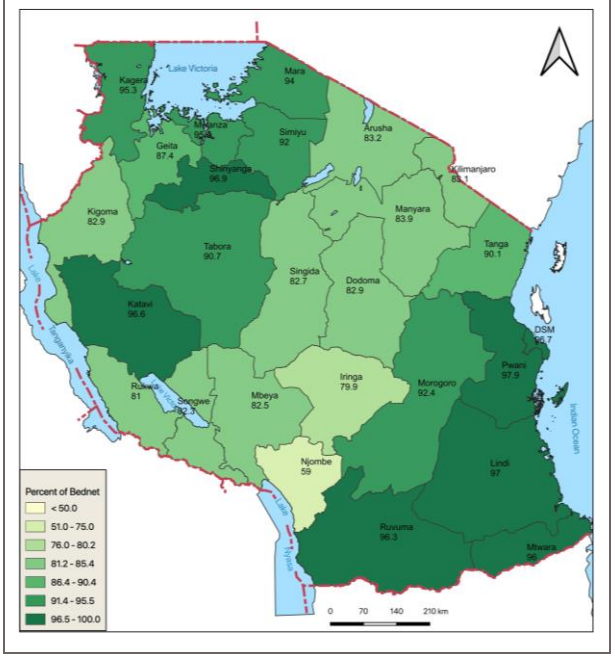


3.4 Mosquito Net Ownership, Access and Use

3.4.1 Reported Mosquito Net Ownership and Use Among Pupils

Out of the pupils surveyed, 89.3% reported having at least one mosquito net in their home or household, 84.3% said that they are generally sleeping under a mosquito net (Table 11), while 96.4% slept under a mosquito net the night before the survey.

Figure 13. Reported mosquito net ownership among pupils (9 and 19 years old)



Age and sex

Out of the pupils surveyed, 89.8% of girls and 88.7% of boys reported to have at least one mosquito net in their households. These percentages decreased slightly for girls (85.2%) and for boys (83.5%) among pupils who reported that they typically sleep under a mosquito net (**Table 10**).

Based on the findings of the survey, 91.1% of pupils aged between 12 and 16 years reported having at least one mosquito net in their households.

The highest proportion of pupils (84.7%) who generally sleep under mosquito nets was recorded in children aged between 9 and 11 years. The lowest proportion (77.2%) of pupils who generally sleep under mosquito nets was recorded among older pupils aged between 17 and 19 years (Table 10). The majority of pupils who reported sleeping under a mosquito net the night before the survey was reported by the younger age group (between 5 and 8 years; 97.3%), followed by 9 to 11 years (96.7%); the lowest percentage of pupils reported were aged between 17 and 19 years (95.4%).

Types of Residence

Based on the findings of the survey, 93.8% of pupils who reported having at least one mosquito net in their households were from urban settings compared with 87.5% of pupils in rural settings (Table 10). A similar pattern was observed among pupils who reported that they typically sleep under mosquito nets: 90.5% of pupils in urban settings compared with 81.8% of pupils in rural settings (Table 10).

Geographical Zones

The highest percentage of pupils (96.4%) who reported having at least one mosquito net in their household were in the southern zone, and the lowest percentage of pupils (81.2%) was recorded in the southern highlands zone (Table 10).

The highest percentage of pupils (93.3%) who reported that they typically sleep under a mosquito net was recorded in the eastern zone, and the lowest percentage of pupils (74.0%) was recorded in the southeast highlands zone (Table 10). Similarly, the highest percentage of pupils (98.2%) who reported having slept under a mosquito net the previous night was recorded in the eastern zone, and the lowest percentage of pupils (93.5%) was recorded in the central zone (Table 10).

Malaria Epidemiological Strata

The highest percentage of pupils (94.8%) who reported having at least one mosquito net in their household was recorded in moderate strata, and the lowest percentage of pupils (80.1%) was recorded in very low strata (Table 10). Similarly, the highest percentage of pupils (88.1%) who reported that they typically sleep under a mosquito net was recorded in moderate strata, and the lowest percentage of pupils (80.7%) was recorded in very low strata (Table 10).

Most pupils (97.2%) who reported that they had slept under a mosquito net the night before the survey were recorded in moderate strata, whereas the lowest percentage of pupils (95.0%) was recorded in very low strata (Table 10).

Malaria Prevalence

Among the pupils with positive malaria tests results, 89.4% reported to have at least one mosquito net in their households, and 77.9% of these reported that they were generally sleeping under a mosquito net (Table 11). In addition, 95.0% of pupils with malaria positive tests results reported having slept under a mosquito net the night before the survey.

Regions

Most pupils (97.9%) who reported having at least one mosquito net in their household were recorded in the Pwani Region; the lowest percentage of pupils (59.0%) was recorded in the Njombe Region. The highest percentage of pupils (95.5%) who typically sleep under a mosquito net was also recorded in the Pwani Region, and the lowest percentage of pupils (67.8%) was recorded in the Geita Region (Table 10 and Figure 13).

Most pupils reported that they had slept under a mosquito net the night before the survey. The highest percentages of pupils were recorded in Dar es Salaam and Mwanza, with each region recording 98.5%; the lowest percentage of pupils (90.8%) was recorded in the Manyara Region (Table 10).

Table 10. Mosquito net ownership and use among pupils aged between 5 and 19 years

Demographic Characteristics	Percentage (%) of Pupils who Reported Having at Least One Mosquito Net in Their Household	Number of Pupils Interviewed	Among Those who Reported Having at Least One Mosquito Net in Their Household, the Percentage (%) of Pupils who Typically Sleep Under Mosquito Nets	Number of Pupils who Reported Having at Least One Mosquito Net in Their Household	Percentage (%) of Pupils who Slept Under Mosquito Nets the Night Before the Survey	Among Those who Reported Having at Least One Mosquito Net in Their Household, the Number of Pupils who Typically Sleep Under Mosquito Nets
Malaria Status						
Negative	89.2	58,460	85.4	52,160	96.6	44,532
Positive	89.4	9,624	77.9	8,604	95.1	6,703
History of fever						
No	88.4	54,352	83.6	48,066	96.6	40,179
Yes	92.5	13,717	87.1	12,687	95.8	11,050
Age (in Years)						
5 to 8	85.8	15,887	83.6	13,632	97.3	11,392
9 to 11	89.5	24,715	84.7	22,124	96.7	18,730
12 to 16	91.1	27,049	84.5	24,644	95.7	20,832
17 to 19	84.1	433	77.2	364	95.4	281
Sex						
Girls	89.8	34,165	85.2	30,667	96.6	26,118
Boys	88.7	33,919	83.5	30,097	96.3	25,117
Malaria Epidemiological Strata						
Very low	80.1	11,480	80.7	9,198	95.0	7,421
Low	88.9	19,312	85.5	17,167	97.0	14,684
Moderate	94.8	13,367	88.1	12,676	97.2	11,165
High	90.8	23,925	82.7	21,723	96.1	17,965
Altitude						
<750 m ASL	95.7	19,217	91.8	18,385	97.4	16,876
750–1,250 m ASL	90.5	26,597	83.4	24,060	96.7	20,060

Demographic Characteristics	Percentage (%) of Pupils who Reported Having at Least One Mosquito Net in Their Household	Number of Pupils Interviewed	Among Those who Reported Having at Least One Mosquito Net in Their Household, the Percentage (%) of Pupils who Typically Sleep Under Mosquito Nets	Number of Pupils who Reported Having at Least One Mosquito Net in Their Household	Percentage (%) of Pupils who Slept Under Mosquito Nets the Night Before the Survey	Among Those who Reported Having at Least One Mosquito Net in Their Household, the Number of Pupils who Typically Sleep Under Mosquito Nets
1,250–1,750 m ASL	83.7	19,340	79.1	16,197	95.1	12,811
>1,750 m ASL	72.4	2,930	70.1	2,122	93.3	1,488
Types of Residence						
Rural	87.5	43,131	81.8	43,130	96.2	35,284
Urban	93.8	17,634	90.5	17,634	97.0	15,951
Geographical Zones						
Central	83.2	7,568	80.6	6,298	93.5	5,076
Eastern	95.8	13,442	93.3	12,872	98.2	12,014
Lake	93.9	15,993	83.0	15,014	96.6	12,459
Northern	85.0	9,107	84.0	7,744	96.1	6,507
Southern Highlands	81.2	4,651	84.1	3,778	94.3	3,177
Southwest Highlands	83.8	6,556	74.0	5,494	96.2	4,064
Southern	96.4	2,837	89.4	2,735	96.0	2,444
Western	86.1	7,930	80.5	6,829	97	5,494
Regions						
Arusha	83.2	3,421	84.6	2,845	95.6	2,406
Dar es Salaam	96.7	8,724	93.5	8,437	98.5	7,888
Dodoma	82.9	2,936	85.5	2,433	94.9	2,079
Geita	87.4	2,108	67.8	1,842	95.7	1,248
Iringa	79.9	1,613	78.6	1,288	92.4	1,014
Kagera	95.3	3,418	82.6	3,257	93.9	2,689
Katavi	96.6	818	86.8	790	97.7	686
Kigoma	82.9	4,680	83.9	3,880	97.2	3,254

Demographic Characteristics	Percentage (%) of Pupils who Reported Having at Least One Mosquito Net in Their Household	Number of Pupils Interviewed	Among Those who Reported Having at Least One Mosquito Net in Their Household, the Percentage (%) of Pupils who Typically Sleep Under Mosquito Nets	Number of Pupils who Reported Having at Least One Mosquito Net in Their Household	Percentage (%) of Pupils who Slept Under Mosquito Nets the Night Before the Survey	Among Those who Reported Having at Least One Mosquito Net in Their Household, the Number of Pupils who Typically Sleep Under Mosquito Nets
Kilimanjaro	83.1	3,192	84.2	2,653	97.8	2,233
Lindi	97.0	1,107	90.9	1,074	96.6	976
Manyara	83.9	2,987	77.0	2,505	90.8	1,928
Mara	94.0	2,563	82.3	2,410	97.1	1,984
Mbeya	82.5	2,166	76.1	1,787	96.5	1,360
Morogoro	92.4	3,334	91.9	3,080	97.6	2,832
Mtwara	96.0	1,730	88.4	1,661	95.6	1,468
Mwanza	95.5	3,896	89.5	3,719	98.5	3,330
Njombe	59.0	1,166	76.0	688	94.3	523
Pwani	97.9	1,384	95.5	1,355	97.8	1,294
Rukwa	81.0	1,738	61.0	1,407	93.6	858
Ruvuma	96.3	1,872	91.0	1,802	95.5	1,640
Shinyanga	96.9	1,992	87.5	1,931	97.5	1,690
Simiyu	92.0	2,016	81.8	1,855	96.4	1,518
Singida	82.7	1,645	78.6	1,360	95.5	1,069
Songwe	82.3	1,834	76.8	1,510	96.9	1,160
Tabora	90.7	3,250	76.0	2,949	96.7	2,240
Tanga	90.1	2,494	83.2	2,246	94.5	1,868
Total	**89.3**	**68,084**	**84.3**	**60,764**	**96.4**	**51,235**

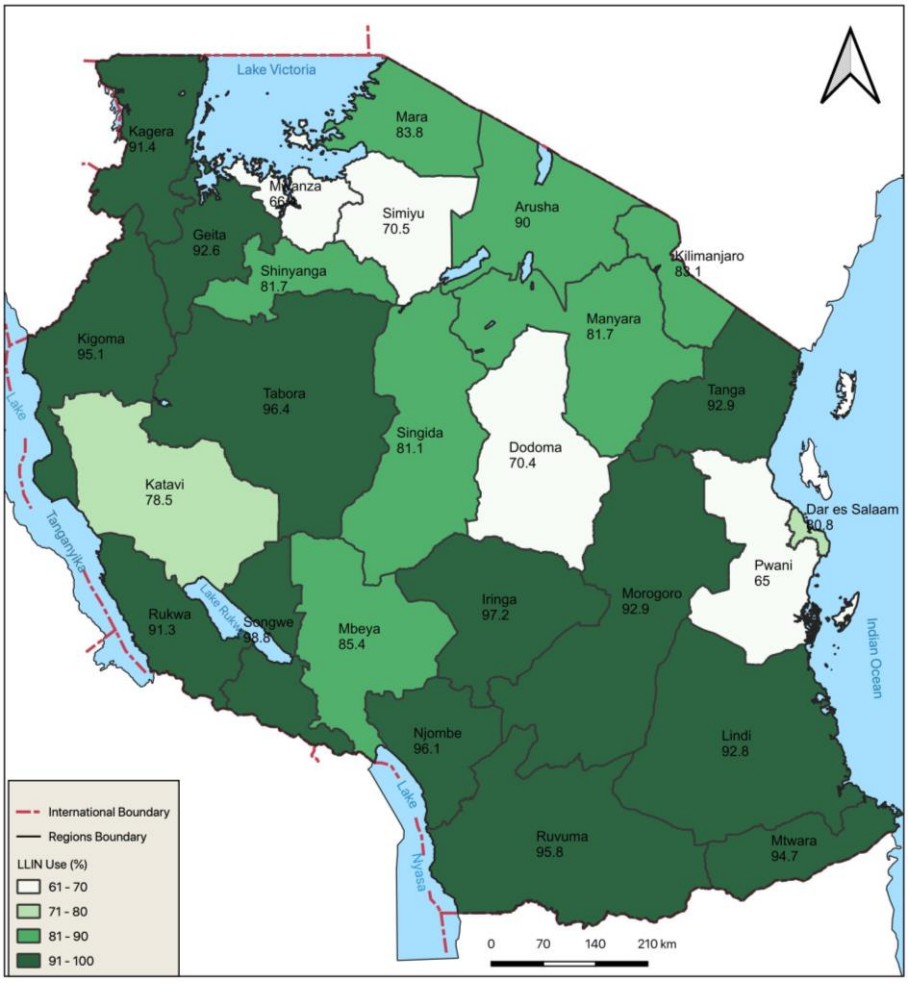
3.4.2 Household Mosquito Net Ownership, Access and Use

Based on the findings, 83.2% of the surveyed households in Mainland Tanzania own at least one any mosquito net (Table 11). Ownership of at least one LLIN in a household was slightly lower (73.1%) compared with reported ownership of any type of mosquito net. Households reported owning approximately three mosquito nets compared with two LLINs.

The results further indicate that access i.e., The overall percentage of households with at least one of any type of mosquito net for every two people in the household the night before the survey was 65.2, while the access to at least one LLIN for every two people who slept in the household the night before the survey was low (40.0%).

The overall use of any mosquito net was low (62.8%) in the household population that slept under any mosquito net the night before the survey. Contrarily, the use of LLINs was higher (85.1%) among household population slept under an LLIN the night prior to the survey.

Figure 14. Household LLIN ownership



Types of Residence

Slightly higher any mosquito net ownership (84.8%) was recorded in urban settings compared with rural settings (83.0%). However, LLIN ownership in rural residence (85.4%) was slightly higher than LLIN use in urban settings (81.9%) (Table 12).

Malaria Epidemiological Strata

Ownership of at least one mosquito net was higher (91.4%) among households in moderate malaria epidemiological stratum than households in high epidemiological stratum (85.4%). A

similar trend was observed as related to the ownership of LLINs per household between moderate and high epidemiological strata (Table 11). The percentage of households with at least one mosquito net for every two people who stayed in the household the night before the survey was higher (71.0%) in very low malaria epidemiological stratum and was lower in moderate (62.3%) and high (62.2%) malaria epidemiological strata.

The findings indicate that, only 48.7% of the household population in very low malaria epidemiological strata slept under any mosquito net the night before the survey. The use of Long-Lasting Insecticide treated Net (LLINs) the night before survey was high (> 80%) in all malaria epidemiological strata (Table12).

Geographical Zones

The highest percentage of households that reported owning at least one of any type of mosquito net was recorded in the Southern (94.7%), Eastern (93.2%), and Lake (89.7%), zones; the Central zone recorded the lowest percentage (69.6%). The results regarding LLIN ownership followed the same trend as that of any mosquito net across the zones. The percentage of households with LLIN for every two people who stayed in the household the night before the survey was highest in the Southern zone (70.9%) and lowest in the Central zone (24.7%).

Generally, more than 50% of the household population slept under any mosquito net night before the survey in all geographical zones except the Central zone which recorded the lowest use 46% of any mosquito net. The Southern (83.4%) and Eastern (78.5%) geographical zones had the highest household population that slept under any mosquito net the night prior to the survey. The results also indicate the Southern Highland (96.2%), Western (95.7) and Southern (93.8%) zones recorded the highest use of LLINs.

Regions

Four out of 26 (15.4%) regions, reached the national goal of ensuring 85.0% of the household owned LLINs (Table 10). LLIN ownership was highest in the Ruvuma Region (92.5%) and lowest in the Dodoma Region (54.1%) (Figure 14). High ownership of at least one mosquito net per household was observed in the following regions: Lindi (97.3%), Mwanza (96.2%), Dar es Salaam (94.8%), Ruvuma (94.7%), Pwani (91.6%), Katavi (91.4%), and Simiyu (90.9%). The lowest mosquito net ownership among households was observed in the Manyara (64.3%) and Njombe (62.5%) regions. The highest percentages of households with at least one LLIN for every two people per household the night before the survey was recorded was in the Lindi (72.1%) and Mtwara (70.2%) regions, and the lowest percentage was recorded in the Katavi Region (18.5%). However, none of the regions attained the national goal of 80% population coverage. The highest percentages of households with mosquito nets available for every two people per household were observed in the Iringa (86.0%), Njombe (82.1%), Lindi (82.0%), Mtwara (81.9%), and Mbeya (80.0%) regions; the lowest percentage was observed in the Katavi Region (42.0%). The highest differences between ownership of at least one of any type of mosquito net and LLINs were observed in the Mwanza (26.7%), Simiyu (24.1%), and Pwani (23.1%) regions.

In mainland Tanzania, only five (5) regions namely Ruvuma, Mwanza, Mtwara, Lindi and Dar es Salaam recorded the highest (>75%) of the household population to have slept under any mosquito net the night before the survey. About 80% (21/26) regions recorded low use (<75%) of any mosquito compare the lowest use recorded in households in Iringa (49.9%), Dodoma (45.2%), Manyara (41.1%), and Njombe (32.8%) (Table 12). On the contrary, the average use of LLIN was high where 85.1% of the household population slept under an LLIN the night prior to the survey. The results further indicate that 54% (14/26) of the regions recorded more than

90% of the household population to have slept under LLINs the night prior to the survey. However, Pwani (65%) and Mwanza (66.4%) regions recorded the lowest percentage of household population who slept under LLINs the night prior to the survey (Figure 14).

Education Level and Main Occupation Status

Overall, heads of household with primary education and above reported higher ownership of LLINs in the households than those with incomplete primary education and no education. similarly, heads of household with a secondary level of education and above reported the highest (89.5%) ownership of at least one mosquito net in the household. Lowest ownership (71.1%) was reported in households where the head of household had no education (Table 11).

Unpaid or unemployed heads of household recorded the lowest (66.3%) ownership of any mosquito net in their household than those with any kind of occupation. Mosquito net ownership was high among employed heads of households (93.4%), followed by those involved in business activities (89.7%). A similar pattern was recorded for LLINs ownership. Heads of households involved in mining or tourism activities recorded the least ownership of any mosquito net (75.0%).

Results indicate the use of any mosquito net the night before the survey was proportionate with education level among head of the household. The highest percentage (75.2%) was reported among the household population with the head of household having secondary education or higher education slept under any mosquito net compared to 49.5% the population with uneducated head of household. However, regardless of the education level of heads of household more than 80% of the household population slept under Long Lasting Insecticide treated Net (LLINs).

Results also indicate the use of mosquito net the night before survey varied with social economic status of the heads of household. A larger percentage of household population with an employed (78.5%) and businessmen (73.9%) as head of house slept under any mosquito net last night compared to those within other social economic categories. The use of LLINs was generally high (>75%) across all social economic categories (Table 12).

Table 11. Mosquito net ownership and access among surveyed households

Demographic Characteristics	Percentage (%) of Households with at Least One Mosquito Net		Average Number of Nets per Household		Number of Households	Percentage of the Household Population That Could Sleep under One Mosquito Net If Each Net in the Household Were Used by up to 2 People	
	Household Ownership of at Least One Mosquito Net	Household Ownership of at Least One LLIN	Any Mosquito Net	LLIN		Any Mosquito Net	LLIN
Gender of Heads of Households							
Men	83.7	74.3	2.5	1.8	5,090	63.1	38.8
Women	81.5	69.5	2.4	1.6	1,663	71.4	43.4
Highest Level of Education of Head of Household							
No education	71.1	61.5	2.4	1.4	798	68.5	33.2
Primary incomplete	74.4	64.9	2.4	1.5	810	60.4	29.7
Primary	85.5	76.3	2.5	1.8	3,763	62.5	39.9
Secondary incomplete	86.2	76.2	2.4	1.8	130	68.5	48.5
Secondary or more	89.5	75.8	2.6	1.9	1,215	73.6	50.1
Do not know	86.5	75.7	2.6	1.9	37	81.1	59.5
Main Occupation of Head of Household							
Agriculture, livestock, or fishing	80.6	72.3	2.5	1.7	4,425	36.9	37.3
Mining or tourism	75.0	68.8	2.4	1.4	32	31.3	31.3
Employed	93.4	78.0	2.6	2.0	668	25.0	53.3
Business	89.7	75.8	2.5	1.8	1,208	33.1	45.0
Unpaid household helper or unemployed	75.6	66.3	2.5	1.5	410	34.6	32.4
Do not know	80.0	60.0	2.6	1.6	10.0	10.0	60.0
Malaria Epidemiological Strata							
Very low	69.9	63.1	2.3	1.4	1,151	71	36.9
Low	82.8	69.2	2.5	1.6	1,903	67.3	38.6
Moderate	91.4	80	2.6	2	1,298	62.2	44.3

Demographic Characteristics	Percentage (%) of Households with at Least One Mosquito Net		Average Number of Nets per Household		Number of Households	Percentage of the Household Population That Could Sleep under One Mosquito Net If Each Net in the Household Were Used by up to 2 People	
	Household Ownership of at Least One Mosquito Net	Household Ownership of at Least One LLIN	Any Mosquito Net	LLIN		Any Mosquito Net	LLIN
High	85.4	77.2	2.5	1.9	2,401	62.3	40.2
Type of Residence							
Rural	83.0	73.1	2.5	1.7	6,018	35.2	39.6
Urban	84.8	73.3	2.5	1.8	735	32.0	43.1
Geographical Zones							
Central	69.6	56.2	2.1	1.1	758	63.9	24.7
Eastern	93.2	80.5	2.7	2.1	1,341	67.8	49.8
Lake	89.7	74.4	2.5	1.7	1,576	59.7	35.7
Northern	73.4	66.3	2.3	1.5	911	65.7	35.0
Southern highlands	80.4	76.9	2.5	2.0	428	80.1	57.2
Southwest highlands	78.4	71.5	2.3	1.6	656	65.7	37.8
Southern	94.7	89.4	2.6	2.3	282	81.9	70.9
Western	78.8	75.3	2.6	1.9	801	57.8	33.8
Region							
Arusha	69.9	63.2	2.3	1.4	342	68.2	34.1
Dar es Salaam	94.8	80.1	2.7	2.1	863	66.5	48.8
Dodoma	71.6	54.1	2.1	1.1	294	68.4	27.2
Geita	86.4	81.6	2.1	1.6	206	42.2	20.9
Iringa	75.2	70.5	2.3	1.6	129	86.0	56.6
Kagera	88	82.1	2.3	1.9	341	61.9	43.4
Katavi	91.4	71.6	2	1.4	81	42.0	18.5
Kigoma	75.6	71.1	2.4	1.7	471	55.4	28.7
Kilimanjaro	70.4	60.1	2.4	1.4	321	73.2	37.7

Demographic Characteristics	Percentage (%) of Households with at Least One Mosquito Net		Average Number of Nets per Household		Number of Households	Percentage of the Household Population That Could Sleep under One Mosquito Net If Each Net in the Household Were Used by up to 2 People	
	Household Ownership of at Least One Mosquito Net	Household Ownership of at Least One LLIN	Any Mosquito Net	LLIN		Any Mosquito Net	LLIN
Lindi	97.3	91.9	2.7	2.4	111	82.0	72.1
Manyara	64.3	54.3	2.1	1	300	64.3	21.3
Mara	84.7	75.2	2.5	1.7	250	67.2	40.4
Mbeya	68.4	60	2.4	1.4	215	80.0	38.1
Morogoro	89.9	86.9	2.5	2.1	335	66.9	52.2
Mtwara	93	87.7	2.5	2.2	171	81.9	70.2
Mwanza	96.2	69.5	2.8	1.8	394	63.5	35.0
Njombe	62.5	58	2.1	1.3	112	82.1	41.1
Pwani	91.6	68.5	2.7	1.8	143	77.6	50.3
Rukwa	81.6	75.3	2.2	1.6	174	46.6	24.1
Ruvuma	94.7	92.5	2.8	2.6	187	74.9	67.4
Shinyanga	87.9	69.7	2.4	1.7	198	70.2	40.9
Simiyu	90.9	66.8	2.5	1.7	187	46.0	27.3
Singida	75.6	63.4	2.1	1.3	164	54.9	26.2
Songwe	81.2	81.2	2.3	1.8	186	77.4	58.6
Tabora	83.3	81.2	2.8	2.3	330	61.2	41.2
Tanga	82.3	78.6	2.3	1.7	248	52.4	32.7
Total	**83.2**	**73.1**	**2.5**	**1.7**	**6,753**	**65.2**	**40.0**

Table 12. Mosquito net use among surveyed households

Background Characteristic	Percentage of people who used Any net the night before the survey	Number of people who used Any net	Percentage of persons who used LLINs the night before the survey	Percentage who slept under an LLIN night before the survey among those reported to sleep under mosquitoe net	Number of persons who used LLINs	Number of persons in households
Regiona Name						
Arusha	52.1	879	46.9	90.0	792	1688
Dar es Salaam	81.7	3487	65.9	80.8	2811	4268
Dodoma	45.2	615	31.7	70.4	432	1361
Geita	57.5	680	53	92.6	627	1183
Iringa	49.9	246	48.5	97.2	239	493
Kagera	65.7	1082	59.9	91.4	987	1648
Katavi	64.5	293	50.7	78.5	230	454
Kigoma	54.8	1518	52.1	95.1	1444	2772
Kilimanjaro	53.3	735	44.3	83.1	610	1378
Lindi	87	400	80.4	92.8	370	460
Manyara	41.1	651	33.6	81.7	532	1583
Mara	59	766	49.4	83.8	642	1299
Mbeya	52	494	44	85.4	418	950
Morogoro	72.3	1119	66.8	92.9	1033	1547
Mtwara	81.1	562	76.8	94.7	532	693
Mwanza	79.8	1771	53.2	66.4	1179	2218
Njombe	32.8	153	31.5	96.1	147	466
Pwani	72.8	520	47.3	65.0	338	714
Rukwa	58.8	584	53.3	91.3	530	994
Ruvuma	76	670	73	95.8	643	881
Shinyanga	69.8	623	56.9	81.7	508	893
Simiyu	60.1	682	42.2	70.5	479	1135
Singida	57.2	455	46.4	81.1	369	796
Songwe	59.5	421	58.8	98.8	416	707
Tabora	56.8	1112	54.8	96.4	1072	1957
Tanga	55.9	774	51.8	92.9	718	1385
Residence						
Rural	62.5	18974	53.3	85.4	16196	30372
Urban	65.3	2318	53.6	81.9	1902	3551
Geographical zone						
Central	46	1721	35.6	77.5	1333	3740

Eastern	78.5	5126	64.1	81.8	4182	6529
Lake	66.9	5604	52.8	79	4422	8376
Northern	53.7	2388	47.6	88.8	2120	4451
Sothern Highlands	58.1	1069	55.9	96.2	1029	1840
South West Highlands	57.7	1792	51.3	89.3	1594	3105
Southern	83.4	962	78.2	93.9	902	1153
Western	55.6	2630	53.2	95.7	2516	4729
Malaria Strata						
Very Low	48.7	2551	42.6	87.5	2233	5240
Low	65.9	5992	52.7	80.2	4792	9087
Moderate	69.2	4735	59.1	85.6	4046	6841
High	62.8	8014	55.1	87.8	7027	12755
Highest level of education of Household head						
No education	49.5	2009	42.5	85.9	1726	4057
Primary incomplete	52.9	2284	44.5	84	1919	4316
Primary	63.9	12384	55.2	86.5	10695	19368
Secondary incomplete	69.6	410	59.8	85.9	352	589
Secondary or more	75.2	4073	60.8	81.1	3296	5417
Main social economic status of household head						
Agriculture/livestock/fishing	58.5	13466	51.3	87.7	11800	23011
Mining/toursim	64.6	102	50.6	77.5	80	158
Employed	78.5	2354	62	79.1	1860	2999
Business	73.9	4169	60.1	81.6	3387	5638
Unpaid Household helper/Unemployed	56.8	1187	46.1	81	963	2088
Total	**62.8**	**21278**	**53.4**	**81.38**	**18090**	**33894**

3.4.3 Sources of Mosquito Nets

Survey results revealed average ownership of 1.7 LLINs per household. Most respondents reported that household LLINs were provided via mass distribution campaigns (45.0%), followed by commercial outlets (18.2%), reproductive and child health (RCH) programs (17.9%), and through the School Net Programme (SNP; 15.8%) (Figure 15).

Findings indicate that more than half of households interviewed in 11 regions (i.e., Arusha, Dar es Salaam, Dodoma, Iringa, Kilimanjaro, Manyara, Mbeya, Njombe, Rukwa, Singida, and Tanga) had obtained LLINs through mass replacement campaigns (Figure 15). Geita, Lindi, Mtwara, Ruvuma, and Tabora regions obtained most of their LLINs through the SNP distribution channel (Figure 16).

Commercial outlets were cited as the most common source of mosquito nets in urban areas, including Dar es Salaam, Morogoro, and Dodoma regions. The regions with the highest source of mosquito nets from RCH programs included Geita, Simiyu, and Songwe. Commercial outlets include accredited drug dispensing outlets (ADDOs), pharmacies, and shops and markets. RCH programs included antenatal care (ANC), HF, the Expanded Programme on Immunization (EPI), SNP, and the Mass Replacement Campaign (MRC).

Figure 15. Sources of LLINs among selected households

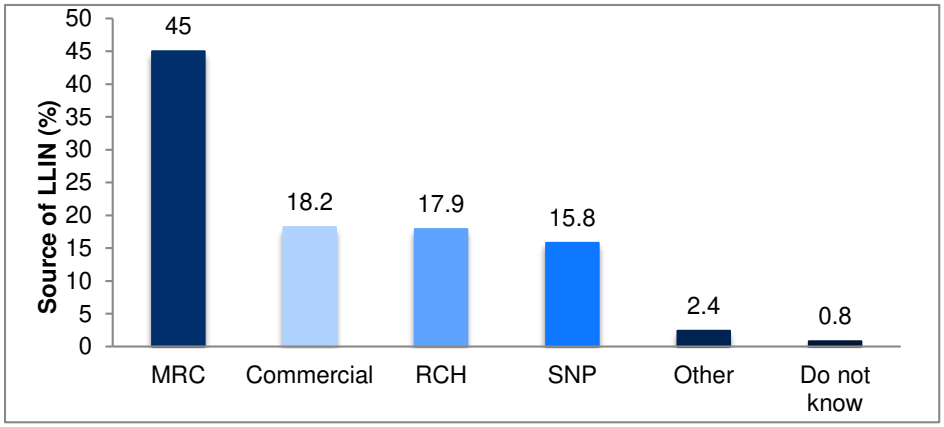
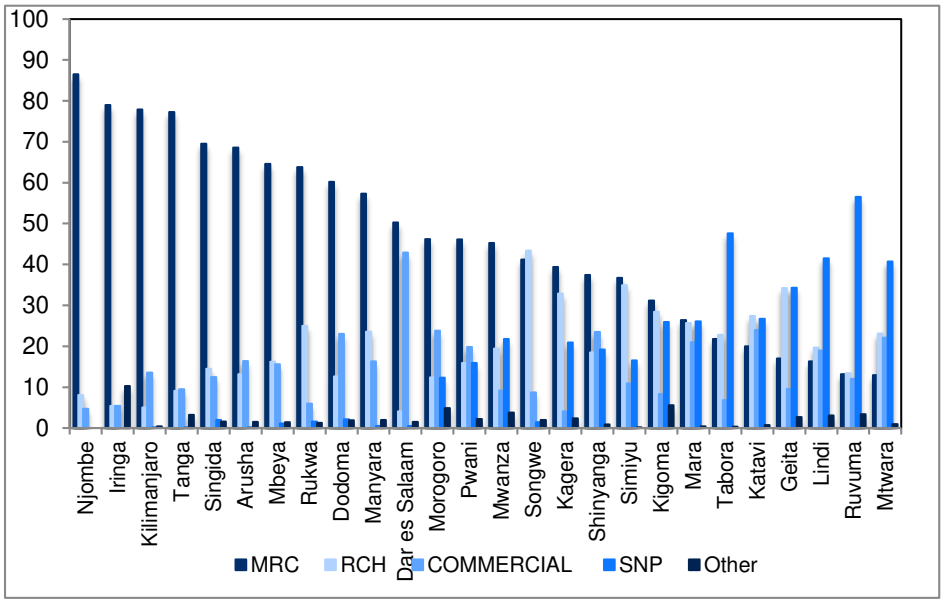


Figure 16. LLIN source among selected households by region



3.4.3 Malaria preventions methods

Questions about malaria prevention methods were used to assess whether the pupils have knowledge of at least one malaria preventive method among those recommended in Tanzania. The questions also help to determine whether pupils have ever heard or seen any malaria prevention messages and to identify the source(s) of such information (Table 13).

Knowledge about Malaria Prevention Methods

During the survey, pupils were asked whether they were aware of methods to prevent malaria and asked to identify them. Among the pupils with knowledge of malaria prevention methods, 68.0% said that sleeping under mosquito nets can prevent malaria. Other prevention methods mentioned included environmental cleaning (18.3%), repellent spray (8.9%), and other methods (27.6%) (Table 13).

Age and sex

Pupils aged between 9 and 19 years demonstrated a better knowledge of the methods used to prevent malaria. The most identified malaria prevention method was the use of mosquito nets; pupils aged between 9 and 19 years (61.0%), 12 and 16 years (78.5%), and 17 and 19 years (82.6%) cited this method. Similar percentage of boys (70.3%) and girls (70.3%) demonstrated their knowledge that mosquito nets are recommended for malaria prevention. Additionally, malaria prevention methods, including the use of repellent spray and cleaning of the environment, were mentioned by a small percentage of pupils across all ages and sex. The results indicate that knowledge of malaria prevention methods increases as children age (Table 13).

Malaria Epidemiological Strata

Most pupils across all malaria epidemiological strata demonstrated having a better understanding of mosquito nets as effective methods for malaria prevention. Despite this better knowledge, there were variations across these strata in which the use of mosquito nets was highly mentioned by those from moderate epidemiological malaria strata (76.5%) compared with those from high (69.4%), low (69.8%), and very low (65.7%) strata (Table 13).

Types of Residence

There was variation in the knowledge of malaria prevention methods based on residence, with most pupils identifying mosquito nets as the primary method. More children from urban areas (74.8%) compared with those from rural areas (68.6%) cited the use of mosquito nets. A small proportion of pupils identified repellent sprays and environmental cleanliness as other prevention methods (Table 13).

Geographical Zones

More than 60.0% of children in all zones identified mosquito nets as the primary method for malaria prevention. The zones with higher percentages of pupils were the eastern (77.4%) and lake (74.8%) zones; the zones with the lower percentage were the Southern (60.8%) and Southwest Highlands (64.3%) zones. Other methods, including the use of repellent spray and environmental cleanliness, were mentioned by small percentages of pupils (Table 13).

Regions

Mosquito nets are the highly mentioned malaria prevention method across all regions, identified by more than 50.0% of pupils in all regions. The highest percentages of pupils were from the Pwani (84.6%), Katavi (80.8%), and Shinyanga (80.3%) regions; the lowest percentages of pupils were from the Mtwara (57.0%), Mbeya (56.75%), and Njombe (52.1%) regions. Other methods, including environmental cleanliness, were identified by small percentages of pupils in all regions (Table 13).

Table 13. Knowledge of malaria prevention methods

Demographic Characteristics	Percentages (%) of Malaria Prevention Methods				
	Mosquito Nets	Repellent Spray	Environmental Cleaning	Do Not Know	Other
Age (in Years)					
9 to 11	61.0	7.0	12.2	36.9	0.7
12 to 16	78.5	10.6	23.7	19.2	1.4
17 to 19	82.7	10.4	25.6	16.2	2.31
Sex					
Girls	70.3	8.7	18.3	27.7	1.0
Boys	70.3	9.1	18.3	27.4	1.2
Malaria Epidemiological Strata					
High	69.4	5.0	15.5	29.0	0.7
Moderate	76.5	11.6	21.8	21.5	1.7
Low	69.8	14.2	21.2	27.1	1.3
Very low	65.7	5.6	15.6	32.3	1.0
Geographical Zones					
Central	67.8	9.2	20.9	30.4	1.7
Eastern	77.4	17.1	21.4	18.9	1.0
Lake	74.8	8.9	16.9	23.7	0.5
Northern	68.6	5.6	13.1	29.4	0.4
Southern Highlands	66.0	8.1	23.9	31.0	2.4
Southwest Highlands	64.3	8.8	22.3	33.3	2.6
Southern	60.8	2.8	6.7	38.1	0.8
Western	64.6	2.0	17.0	34.0	0.5

Demographic Characteristics	Percentages (%) of Malaria Prevention Methods				
	Mosquito Nets	Repellent Spray	Environmental Cleaning	Do Not Know	Other
Types of Residence					
Rural	68.6	6.6	17.3	29.4	0.9
Urban	74.8	15.4	21.0	22.5	1.7
Regions					
Arusha	69.7	6.2	8.5	28.0	0.2
Dar es Salaam	76.3	21.8	18.2	19.1	1.2
Dodoma	68.9	15.0	24.2	28.7	1.9
Geita	66.9	4.9	10.7	31.8	0.7
Iringa	68.2	6.4	25.1	29.6	3.3
Kagera	78.5	11.8	14.4	19.5	0.7
Katavi	80.8	5.8	31.2	18.4	11.2
Kigoma	61.6	1.3	12.6	37.6	0.8
Kilimanjaro	67.8	5.0	16.3	30.3	0.5
Lindi	66.1	3.6	8.2	33.5	1.0
Manyara	65.8	5.3	15.0	32.5	0.8
Mara	77.9	11.4	25.5	20.4	0.6
Mbeya	56.8	6.5	15.4	41.3	1.6
Morogoro	77.1	7.9	28.0	20.4	0.7
Mtwara	57.0	2.3	5.7	41.2	0.6
Mwanza	69.9	11.8	18.6	28.7	0.6
Njombe	52.1	7.0	26.4	44.6	0.1
Pwani	84.6	11.0	23.9	14.1	0.7
Rukwa	64.7	7.4	19.9	32.1	1.0
Ruvuma	72.9	10.2	21.3	23.6	3.2
Shinyanga	80.3	5.6	12.7	18.8	0.0
Simiyu	76.8	2.9	17.3	21.9	0.5
Singida	69.4	6.0	25.9	29.7	3.1
Songwe	64.3	14.1	28.3	32.9	1.3
Tabora	69.2	2.9	23.5	28.7	0.1
Tanga	68.0	5.7	15.7	30.3	0.6
Total	**68.0**	**8.9**	**18.3**	**27.6**	**1.1**

3.5 Exposure to Malaria Messages

3.5.1 Malaria Prevention Messages

Effective communication promotes positive behaviors to support the control and prevention of malaria. Overall survey results indicate that 41.3% of pupils reported to have seen or heard specific malaria control and prevention messages.

Sources of Malaria Prevention Messages

The pupils were asked to identify the source of the malaria prevention message or messages they saw or heard. Five media outlets (i.e., radio, television, billboards, brochures and banners, and newspapers) were identified by pupils in all regions. Pupils highly referenced radio and television advertisements, with radio the most cited (53.5%) followed by television

(38.9%). The survey respondents also identified other communication channels (13.4%), brochures and banners (13.3%), billboards (10.8%), and newspapers (4.3%) as sources of malaria prevention messages (Figure 17).

Pupils' exposure was observed across demographic characteristics to identify linkages (**Table 13**).

Figure 17. Sources of malaria prevention messages

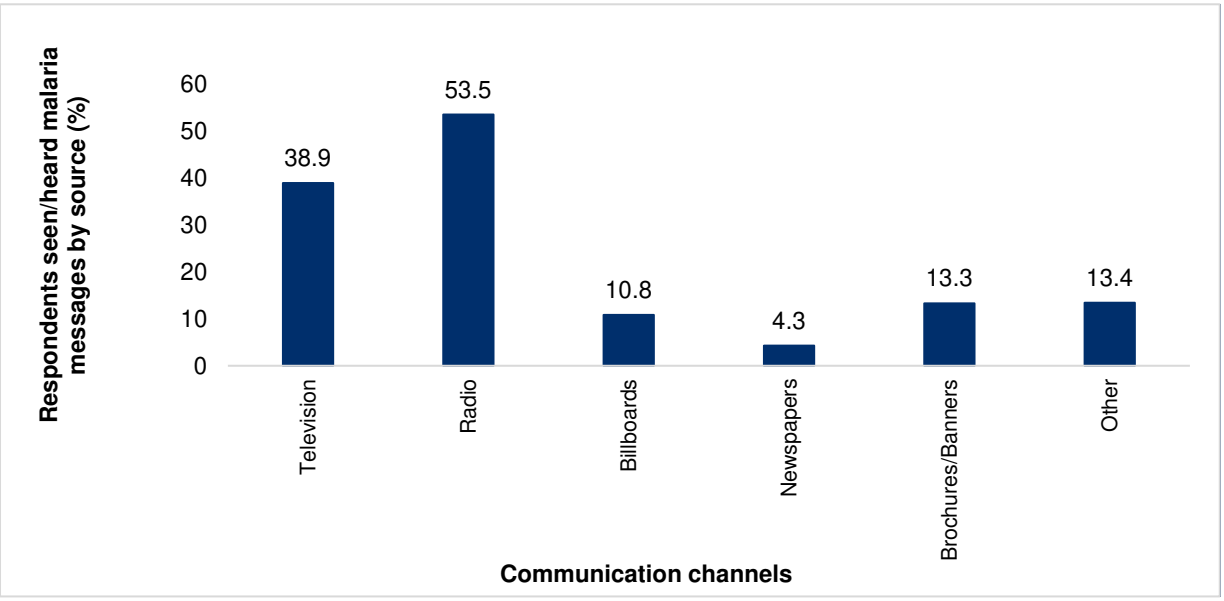


Table 14. Sources of malaria prevention messages

Demographic Characteristics	Source of Malaria Information (%)					
	Television	Radio	Billboards	Newspapers	Brochures, Leaflets, Posters, and Banners	Other
Age (in Years)						
9 to 11	41.6	51.8	10.3	3.9	12.2	11.9
12 to 16	37.4	54.7	11.5	5.1	15.4	14.9
17 to 19	30.9	57.7	8.2	4.1	20.0	16.8
Sex						
Girls	39.0	53.9	10.7	5.0	14.5	13.8
Boys	39.1	53.2	11.3	4.3	13.8	13.7
Malaria Epidemiological Strata						
High	25.0	56.1	12.1	3.4	13.8	15.8
Moderate	37.9	55.8	12.4	5.9	21.1	12.1
Low	55.9	47.8	9.4	5.1	11.5	12.6
Very low	36.9	56.2	10.1	4.3	10.3	14.3
Types of residence						
Rural	30.8	56.5	11.6	4.5	15.3	14.7
Urban	57.9	46.8	9.6	4.8	11.6	11.5
Geographical Zones						
Central	34.4	66.9	12.2	5.3	16.2	11.2
Eastern	62.3	45.5	12.5	7.3	10.6	8.0
Lake	28.2	60.8	9.9	3.1	17.8	10.6
Northern	40.0	48.7	10.1	3.1	7.6	14.9
Southern Highlands	36.0	44.1	7.3	3.2	13.5	27.2
Southwest Highlands	34.8	53.3	12.0	6.6	20.8	20.1
Southern	25.4	37.9	17.0	2.2	9.9	21.7
Western	21.1	56.7	9.6	2.8	15.7	22.8
Regions						
Arusha	40.7	47.1	10.6	2.6	8.2	12.3
Dar es Salaam	73.6	36.4	8.7	6.6	7.4	7.3
Dodoma	35.1	60.0	14.8	4.2	17.1	13.9
Geita	16.5	64.5	11.2	1.7	9.3	16.2
Iringa	28.1	50.8	5.0	1.8	15.1	29.7
Kagera	25.5	59.8	13.7	2.6	8.0	9.6
Katavi	32.1	38.7	21.0	5.7	16.8	26.4
Kigoma	18.1	48.1	12.0	1.7	9.2	32.1
Kilimanjaro	42.2	49.0	7.7	2.6	8.3	20.2
Lindi	32.6	42.3	18.7	2.8	9.0	13.1
Manyara	33.0	75.5	11.9	6.5	16.3	5.0
Mara	41.8	67.2	7.8	6.0	16.9	7.0
Mbeya	26.5	59.6	9.0	5.1	20.0	7.6
Morogoro	36.2	61.5	17.9	8.7	20.5	9.5
Mtwara	16.9	32.5	15.0	1.5	11.0	31.9

Demographic Characteristics	Source of Malaria Information (%)					
	Television	Radio	Billboards	Newspapers	Brochures, Leaflets, Posters, and Banners	Other
Mwanza	38.1	50.5	5.9	1.0	35.5	5.9
Njombe	27.2	54.4	3.8	2.1	7.3	27.8
Pwani	44.0	70.1	25.3	9.0	10.1	9.7
Rukwa	56.5	63.3	9.0	5.7	17.8	16.1
Ruvuma	44.0	36.1	10.1	4.5	15.5	25.7
Shinyanga	25.3	85.1	9.3	5.3	9.6	4.0
Simiyu	11.8	40.9	12.2	3.0	21.8	28.9
Singida	35.9	60.7	8.3	4.9	14.5	19.8
Songwe	15.2	42.7	13.7	9.9	27.9	33.2
Tabora	24.1	65.1	7.3	3.9	22.1	13.6
Tanga	36.2	50.8	12.6	4.4	5.9	12.3

Age and Sex

Similar patterns regarding access to information about malaria prevention across media channels were measured by age and sex. It was observed that electronic media channels—radio and television—were more often accessed and preferred by children compared with paper-based media (i.e., newspaper, brochures, and billboards). Among electronic media channels, 53.9% of girls and 53.2% of boys cited awareness of radio programming; only 39.0% of girls and 39.1% of boys cited television programming. By age, 51.8% of pupils aged between 9 and 11 years, 54.7% between 12 and 16 years, and 57.7% between 17 and 19 years used radio to access information, whereas 41.6%, 37.4%, and 30.9% of children within the same age groups used television. Radio usage was observed to increase based on the pupil's age. Other sources, including billboards, brochures, and newspaper articles and advertisements, were cited by a few pupils (Table 14).

Malaria Epidemiological Strata

Media usage to communicate information about malaria prevention efforts differs across malaria risk areas. Radio is widely used in high (56.1%), moderate (55.5%), and very low (56.2%) malaria epidemiological areas; television is widely used (56.4%) by pupils from low epidemiological strata. Based on the survey results, there was no noteworthy difference in the percentage of pupils using radio as the primary source of information across all strata. (Table 14). Newspaper articles and advertisements were the least (4.3%) commonly used form of media communication among the identified sources (Figure 17).

Types of Residence

Survey results indicate that sources of malaria information vary across types of residence. Use of television is predominant in urban areas (57.9%) compared with rural areas (30.8%); radio is widely used in rural areas (56.5%) compared with their urban counterparts (46.8%). Pupils cited newspapers as their source of malaria prevention messaging in less than 5.0% of cases from both rural and urban areas.

Geographical Zones

Radio usage to access malaria prevention messaging is highly predominant in the central (66.9%) and lake (60.8%) zones; television is widely used in the eastern zone (62.3%). Only

21.1% of pupils in the western zone access malaria prevention information through television (Table 14).

Regions

Use of television to access malaria prevention messaging is very high in the Dar es Salaam Region (73.6%); conversely, only small percentages of pupils' access prevention messaging through television in the Simiyu (11.8%) and Kigoma (18.1%) regions. Radio is predominantly used in the Shinyanga (85.1%), Manyara (75.5%), and Pwani (70.1%) regions (Table 14).

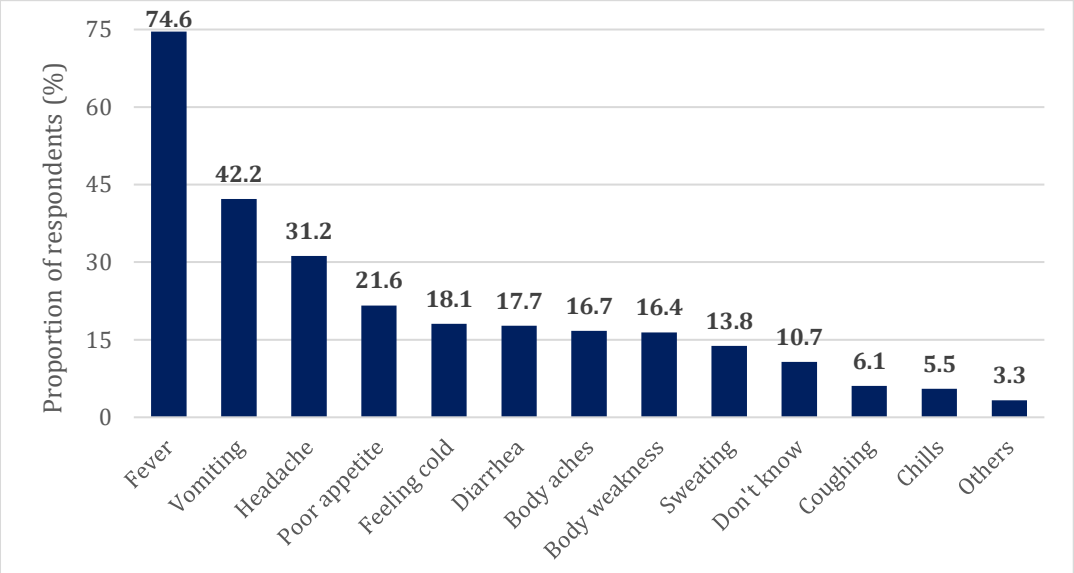
3.5.2 Knowledge of Malaria Prevention among Households

Based on the findings from the survey, knowledge about malaria prevention methods were high (88.5%) among household respondents. In addition, 85.2% of household respondents identified sleeping under a mosquito net as the commonly used method of malaria prevention. Small percentages of respondents identified other recommended methods, including IRS (3.6%) and intermittent preventive treatment during pregnancy (2.4%). Household respondents identified less effective and non-effective malaria prevention methods, including keeping environments clean; regularly cutting grass; using mosquito coils, sprays, and repellents; keeping doors and windows closed; and avoiding stagnant water, but these methods were mentioned far less frequently than other methods.

Knowledge of Malaria Symptoms

Based on the findings from the survey, 74.6% of the household respondents cited fever as a sign of malaria in young pupils; other commonly identified signs and symptoms included vomiting (42.2%) and headache (31.2%) (Figure 18).

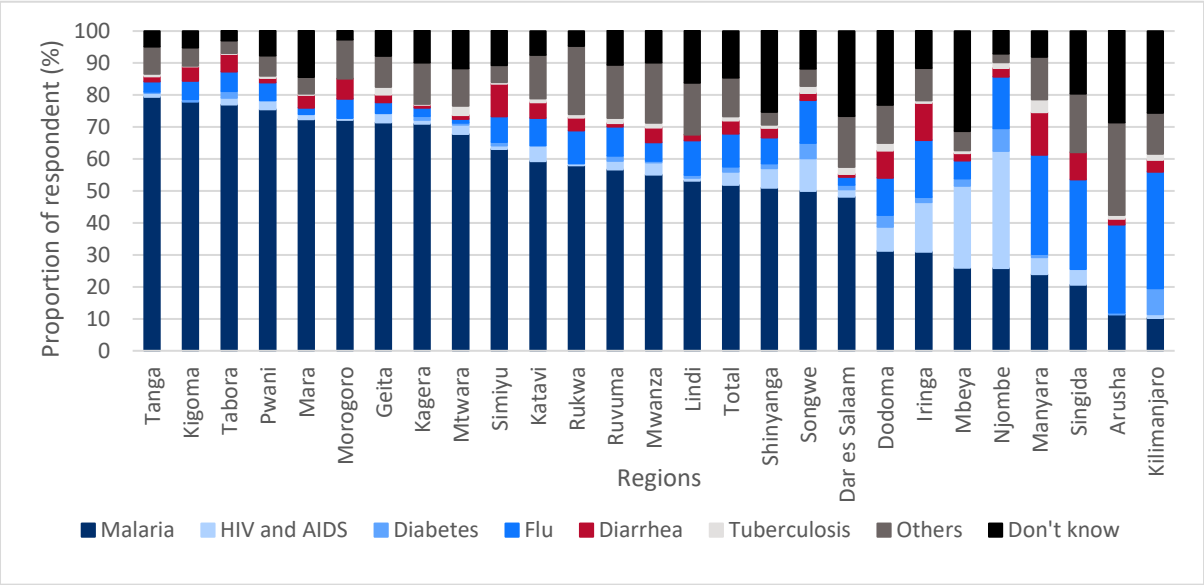
Figure 18. Malaria signs and symptoms identified by household respondents



Knowledge of the most serious health problems among Household respondents

Based on the findings from the survey, the household respondents mentioned malaria as the most serious health problem in their communities; malaria was cited by more than 70.0% of heads of households in the Tanga, Kigoma, Tabora, Pwani, Mara, Morogoro, Geita and Kagera regions. Respondents in the Arusha, Kilimanjaro, Manyara, and Singida regions reported the flu as the most serious health problem in their communities (Figure 19).

Figure 19. Most serious health problem in the community



3.5.3 Malaria Testing and Treatment Messages

Tanzania's 2020 national target is to provide quality assured and quality-controlled malaria testing by using mRDTs in 75.0% of HFs across the country. The ability to reach the population with messaging about diagnosis and treatment of malaria is a key element of the GOT's malaria elimination agenda. Overall survey results indicate that 30.0% of pupils are aware of malaria testing and 35.8% are aware of treatment messages (Table 15).

Age and Sex

Survey findings indicate that small percentages of girls (30.0%) and boys (30.1%) were aware of malaria diagnosis messages, whereas 36.0% of girls and 35.7% of boys were aware of malaria treatment messages. Across age groups, 34.1% (diagnosis) and 40.9% (treatment) of the pupils aged between 12 and 16 years reported to have seen or heard malaria diagnosis and treatment messages; these were the highest percentages compared with other age categories. A slight difference was observed between boys and girls across communication channels. Radio was cited as the most common communication channel for malaria treatment messages by 54.0% of girls and 52.8% of boys; television was cited by 41.0% of girls and 40.5% of boys (Table 15).

Types of Residence

Survey results regarding access to treatment and testing messaging indicated those who had heard and/or seen malaria testing messages were slightly higher (37.8%) in urban areas compared to the ones residing in the rural settings (27.2%). Furthermore, 44.0% and 32.9% had heard or seen treatment messages among pupils residing in urban and rural areas, respectively. These results strengthen the finding that television is predominantly used in urban areas (58.2%) compared with radio availability and usage (56.9%) (Table 15).

Malaria Epidemiological Strata

Survey results indicate that pupils from moderate and low risk areas for malaria have increased access to malaria testing and treatment information. Specifically, 43.2% of pupils from moderate risk strata and 38.9% of pupils from low-risk strata for malaria had heard or seen malaria testing messages. In addition, 35.4% of pupils from moderate risk strata and 33.4% of pupils from low-risk strata for malaria had heard or seen malaria treatment

messages. Radio usage was high in moderate (57.9%) and very low (58.8%) malaria epidemiological strata, and television usage was reported in low (59.4%) and moderate (38.6%) strata (Table 15).

Geographical Zones

Survey findings indicate that the eastern zone recorded the highest percentages of pupils who have seen and/or heard malaria testing (44.3%) and treatment (50.5%) messages. The western zone recorded the lowest percentages of pupils who have seen and/or heard malaria testing (18.3%) and treatment (22.1%) messages. Pupils in the central zone (67.1%) and those in the lake zone (60.5%) cited radio as the primary communication means by which they received malaria treatment messages. Pupils in the eastern zone (62.2%) and those in the western zone (23.9%) cited television as the primary communication means (Table 15).

Regions

Across the regions, the highest percentages of pupils who reported that they have seen or heard malaria testing messages were observed in Dar es Salaam (48.7%) and Pwani (43.2%), compared with the lowest percentage (13.9%) recorded in Mbeya. The highest percentages of pupils who reported that they have seen or heard malaria treatment messages were from the Dar es Salaam (54.5%) and Pwani (50.0%) regions; the lowest percentage of pupils was recorded in the Iringa Region (13.2%). Radio was the communication channel cited most by pupils from the Shinyanga (87.5%) and Manyara (76.1%) regions as the source of malaria treatment messages; television was cited most often by pupils from the Dar es Salaam (72.3%) and Rukwa (64.2%) regions (Table 15).

Table 15. Pupils who have seen and/or heard malaria testing and treatment messages

Demographic Characteristics	Percentage (%) of Pupils who Have Seen or Heard Malaria Treatment Messages	Number of Pupils	Percentage (%) of Pupils who Have Seen or Heard Malaria Testing Messages	Number of Pupils	Percentages (%) of the Sources of Malaria Treatment Messages					
					Television	Radio	Billboards	Newspapers	Brochures, Leaflet, Posters, and Banners	Other
Age (in Years)										
9 to 11	30.3	7,475	25.6	6,317	42.8	50.7	5.8	4.0	16.1	10.9
12 to 16	40.9	11,064	34.1	9,222	39.5	55.2	6.5	5.3	20.5	12.6
17 to 19	37.6	163	30.5	132	28.8	54.6	5.5	3.1	21.5	21.5
Sex										
Girls	36.0	9,264	30.0	7,726	41.0	54.0	6.4	4.9	18.8	11.9
Boys	35.7	9,438	30.1	7,945	40.5	52.8	6.1	4.7	18.7	12.1
Malaria Epidemiological Strata										
High	32.1	6,078	27.6	5,225	26.6	55.0	7.8	3.4	19.1	13.9
Moderate	43.2	4,396	35.4	3,609	38.6	57.9	7.5	5.2	26.9	11.1
Low	38.9	5,541	33.4	4,766	59.4	45.4	4.3	5.2	12.6	11.3
Very low	30.5	2,687	23.5	2,071	37.6	58.8	4.4	6.3	17.2	10.8
Types of Residence										
Rural	32.9	12,630	27.2	10,454	32.3	56.9	6.7	4.6	20.2	13.0
Urban	44.0	6,072	37.8	5,217	58.2	45.9	5.3	5.2	15.6	10.0
Geographical Zones										
Central	32.9	2,038	25.3	1,570	33.7	67.1	3.8	8.0	24.6	8.5
Eastern	50.5	4,998	44.3	4,382	62.2	45.4	7.7	6.6	12.3	7.6
Lake	40.4	5,027	33.0	4,101	29.8	60.5	6.6	2.9	23.2	9.0
Northern	32.2	2,179	25.8	1,744	41.3	47.0	6.6	3.2	11.9	12.5
Southern Highlands	29.6	1,009	27.8	949	36.2	44.0	3.9	2.9	18.3	23.0

Demographic Characteristics	Percentage (%) of Pupils who Have Seen or Heard Malaria Treatment Messages	Number of Pupils	Percentage (%) of Pupils who Have Seen or Heard Malaria Testing Messages	Number of Pupils	Percentages (%) of the Sources of Malaria Treatment Messages					
					Television	Radio	Billboards	Newspapers	Brochures, Leaflet, Posters, and Banners	Other
Southwest Highlands	28.5	1,417	24.3	1,212	38.5	53.8	3.0	7.1	28.6	25.3
Southern	29.6	618	25.9	540	28.2	42.4	11.5	2.1	13.6	14.9
Western	22.1	1,416	18.3	1,173	23.9	57.4	5.2	2.9	20.1	19.8
Regions										
Arusha	32.9	855	24.4	634	37.0	43.6	5.1	3.6	11.8	14.4
Dar es Salaam	54.5	3,418	48.7	3,056	72.3	35.4	5.1	5.6	8.1	6.1
Dodoma	28.1	672	23.6	566	35.9	57.3	1.8	7.3	25.0	10.6
Geita	40.4	672	29.7	495	18.2	65.3	8.8	1.8	12.2	10.1
Iringa	13.2	150	17.2	196	38.7	42.7	4.7	2.7	24.7	27.3
Kagera	45.7	1,180	39.9	1,029	29.7	56.2	11.8	3.0	20.0	9.7
Katavi	31.1	209	33.5	225	24.9	29.7	11.0	8.6	30.1	35.4
Kigoma	19.3	741	17.9	689	20.4	50.6	4.2	2.2	14.7	29.1
Kilimanjaro	27.2	634	22.5	524	54.6	54.9	4.1	3.0	11.0	10.1
Lindi	42.8	370	39.5	341	31.9	48.9	14.1	2.4	9.5	9.5
Manyara	39.3	964	27.9	684	30.4	76.1	5.8	10.1	28.4	3.8
Mara	38.8	796	35.3	723	45.0	67.6	3.5	5.7	19.8	4.0
Mbeya	19.1	298	13.9	217	31.2	46.6	2.7	8.4	31.9	8.7
Morogoro	41.1	1,052	33.9	869	39.8	64.8	7.9	9.4	23.3	10.2
Mtwara	20.3	248	16.3	199	22.6	32.7	7.7	1.6	19.8	23.0
Mwanza	38.9	1,147	30.1	888	37.9	48.9	4.4	0.8	41.0	5.6
Njombe	24.4	213	20.3	177	19.2	68.5	0.5	0.5	8.5	21.1
Pwani	50.0	528	43.2	457	41.3	71.4	23.5	7.2	17.6	12.5
Rukwa	41.2	567	34.7	477	64.2	68.3	1.6	1.6	18.3	28.2

Demographic Characteristics	Percentage (%) of Pupils who Have Seen or Heard Malaria Treatment Messages	Number of Pupils	Percentage (%) of Pupils who Have Seen or Heard Malaria Testing Messages	Number of Pupils	Percentages (%) of the Sources of Malaria Treatment Messages					
					Television	Radio	Billboards	Newspapers	Brochures, Leaflet, Posters, and Banners	Other
Ruvuma	46.1	646	41.1	576	41.2	36.2	4.8	3.7	20.1	22.6
Shinyanga	49.3	768	36.6	570	21.9	87.5	2.5	4.9	12.6	4.3
Simiyu	28.6	464	24.4	396	13.8	35.8	8.2	1.9	26.9	30.8
Singida	29.8	402	23.7	320	38.1	61.7	2.2	4.5	14.7	16.2
Songwe	24.9	343	21.3	293	10.8	50.7	0.9	14.0	41.7	28.9
Tabora	26.3	675	18.8	484	27.9	64.9	6.4	3.7	25.9	9.6
Tanga	37.6	690	31.9	586	34.3	43.9	10.6	2.9	12.9	12.3
Total	**35.8**	**18,702**	**30.0**	**15,671**	**40.3**	**54.5**	**11**	**4.8**	**15.5**	**5.3**

3.5.4 Pupils' Knowledge of Recommended Antimalarial Medicines

Survey findings indicate that 52.2% of pupils interviewed had cited ALu as a recommended antimalarial medicine. A small proportion (0.6%) mentioned artesunate injections as one of the recommended antimalarial drugs, while others (0.4%) mentioned quinine antimalarial medicine (Table 16).

Age and Sex

Based on the results from the survey, the percentage of girls who cited ALu as a recommended antimalarial drug was higher (53.5%) than the percentage of boys (51.1%). Knowledge of ALu increased with the age of the pupil; the highest percentage of pupils who named ALu as a recommended antimalarial drug was recorded among those aged between 17 and 19 years (66.3%) compared with those aged between 12 and 16 years (58.9%) and those between 9 and 11 years (44.7%). Quinine and artesunate injections, were rarely (less than 1.0%) cited by pupils as antimalarial medicines (Table 16).

Types of Residence

Based on the results from the survey, there was no difference in pupils' awareness of ALu as the recommended antimalarial drug across residence areas; similar percentages of pupils from rural (52.3%) and urban areas (52.2%) identified ALu (Table 16).

Malaria Epidemiological Strata

A high percentage of pupils living in high burden malaria strata (66.8%) cited ALu as a recommended antimalarial drug compared with those living in very low malaria burden strata (23.5%). Awareness of ALu as a recommended antimalarial drug increased between very low and high malaria burden strata (Table 16).

Geographical Zones

Across all geographical zones, the highest percentage of pupils who cited ALu as the recommended antimalarial drug was observed in the southern zone (78.0%); the lowest percentages were recorded in the Central (35.5%) and Northern (34.8%) zones. ALu awareness appeared to be dominant in geographical zones where malaria burden is generally high, including the Eastern (66.2%), Lake (61.7%), and Western (55.3%) zones (Table 16).

Regions

ALu awareness varied greatly among the regions of Tanzania. The highest percentages of pupils who cited ALu as the recommended antimalarial drug were observed in the Pwani (84.8%) and Mtwara (81.4%) regions; the lowest percentages were recorded in the Arusha (18.1%) and Iringa (14.6%) regions (Table 16).

Table 16. Pupils' knowledge of recommended antimalarial drugs

Demographic Characteristics	Types of Antimalarial Drugs Identified by Pupils					Number of Pupils Interviewed
	Percentages (%) of Pupils who Cited a Specific Type of Antimalarial Drug					
	Quinine	ALu	Artesunate Injection	Other	Do Not Know	
Age (in Years)						
9 to 11	0.4	44.7	0.6	1.2	53.1	24,733
12 to 16	0.4	58.9	0.6	1.0	39.1	27,076
17 to 19	0.2	66.3	1.6	1.4	30.5	433
Sex						

Demographic Characteristics	Types of Antimalarial Drugs Identified by Pupils					Number of Pupils Interviewed
	Percentages (%) of Pupils who Cited a Specific Type of Antimalarial Drug					
	Quinine	ALu	Artesunate Injection	Other	Do Not Know	
Girls	0.3	53.5	0.5	1.1	44.6	25,783
Boys	0.4	51.1	0.6	1.1	46.8	26,459
Malaria Epidemiological Strata						
High	0.2	66.8	0.4	1.1	31.5	18,929
Moderate	0.3	60.3	0.6	1.6	37.1	10,186
Low	0.5	45.0	0.9	0.8	52.8	14,311
Very low	0.4	23.5	0.6	1.0	74.6	8,816
Types of Residence						
Rural	0.2	52.3	0.5	1.0	46.0	38,454
Urban	0.7	52.2	0.9	1.3	44.9	13,788
Geographical Zones						
Central	0.3	35.5	0.3	1.5	62.5	6,248
Eastern	0.8	66.2	1.3	0.8	31.0	9,892
Lake	0.3	61.7	0.5	1.3	36.2	12,433
Northern	0.2	34.8	0.6	0.9	63.5	6,775
Southern Highlands	0.1	39.9	0.4	2.0	57.5	3,413
Southwest Highlands	0.7	39.3	0.5	0.7	58.7	4,980
Southern	0.0	78.0	0.0	1.0	21.0	2,086
Western	0.0	55.3	0.4	1.0	43.3	6,415
Regions						
Arusha	0.3	18.1	0.7	1.3	79.6	2,598
Dar es Salaam	1.1	62.4	1.8	0.8	33.9	6,275
Dodoma	0.2	33.4	0.3	2.1	64.1	2,446
Geita	0.1	67.3	0.2	1.2	31.2	1,665
Iringa	0.1	14.6	0.0	0.6	84.6	1,140
Kagera	0.9	65.4	0.6	1.9	31.1	2,583
Katavi	0.0	75.7	0.0	3.3	21.0	671
Kigoma	0.0	53.5	0.5	1.2	44.9	3,846
Kilimanjaro	0.1	21.9	0.3	0.9	76.8	2,336
Lindi	0.0	73.3	0.0	0.9	25.8	864
Manyara	0.4	43.3	0.3	0.9	55.1	2,453
Mara	0.2	61.3	0.2	1.7	36.6	2,051
Mbeya	0.1	32.7	0.1	0.5	66.7	1,558
Morogoro	0.1	67.8	0.5	1.0	30.6	2,560
Mtwara	0.0	81.4	0.0	1.0	17.6	1,222
Mwanza	0.1	61.2	0.2	1.0	37.5	2,953
Njombe	0.0	22.6	0.8	1.1	75.5	873
Pwani	0.8	84.8	0.3	0.1	14.1	1,057
Rukwa	1.4	45.4	1.0	0.2	52.0	1,376
Ruvuma	0.2	71.4	0.4	3.7	24.3	1,400
Shinyanga	0.3	68.2	1.0	0.6	30.0	1,558

Demographic Characteristics	Types of Antimalarial Drugs Identified by Pupils					Number of Pupils Interviewed
	Percentages (%) of Pupils who Cited a Specific Type of Antimalarial Drug					
	Quinine	ALu	Artesunate Injection	Other	Do Not Know	
Simiyu	0.1	45.3	1.0	0.9	52.7	1,623
Singida	0.2	25.4	0.1	1.4	72.9	1,349
Songwe	1.2	23.1	0.9	0.1	74.8	1,375
Tabora	0.1	58.0	0.4	0.6	41.0	2,569
Tanga	0.2	74.9	0.7	0.4	23.8	1,841
Total	**0.4**	**52.2**	**0.6**	**1.1**	**45.7**	**52,242**

3.5.5 Anemia Prevalence

Only one-third of surveyed pupils were assessed for hemoglobin concentration. Based on the findings, 33.7% of pupils assessed had anemia; of these pupils, 33.1% were aged between 5 and 9 years and 56.6% were between 15 and 19 years. Most of the pupils diagnosed had moderate anemia.

Age and Sex

Based on the findings from the survey, pupils aged 15 to 19 years were more anemic (56.6%) than pupils between 5 and 9 years (33.1%) and those between 10 and 14 years (31.5%). Boys (35.1%) were more affected by anemia than girls (32.4%) in both age groups. Overall, boys aged between 10 and 19 years were more anemic (35.8%) than those aged between 5 and 9 years (33.7%; Table 17).

Malaria Infection

Anemia was high among pupils with malaria infection. Based on the findings from the survey, 54.9% of all pupils with anemia also tested positive for malaria. Also, 57.9% of pupils aged between 5 and 9 years and who had anemia was also positive for malaria compared with 53.5% of pupils aged between 10 and 19 years. Similarly, a high percentage (45.7.0%) of anemic pupils were from high malaria strata compared with low malaria strata (18.2%) (Table 17).

Types of Residence

Anemia prevalence varied by pupils' residences. Pupils in rural areas (36.9%) were more affected than those in urban areas (25.6%). Among pupils aged between 5 and 9 years, anemia was highest among those from rural areas (35.8%) compared with those from urban areas (27.6%). The prevalence of anemia among pupils aged between 10 and 19 years was higher in rural areas (37.5%) compared with those in urban areas (24.1%; Table 17).

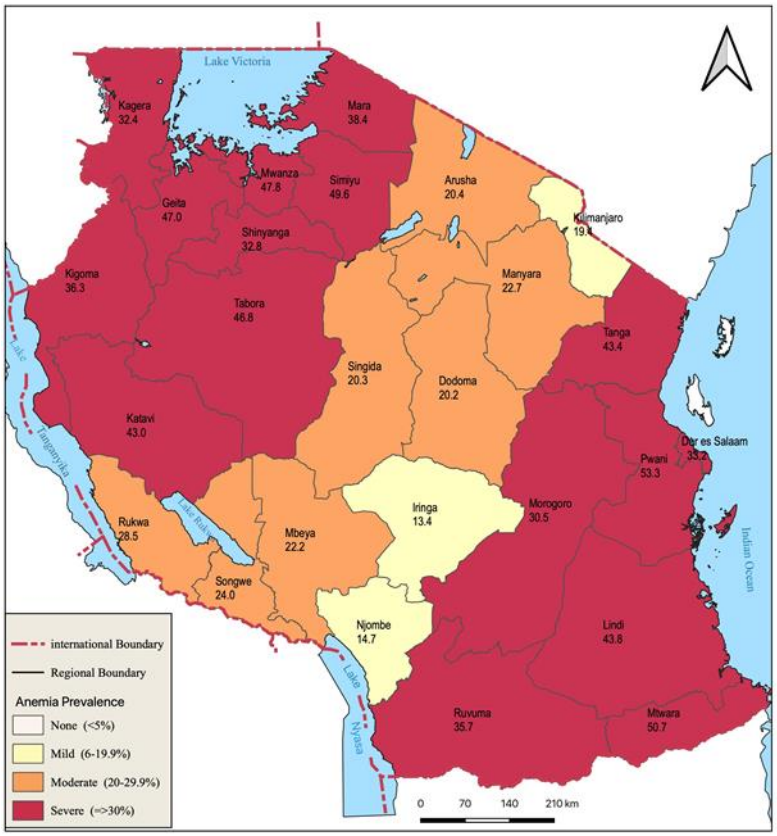
Geographical Zones

Anemia was more prevalent in the Southern (48.3%) and Lake (41.7%) zones. The lowest prevalence of anemia was observed in the Northern (26.1%), Southern Highlands (23.6%), and Central (21.2%) zones. Among pupils aged between 5 and 9 years, anemia was highest in the Southern (58.0%), Lake (38.5%), and Eastern (38.3%) zones. The lowest percentages were found in the Southwest Highlands (24.5%) and Central (20.0%) zones (Table 17).

Regions

Anemia prevalence was high among pupils in the Pwani (53.3%), Mtwara (50.7%), Simiyu (49.6%), Mwanza (47.8%), and Geita (47.0%) regions. Low prevalence was recorded in the Singida (20.3%), Dodoma (20.2%), Kilimanjaro (19.4%), Njombe (14.7%), and Iringa (13.4%) regions. Among pupils aged between 5 and 9 years, anemia prevalence was recorded below 20.0% in the Songwe (19.2%), Dodoma (18.5%), Arusha (15.8%), Iringa (13.8%), and Singida (13.4%) regions. Comparatively, anemia prevalence among pupils aged between 10 and 19 years was highest in the Simiyu (50.8%), Mwanza (49.7%), Tabora (49.2%), Pwani (48.2%), and Geita (47.5%) regions. The lowest percentages among this same age group were recorded in the Manyara (21.6%), Dodoma (20.9%), Kilimanjaro (18.5%), Iringa (13.1%), and Njombe (10.2%) regions (Table 17 and Figure 20).

Figure 20. Anemia prevalence among pupils aged between 5 and 19 years



Councils

Based on the findings from the survey, huge variations were reported within and outside councils. In Tunduru DC, all pupils who were tested for anemia were found to be anemic. Other councils with the highest recorded prevalence include Sengerema DC (95.6%), Momba DC (93.0%), Mtwara MC (87.1%) and Kaliua DC (86.4%). Five councils with the lowest recorded prevalence included Mbinga Town Council (TC) (2.4%), Makambako TC (3.0%), Dodoma CC (5.4%), Ubungo MC (5.5%), and Kahama TC (5.9%); Table 13.

Table 17. Anemia prevalence in children and adolescents

Demographic Characteristic	Percentage (%) of Pupils Aged Between 5 and 9 Years Classified as Having Anemia					Percentage (%) of Adolescents Aged Between 10 and 19 Years Classified as Having Anemia					Total Anemia Prevalence				
	Any Anemia (<11.0 g/dl)	Severe Anemia (<7.0 g/dl)	Moderate Anemia (7.0 to 9.9 g/dl)	Mild (10.0 to 10.9 g/dl)	Number of Pupils Aged Between 5 and 9 Years	Any	Severe	Moderate	Mild	Number of Adolescents Aged Between 10 and 19 Years	Any	Severe	Moderate	Mild	Total Number of Pupils and Adolescents
Age (in Years)															
5 to 9	33.1	1.6	20.9	10.6	8,686						33.1	1.6	20.9	10.6	8,686
10 to 14						31.5	1.5	18.0	12.0	13,704	31.5	1.5	18.0	12.0	13,704
15 to 19						56.6	1.3	20.0	35.3	1,570	56.6	1.3	20.0	35.3	1,570
Sex															
Girls	32.6	1.7	20.1	10.8	4,542	32.3	1.4	18.6	12.3	7,443	32.4	1.5	19.1	11.7	11,985
Boys	33.7	1.5	21.7	10.5	4,144	35.8	1.5	17.9	16.4	7,831	35.1	1.5	19.2	14.3	11,975
Malaria Epidemiological Strata															
High	45.6	2.2	30.5	12.9	2,640	45.8	1.7	26.7	17.4	5,564	45.7	1.9	27.9	15.9	8,204
Low	27.5	1.3	16.0	10.1	2,779	25.6	1.4	11.9	12.3	3,951	26.4	1.4	13.6	11.4	6,730
Moderate	35.5	1.7	22.6	11.2	1,911	35.3	1.3	18.1	16.0	3,398	35.4	1.5	19.7	14.2	5,309
Very low	17	0.9	9.6	6.5	1,356	18.9	1.1	9.1	8.7	2,361	18.2	1	9.3	7.9	3,717
Types of Residence															
Rural	35.8	2.0	23.0	10.8	5,865	37.5	1.7	20.6	15.3	11,344	36.9	1.8	21.4	13.8	17,209
Urban	27.6	0.9	16.3	10.4	2,821	24.1	0.8	11.5	11.8	3,930	25.6	0.8	13.5	11.2	6,751
Malaria Infection															
Negative	29.6	1.3	17.9	10.4	7,597	30.4	1.3	15.5	13.5	12,829	30.1	1.3	16.4	12.4	20,426
Positive	57.9	3.6	41.7	12.7	1,089	53.5	2.1	32.5	18.9	2,445	54.9	2.6	35.3	17	3,534
Geographical Zones															
Central	20.0	1.7	10.5	7.8	822	21.7	1.6	8.4	11.6	1,896	21.2	1.7	9.1	10.4	2,718
Eastern	38.3	0.9	23.9	13.5	1,758	31.9	0.9	17.9	13.1	2,454	34.5	0.9	20.4	13.3	4,212
Lake	38.5	1.9	25.6	11.1	2,338	43.4	1.5	24.9	17.0	4,443	41.7	1.6	25.2	14.9	6,781
Northern	25.6	1.3	14.6	9.6	1,193	26.5	1.5	13.9	11.1	1,905	26.1	1.5	14.1	10.5	3,098
Southern Highlands	25.3	3.7	14.9	6.8	679	22.3	2.5	12.2	7.6	911	23.6	3.0	13.3	7.2	1,590

Demographic Characteristic	Percentage (%) of Pupils Aged Between 5 and 9 Years Classified as Having Anemia					Percentage (%) of Adolescents Aged Between 10 and 19 Years Classified as Having Anemia					Total Anemia Prevalence				
	Any Anemia (<11.0 g/dl)	Severe Anemia (<7.0 g/dl)	Moderate Anemia (7.0 to 9.9 g/dl)	Mild (10.0 to 10.9 g/dl)	Number of Pupils Aged Between 5 and 9 Years	Any	Severe	Moderate	Mild	Number of Adolescents Aged Between 10 and 19 Years	Any	Severe	Moderate	Mild	Total Number of Pupils and Adolescents
Southwest Highlands	24.3	1.1	15.9	7.3	806	29.6	1.5	13.1	15.0	1,318	27.6	1.4	14.1	12.1	2,124
Southern	57.8	1.2	39.2	17.3	329	42.6	1.5	26.2	14.9	549	48.3	1.4	31.1	15.8	878
Western	36.3	1.6	23.1	11.6	761	42.0	1.4	21.6	19.0	1,798	40.3	1.5	22.0	16.8	2,559
Regions															
Arusha	15.8	1.1	9.0	5.8	469	23.1	1.1	12.6	9.3	793	20.4	1.1	11.3	8.0	1,262
Dar es Salaam	36.5	0.9	23.7	12.0	1,287	30.6	0.8	17.8	12.0	1,620	33.2	0.8	20.4	12	2,907
Dodoma	18.5	0.7	7.3	10.6	302	20.9	0.9	6.3	13.7	766	20.2	0.8	6.6	12.8	1,068
Geita	46.2	2.7	33.9	9.5	221	47.5	0.5	25.1	21.9	406	47.0	1.3	28.2	17.5	627
Iringa	13.8	0.8	4.9	8.1	247	13.1	1.4	3.7	7.9	214	13.4	1.1	4.3	8.0	461
Kagera	29.0	0.5	18.8	9.7	372	34.4	0.9	19.3	14.2	643	32.4	0.8	19.1	12.5	1,015
Katavi	43.0	2.2	30.1	10.8	93	43.0	3.6	13.6	25.8	221	43.0	3.2	18.5	21.3	314
Kigoma	31.7	0.9	20.7	10.1	426	38.0	1.6	18.1	18.4	1,152	36.3	1.4	18.8	16.2	1,578
Kilimanjaro	20.8	1.5	10.8	8.6	409	18.5	1.6	7.2	9.7	611	19.4	1.6	8.6	9.2	1,020
Lindi	58.8	2.0	40.2	16.7	102	36.3	2.0	20.1	14.2	204	43.8	2.0	26.8	15.0	306
Manyara	24.9	2.7	14.4	7.8	334	21.6	2.2	10.9	8.5	680	22.7	2.4	12.0	8.3	1,014
Mara	38.1	4.7	22.5	11.0	365	38.5	2.0	19.8	16.7	732	38.4	2.9	20.7	14.8	1,097
Mbeya	20.0	1.0	11.3	7.7	310	23.9	1.0	10.2	12.7	394	22.2	1.0	10.7	10.5	704
Morogoro	34.2	1.6	18.8	13.8	319	28.5	0.3	14.1	14.1	583	30.5	0.8	15.7	14.0	902
Mtwara	57.3	0.9	38.8	17.6	227	46.4	1.2	29.9	15.4	345	50.7	1.0	33.4	16.3	572
Mwanza	44.5	1.2	32	11.3	769	49.7	1.4	33.4	14.8	1,361	47.8	1.3	32.9	13.6	2,130
Njombe	22.1	6.7	8.0	7.4	163	10.2	1.5	3.4	5.3	266	14.7	3.5	5.1	6.1	429
Pwani	61.8	0.0	36.2	25.7	152	48.2	2.4	27.5	18.3	251	53.3	1.5	30.8	21.1	403
Rukwa	27.3	1.5	18.0	7.8	205	29.1	1.1	12.9	15.1	443	28.5	1.2	14.5	12.8	648
Ruvuma	37.9	4.5	28.3	5.2	269	34.3	3.7	21.8	8.8	431	35.7	4.0	24.3	7.4	700
Shinyanga	25.6	1.9	11.4	12.3	359	36.3	1.5	16.0	18.9	732	32.8	1.6	14.5	16.7	1,091

Demographic Characteristic	Percentage (%) of Pupils Aged Between 5 and 9 Years Classified as Having Anemia					Percentage (%) of Adolescents Aged Between 10 and 19 Years Classified as Having Anemia					Total Anemia Prevalence				
	Any Anemia (<11.0 g/dl)	Severe Anemia (<7.0 g/dl)	Moderate Anemia (7.0 to 9.9 g/dl)	Mild (10.0 to 10.9 g/dl)	Number of Pupils Aged Between 5 and 9 Years	Any	Severe	Moderate	Mild	Number of Adolescents Aged Between 10 and 19 Years	Any	Severe	Moderate	Mild	Total Number of Pupils and Adolescents
Simiyu	46.8	1.2	33.3	12.3	252	50.8	2.1	29.0	19.7	569	49.6	1.8	30.3	17.4	821
Singida	13.4	1.6	8.6	3.2	186	23.1	2.0	8.4	12.7	450	20.3	1.9	8.5	9.9	636
Songwe	19.2	0.5	14.1	4.5	198	27.7	1.2	17.3	9.2	260	24.0	0.9	15.9	7.2	458
Tabora	42.1	2.4	26.3	13.4	335	49.2	1.2	27.9	20.1	646	46.8	1.6	27.3	17.8	981
Tanga	46.3	1.6	27.9	16.8	315	41.5	2.0	24.0	15.6	501	43.4	1.8	25.5	16.1	816
Total	**33.1**	**1.6**	**20.9**	**10.6**	**8,686**	**34.1**	**1.5**	**18.2**	**14.4**	**15,274**	**33.7**	**1.5**	**19.2**	**13**	**23,960**

Source: Hemoglobin concentration for diagnosis of anemia and assessment of severity, Geneva, WHO, 2011.

Notes: The prevalence of anemia—determined based on hemoglobin levels—is adjusted for altitude (greater than 1,000 m ASL).

For adolescent boys aged between 10 and 11 years, anemia is measured as follows: severe anemia (<8.0 g/dl), moderate anemia (8.0–10.9 g/dl), mild anemia (11.0–11.4 g/dl), and any anemia (<11.5 g/dl).

For adolescent boys aged between 12 and 14 years, anemia is measured as follows: mild anemia (11.0–11.9 g/dl) and any anemia (<12.0 g/dl).

For adolescent boys aged between 15 and 19 years, anemia is measured as follows: mild anemia (11.0–12.9 g/dl) and any anemia (<13.0 g/dl).

For adolescent girls aged between 10 and 11 years, anemia is measured as follows: severe anemia (<8.0 g/dl), moderate anemia (8.0–10.9 g/dl), mild anemia (11.0–11.4 g/dl), and any anemia (<11.5 g/dl).

For adolescent girls aged between 12 and 14 years and between 15 and 19 years, anemia is measured as follows: mild anemia (11.0–11.9 g/dl) and any anemia (<12.0 g/dl).

3.6 Nutrition Status

3.6.1 Stunting

Children are defined as being stunted if their height for their age is more than 2 SDs below the WHO's Child Growth Standards median.48 A total of 68,016 pupils aged between 5 and 19 years provided stunting data. Based on the results, 25.0% of pupils aged between 5 and 19 years were stunted, 18.7% were moderately stunted, and 6.3% were severely stunted (Figure 20).

Malaria status and Epidemiological Strata

Based on the results from the survey, children who tested positive for malaria recorded a higher percentage of stunting (33.4%) than those who tested negative (23.6%). Results also indicated that the percentage of stunted pupils was generally higher in high malaria epidemiological strata (29.3%) when compared with moderate (22.9%), low (21.7%), and very low (24.2%) malaria epidemiological strata. Similar trends were observed among pupils with moderate stunting between high and very low malaria burden strata (Figure 20).

Age and Sex

Overall stunting was higher among boys (28.4%) than girls (21.6%). Moderate (20.7%) to severe (7.7%) stunting was generally also higher and among boys compared with girls (moderate: 16.6%; severe: 5.0%). Findings also showed that the percentage of stunting increased with age, reflected as 12.2% in pupils aged between 5 and 9 years, 30.5% in those aged between 10 and 14 years, and 45.8% in pupils aged between 15 and 19 years (Figure 21).

Types of Residence

A higher percentage of stunted children were recorded in rural settings (27.2%) compared with their urban counterparts (19.1%). A similar pattern was observed for moderate to severe stunting.

Figure 21. Percentages of stunted pupils aged between 5 and 19 years

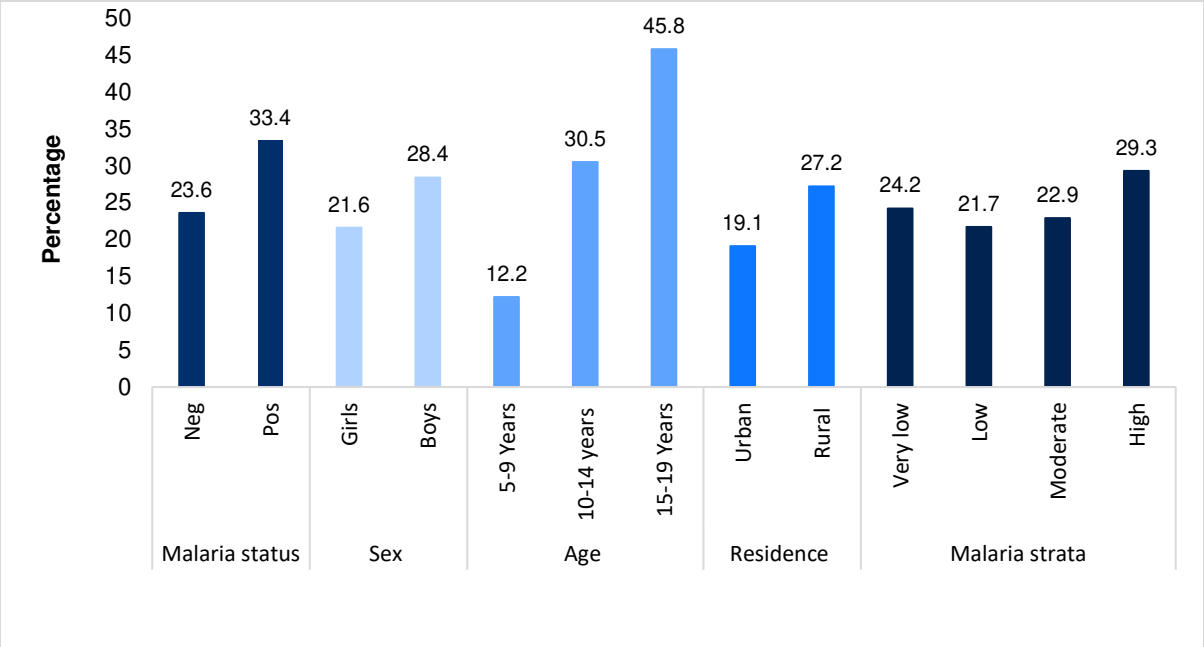
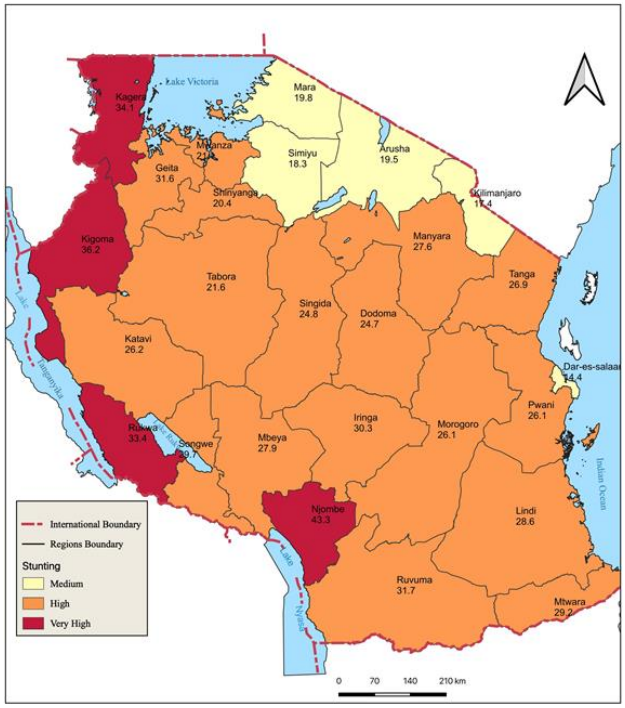


Figure 22. Prevalence of stunting among school children and adolescents



Geographical Zones

Findings showed high percentages of stunting among pupils living in the Southern Highlands zone (34.1%) and Western zone (30.2%). The lowest prevalence was recorded in the Eastern zone (18.5%). Moderate to severe stunting among pupils exhibited the same pattern.

Regions

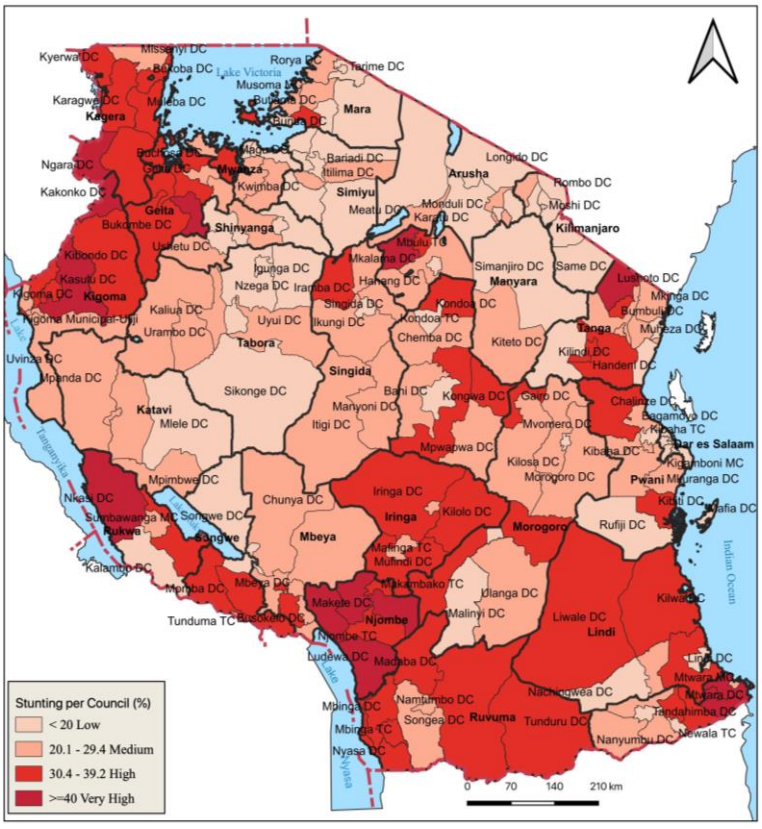
Across the regions, the highest percentages of stunting were observed in Njombe (43.3%), Kigoma (36.2%), Kagera (34.1%), and Rukwa (33.4%) regions; the lowest prevalence was recorded in the Dar es Salaam region (14.4%). The same pattern was observed for moderate to severe stunting (Figure 22).

Councils

Generally, prevalence of stunting was high in two-thirds of all (184) councils surveyed. Nkasi and Makete recorded the highest prevalence of stunting (53.2% and 51.4%, respectively).

In total, 13 district councils (Ludewa, Lushoto, Kakonko, Kibondo, Makete, Mbogwe, Mbulu, Mtwara, Nanyamba, Ngara, Njombe, Nkasi, and Wanging'ombe) recorded very high (greater than or equal to 40.0%) stunting and 8 councils recorded a stunting prevalence of ≤20% (Figure 23).

Figure 23. Prevalence of stunting among school children by council



3.6.2 Underweight (pupils aged between 5 and 9 years)

Weight-for-age is a composite index of height-for-age and weight-for-height that accounts for both acute and chronic undernutrition. Out of the 23,860 children for whom weight and age information were collected, 11.7% of the pupils were underweight, 9.7% were moderately underweight, and 2.1% were severely underweight (Figure 22).

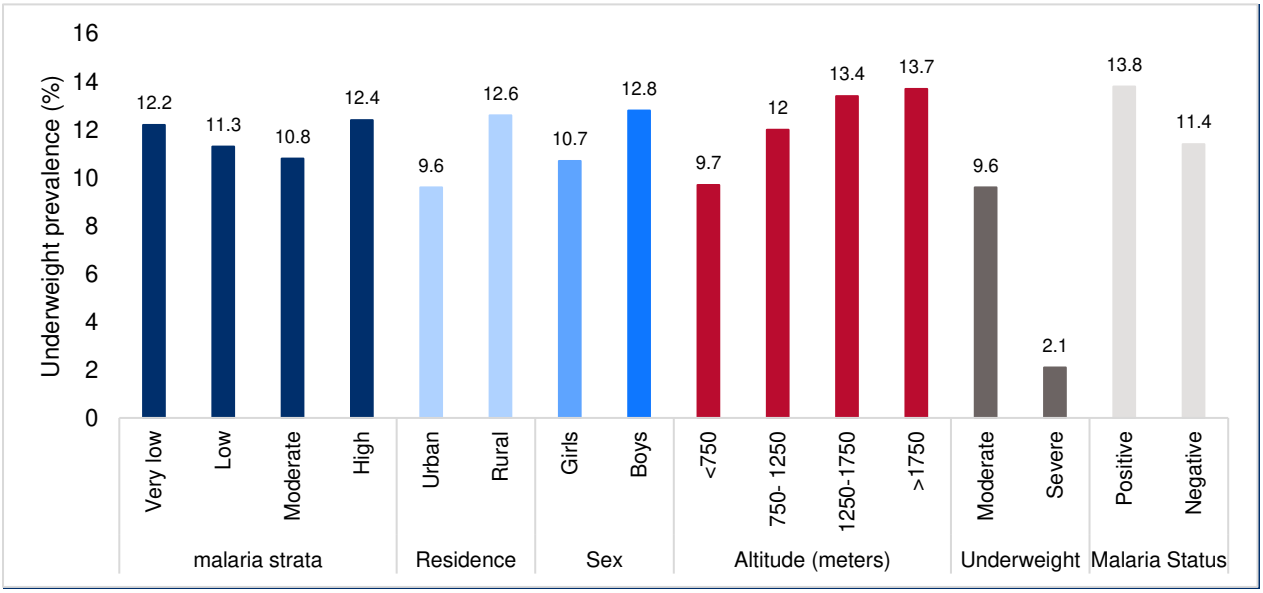
Malaria status and Epidemiological Strata

Among children 5 to 9 years who were positive for malaria, 13.8% were underweight. Between the strata, 12.4% of children from the high malaria zone were also underweight while 11.3% were from the low malaria strata.

Sex and Residence

Similarly, prevalence of underweight boys aged between 5 and 9 years was 12.8%, compared to girls of the same age. Prevalence of underweight was higher in rural areas (12.6%) than in urban areas (9.6%). Similarly, underweight prevalence was higher among those living in the high altitude (13.7%) than those living in the lowland (9.7%; Figure 24).

Figure 24. Percentage of underweight children aged between 5 and 9 years



Geographical Zones

The highest percentage of underweight pupils was observed in the Central zone (16.7%); the lowest percentage was recorded in the Eastern zone (8.7%). Similarly, a high percentage of pupils who were moderately underweight were recorded in the central zone (13.2%).

Regions

Among the regions, the highest prevalence of underweight was recorded in Rukwa (20.8%), Singida (17.7%), Kigoma (16.3%), Kilimanjaro (14.7%), Ruvuma (14.7%), Tanga (14.5%) and Pwani (14.1%). Simiyu (4.7%), Dar es Salaam (7.6%), Mwanza (8.2%), Shinyanga (8.3%), Katavi (8.9%), Tabora (9.3%), Arusha (9.8%), and Morogoro (9.9%) were regions with the lowest underweight prevalence (Figure 25).

Councils

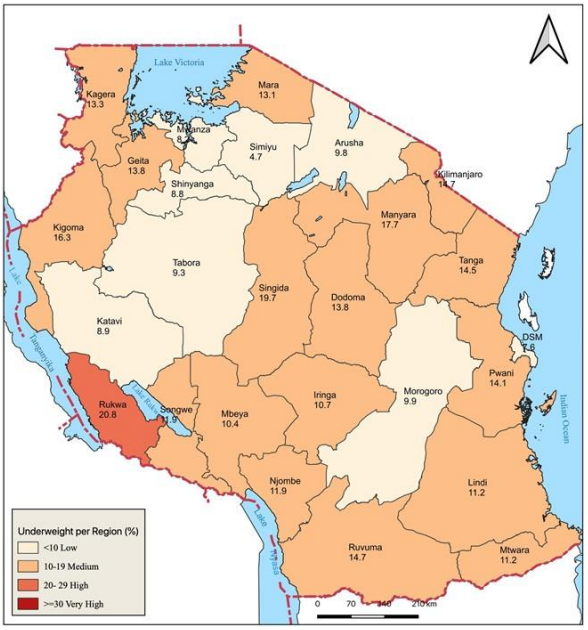
Six councils (i.e., Kiteto, Kongwa, Mkalama, Momba, Nkasi, and Nyasa) had high prevalence (greater than 30%) of underweight pupils. Conversely, two councils (Bukombe DC and Busega) had no underweight (0%) pupils (Annex 8: The 2019 SMNS Regional Profiles).

3.6.3 Thinness

Thinness (BMI-for-age <−2 scores of the 2007 WHO reference) in children and adolescents is largely under-studied, a contrast with abundant literature on under-nutrition in infants and on overweight in children and adolescents. Table 17 illustrates the prevalence of thinness and overweight among school children and adolescents aged 5–19 years by age, sex, residence, geographical zones, regions, and councils.

The overall prevalence of thinness among pupils aged 5–19 years was 11.2%; 2.4% of the same pupils were severely thin.

Figure 25. Percentage of underweight children aged between 5 and 9 years



Age and Sex

A gender differential was observed in the prevalence of thinness, with boys having a higher prevalence (12.5%) compared to girls (9.9%). The prevalence of thinness was higher among old pupils 15–19 years as compared to young pupils aged 5–9 years (19.6% vs. 7.2%).

Sex-specific differences were apparent for thinness. The prevalence of thinness was higher among boys (12.5%) compared to girls (9.9%) (Table 18).

Types of Residence

Based on the findings, the prevalence of thinness was higher (12.2%) among pupils in rural areas compared to those who resides in urban area (8.7%; **T**able 18).

Figure 26. Prevalence of overweight and obese pupils aged between 5 and 19 years

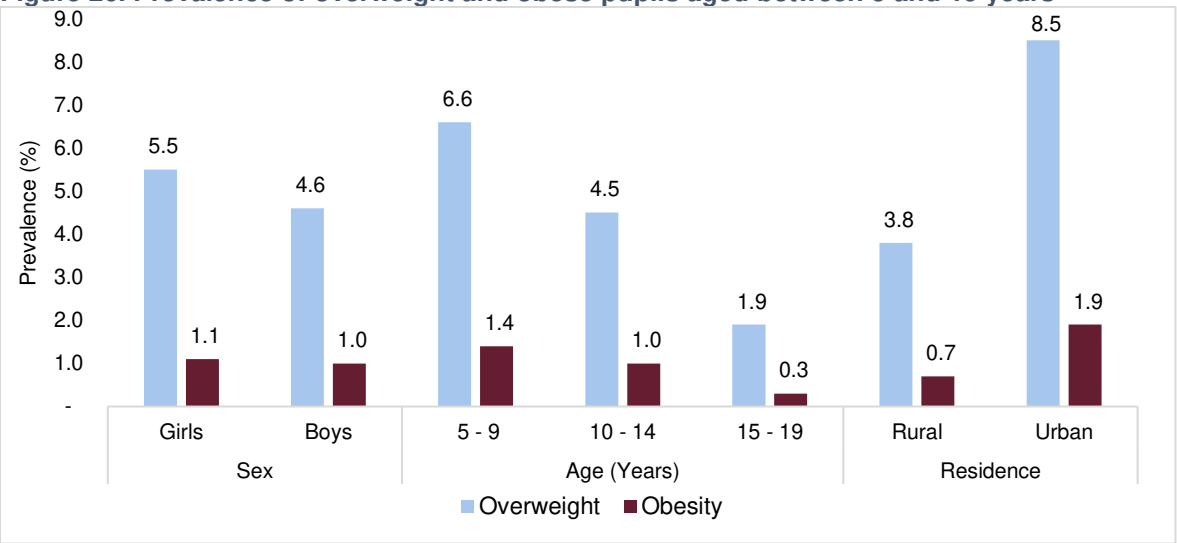
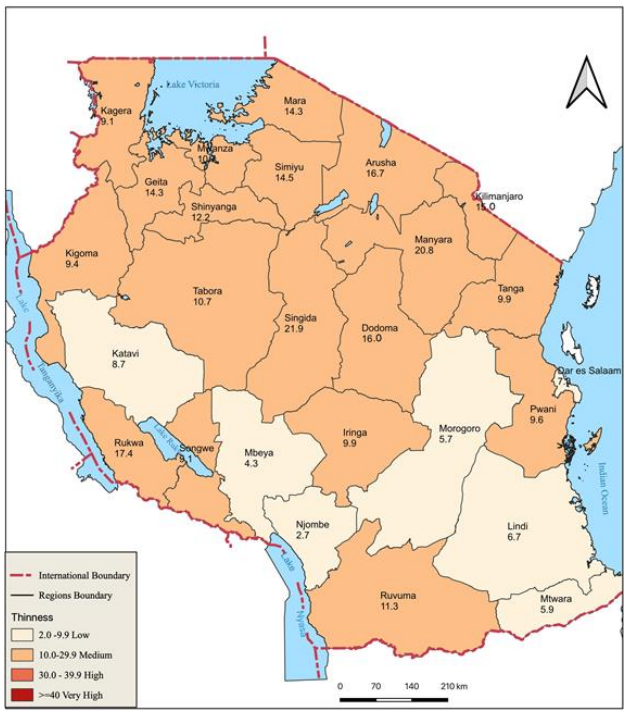


Figure 27. Prevalence of thinness among school-aged children



Geographical Zones

The zones with the highest prevalence of thinness in pupils 5 to 19 years were central (19.1%), North (14.3%), and Lake (12.1%). The Eastern zone had the lowest prevalence of thinness (7.1%; Table 18).

Regions

Regions with the highest prevalence of thinness in pupils aged 5 to 19 years were Singida (21.9%), Manyara (20.8%), and Rukwa (17.4%). Regions with the lowest prevalence of thinness in pupils aged 5–19 years were Njombe (2.7%), Mbeya (4.3%), and Morogoro (5.7%).

Based on the prevalence of thinness, regions were classified according to the level of problem: medium, high, or very high. Maps illustrating the level of thinness across all regions are presented in Table 17. Thinness was at least a medium public health problem for pupils aged 5–19 years in 13 regions, a high public health problem in 8 regions, and a very high public health problem among pupils in 5 regions (Table 18 and Figure 27).

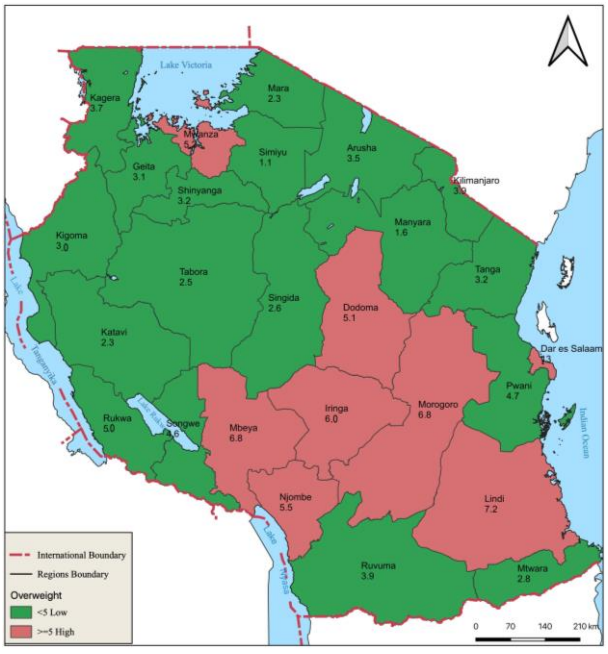
Councils

The highest prevalence of thinness in pupils aged 5 to 19 years were found in the following councils: Mkalama (57.4%), Kondoa TC (55.0%), Nyasa (39.5%), and Ngorongoro (37.7%). Regions with the lowest prevalence of thinness in pupils aged 5–19 years were Busokelo (1.6%), Makambako TC (1.6%), Mbinga DC (1.3%), and Newala TC (1.2%).

3.6.4 Overweight and Obesity

Overweight and obesity are increasing in Tanzania and the onset of overweight and obesity at an early age is of public health concern. Optimal nutrition in childhood and adolescence is very important to ensure that full growth potential is achieved and that young people reach adulthood having good health and wellbeing. In the SMNS, the prevalence of overweight (BAZ >1 SD) and obesity (BAZ >2 SD) were 5.1% and 1.1%, respectively, in pupils aged 5–19 years (Table 18).

Figure 28. Prevalence of overweight pupils aged between 5 and 19 years by region



Age and Sex

There was variation in overweight among pupils aged 5–19 years, with a prevalence of 6.6% at ages 5–9 years, 4.5% at 10–14 years, and reducing to 1.9% by the start of adulthood (15–19 years).

Sex-specific differences were less apparent for overweight. There was higher prevalence of overweight and obesity among female pupils 5.5% and 1.1%, respectively, than among boys 4.6% and 1.0%, respectively (Figure 26).

Region

With regard to area of region, pupils living in Eastern, Southern highlands and Western regions were more thinness (9.9% - 20.0%) compared to their counterparts living in the other regions (2.7% - 8.7%) (Figure 27).

Types of Residence

With regard to area of residence, pupils living in urban areas were more overweight (8.5%) or obese (1.9%) compared to their counterparts living in rural settings (overweight 3.8% and obese 0.7%; Figure 28).

Table 18. Prevalence of obesity and thinness among pupils (5–19 years)

Demographic Characteristics	BMI for Age (%)				
	Overweight BAZ >1 SD	Obesity BAZ >2 SD	Thinness BAZ <-2	Severe Thinness BAZ <-3	Number of Children
Age (in Years)					
5 to 9	6.6	1.4	7.2	1.8	23,851
10 to 14	4.5	1.0	12.7	2.6	39,714
15 to 19	1.9	0.3	19.6	4.2	4,202
Gender					
Girls	5.5	1.1	9.9	2.0	34,039
Boys	4.6	1.0	12.5	2.9	33,728
Malaria Epidemiological Strata					
High	3.3	0.5	10.4	1.9	23,835
Low	8.6	2.1	10.3	2.6	19,206
Moderate	4.7	1.0	10.8	2.4	13,292
Very low	3.4	0.6	15.1	3.3	11,434
Types of Residence					
Rural	3.8	0.7	12.2	2.6	49,068
Urban	8.5	1.9	8.7	2.0	18,699
Geographical Zones					
Central	3.2	0.9	19.1	4.3	7,534
Eastern	10.6	2.5	7.1	1.5	13,386
Lake	3.4	0.7	12.1	2.4	15,920
Northern	3.6	0.6	14.3	3.2	9,088
Southern Highlands	5.1	0.8	8.7	2.2	4,624
Southwest Highlands	5.2	1.1	9.6	2.9	6,485
Southern	4.5	1.0	6.2	0.8	2,829

Demographic Characteristics	BMI for Age (%)				
	Overweight BAZ >1 SD	Obesity BAZ >2 SD	Thinness BAZ <-2	Severe Thinness BAZ <-3	Number of Children
Western	2.8	0.3	10.0	1.8	7,901
Regions					
Arusha	3.5	0.7	16.7	4.0	3,404
Dar es Salaam	13	3.2	7.3	1.7	8,686
Dodoma	5.1	1.8	16.0	3.9	2,957
Geita	3.1	0.7	14.3	3.8	2,098
Iringa	6.0	1.1	9.9	2.1	1,608
Kagera	3.7	0.6	9.1	1.8	3,406
Katavi	2.3	0.5	8.7	1.1	812
Kigoma	3.0	0.4	9.4	1.9	4,658
Kilimanjaro	3.9	0.6	15.0	3.9	3,190
Lindi	7.2	1.8	6.7	0.9	1,102
Manyara	1.6	0.2	20.8	4.0	2,976
Mara	2.3	0.9	14.3	2.6	2,541
Mbeya	6.8	1.0	4.3	0.6	2,163
Morogoro	6.8	1.3	5.7	1.0	3,321
Mtwara	2.8	0.5	5.9	0.8	1,727
Mwanza	5.2	0.9	10.7	2.2	3,879
Njombe	5.5	0.3	2.7	0.2	1,163
Pwani	4.7	0.7	9.6	1.7	1,379
Rukwa	5.0	2.2	17.4	7.3	1,692
Ruvuma	3.9	0.9	11.3	3.7	1,853
Shinyanga	3.2	0.6	12.2	1.9	1,985
Simiyu	1.1	0.1	14.5	2.3	2,011
Singida	2.6	0.5	21.9	5.6	1,601
Songwe	4.6	0.6	9.1	2.4	1,818
Tabora	2.5	0.2	10.7	1.6	3,243
Tanga	3.2	0.6	9.9	1.4	2,494
Total	**5.1**	**1.1**	**11.2**	**2.4**	**67,767**

3.6.5 Individual Dietary Diversity

The mean IDDS for pupils was very low, marked with an average consumption of only two out of five food groups per week. Overall, the survey results indicated high consumptions of starches (76.0%) and pulses and legumes (50.0%), with a low consumption of vegetables (32.2%) and fruits (16.5%; Table 19).

Age and Sex

Results based on age categories indicated less variability of mean IDDS across age groups (1.9, 2.0, and 1.8 for 5–9 years, 10–14 years, and 15–19 years, respectively). A similar pattern was observed among boys (1.9) and girls (2.0). Percentages of consumption of all food groups were more or less the same between girls and boys and across different age categories (Table 19).

Types of Residence

Urban residents recorded a higher consumption of almost all food groups compared with their rural counterparts. Consumption of sugar, oils, and fats in urban areas was nearly twice as high (32.9%) as that in rural areas (16.6%; Table 19).

Geographical Zones

Primary school children and adolescents from the Eastern zone recorded the highest mean IDDS (2.5). The Eastern zone scored higher in the consumption of foods from different food groups, including vegetables (56.1%); pulses and legumes (44.9%); and sugars, fats, and oils (44.4%) compared with other zones. Southwest Highlands and Western zones both recorded the lowest mean IDDS of 1.6 (Table 19).

Regions

Regionally, consumption was low with none of the regions attaining the mean IDDS above three points, except for Dar es Salaam. Pupils in the Dar es Salaam Region recorded the highest consumption across all food groups, including high percentages of sugar, oils, and fats (57.6%). Mbeya and Songwe recorded the lowest consumption of different food groups with the exception of starchy staples. (Table 19).

Table 19. Dietary diversity among primary school pupils

Demographic Characteristics	Mean Dietary Diversity Score	Food groups (%)				
		Starches	Pulses, Legumes, and Animal Source Foods	Vegetables	Fruits	Sugars, Fats, and Oils
Age (in Years)						
5 to 9	1.9	75.3	50.1	32.0	15.8	21.5
10 to 14	2.0	76.3	50.3	32.8	17.3	21.6
15 to 19	1.8	77.2	47.3	27.9	13.6	14.6
Sex						
Girls	2.0	75.8	50.0	32.7	16.6	21.8
Boys	1.9	76.2	50.1	31.8	16.4	20.5
Types of Residence						
Rural	1.8	74.9	48.8	29.1	14.1	16.6
Urban	2.3	78.8	53.3	40.4	22.7	32.9
Geographical Zones						
Central	1.9	76.8	45.4	35.7	12.3	17.2
Eastern	2.5	79.2	56.1	44.9	26.7	44.4
Lake	1.9	77.0	55.3	25.6	15.1	12.7
Northern	2.0	65.0	55.2	35.0	19.9	25.7
Southern Highlands	1.9	81.6	43.6	38.0	16.2	12.8
Southwest Highlands	1.6	78.0	38.4	24.3	10.0	12.2
Southern	1.7	80.4	38.9	26.3	8.1	15.1
Western	1.6	73.8	45.1	23.0	10.8	11.5
Regions						

Demographic Characteristics	Mean Dietary Diversity Score	Food groups (%)				
		Starches	Pulses, Legumes, and Animal Source Foods	Vegetables	Fruits	Sugars, Fats, and Oils
Arusha	1.8	61.7	51.2	34.2	15.6	17.3
Dar es Salaam	2.9	83.2	64.7	53.6	33.5	57.6
Dodoma	1.6	74.5	28.2	29.2	11.4	16.7
Geita	1.9	82.4	59.8	28.3	6.5	11.2
Iringa	1.8	83.2	48.1	35.2	5.8	6.6
Kagera	1.7	61.0	62.7	17.4	15.5	12.3
Katavi	2.1	88.0	58.3	33.5	12.7	13.3
Kigoma	1.6	77.9	50.3	15.7	7.2	6.3
Kilimanjaro	2.1	61.6	66.0	30.1	18.3	32.1
Lindi	1.8	78.5	48.1	23.2	11.2	20.6
Manyara	2.0	69.7	61.5	43.5	11.3	18.1
Mara	2.1	67.1	55.8	40.4	26.0	17.7
Mbeya	1.5	76.1	26.8	27.0	9.1	7.1
Morogoro	1.6	70.6	35.4	25.6	12.5	14.4
Mtwara	1.6	81.6	32.9	28.2	6.2	11.6
Mwanza	1.9	85.1	54.8	22.8	10.6	13.2
Njombe	2.2	81.6	43.4	52.8	32.2	9.8
Pwani	2.2	74.4	51.7	37.2	18.2	33.5
Rukwa	1.8	74.5	56.0	22.8	11.2	16.1
Ruvuma	1.9	80.1	39.7	31.1	15.2	20.0
Shinyanga	2.0	83.3	50.8	33.4	18.7	16.4
Simiyu	1.7	89.0	43.1	15.8	14.4	3.7
Singida	2.1	93.9	46.5	32.8	15.6	16.5
Songwe	1.5	78.9	26.3	18.4	8.7	13.9
Tabora	1.7	67.9	37.6	33.5	16.0	18.9
Tanga	2.2	74.1	46.8	42.3	28.0	29.1
Total	**2.0**	**76.0**	**50.0**	**32.2**	**16.5**	**21.1**

3.6.6 Household Dietary Diversity

On average, 4 out of 11 food groups were consumed by the household in a week. In general, starchy staples (84.9%), oils and fats (40.3%), and legumes and nuts (44.4%) were consumed at least five to seven times per week. Fruits and animal source foods, including meat (10.4%), milk (18.8%), and eggs (4.8%), were among the least consumed foods at the household level (Table 20).

Sex and Education Level

The mean HDDS did not differ across sex of the heads of households. However, a notable variation was observed across education levels. The higher mean HDDS (4.3) was recorded among households where the head of household had achieved at least a secondary level of

education compared with those who had not completed primary school or with no education (3.3; Table 20).

Types of Residence

Survey results between rural and urban subcategories indicated little to no variability in household dietary diversity. Similarly, there was less variability in the consumption of specific food groups between urban and rural residents (Table 20).

Geographical Zones

Remarkable variations were observed across different geographical zones; the higher mean HDDS were recorded in the Eastern (4.5), Southern (4.0) and Northern zones (3.9). A notable disparity in the consumption of specific food groups was observed across geographical zones. For example, fish consumption was higher in the Lake (49.2%), Southern (36.9%), and Eastern (33.0%) zones. Consumption of legumes and nuts was higher in the Western zone (59.9%), while consumption of fruits was recorded higher in the Eastern zone (51.1%; Table 20).

Regions

HDDS varied across the regions; higher HDDS was observed in the Dar es Salaam and Kilimanjaro regions (5 out of 11 food groups). The lowest HDDS was recorded in Mbeya Region (2 out of 11 food groups; Table 20).

Table 20. Household dietary diversity

Demographic Characteristics	Mean HDDS	Food groups (%)										
		Starchy Staples	Roots and Tubers	Fruits	Vegetables	Milk	Pulses, Legumes and Nuts	Fish	Meat	Eggs	Sweets	Fats and Oils
Sex												
Men	3.7	85.1	28.0	34.0	74.7	19.0	44.5	30.6	10.6	4.7	4.1	39.5
Women	3.7	84.0	27.4	33.0	75.2	18.3	44.1	29.3	9.7	5.2	4.8	42.5
Types of Residence												
Rural	3.7	85.2	28.0	33.2	74.4	19.0	45.1	30.9	10.5	4.6	4.3	39.7
Urban	3.7	82.2	26.3	38.5	78.2	17.4	38.8	25.6	9.7	6.5	3.7	45.0
Highest Level of Education of Head of Household												
No education (n = 798)	3.3	86.8	24.1	23.3	65.5	16.7	39.7	27.1	5.5	1.8	2.4	32.2
Primary incomplete (n = 810)	3.4	80.9	25.6	26.2	64.8	16.7	43.8	31.0	11.0	4.9	5.7	32.8
Primary (n = 3,763)	3.7	85.7	28.9	33.1	76.1	17.2	45.3	31.4	9.4	4.0	3.5	39.8
Secondary incomplete (n = 130)	3.8	79.2	23.8	40.0	82.3	16.9	40.8	26.9	8.5	4.6	4.6	47.7
Secondary or more (n = 1215)	4.3	84.4	28.6	46.3	82.6	26.3	45.5	29.2	16.5	9.4	6.7	50.8
Geographical Zones												
Central	3.7	87.9	19.5	29.7	71.5	25.1	39.4	17.8	12.4	4.4	4.4	60.8
Eastern	4.5	88.1	39.1	51.4	86.9	25.4	51.7	33.0	16.3	8.2	7.3	44.2
Lake	3.6	84.0	28.0	29.1	76.3	12.3	37.2	49.2	6.2	2.0	2.5	28.5
Northern	3.9	73.4	26.6	39.4	74.6	37.2	37.5	24.7	19.8	8.5	6.1	43.9
Southern Highlands	3.7	91.6	28.0	36.9	78.7	9.3	48.4	18.2	8.2	5.4	2.6	42.5
Southwest Highlands	3.1	80.5	14.8	19.2	65.9	9.8	42.1	16.8	7.3	3.5	3.7	42.8
Southern	4.0	90.4	52.8	27.3	80.1	24.1	40.4	36.9	3.5	5.0	3.9	30.5
Western	3.2	89.1	19.7	23.1	58.7	4.4	59.9	22.1	2.5	1.9	1.9	33.3
Regions												
Arusha	3.2	62	12.3	24	72.5	44.7	31.3	12	16.1	4.4	0.9	41.8
Dar es Salaam	4.9	87.9	36.7	59.2	88.4	30	54	34.6	22.1	10.5	8.7	53.1
Dodoma	3.3	83	16.3	32.3	66.3	15	38.8	12.2	9.9	5.1	4.8	49.3
Geita	3.3	93.2	18.9	19.9	77.2	5.3	35	51.9	3.9	2.4	4.9	18

Demographic Characteristics	Mean HDDS	Food groups (%)										
		Starchy Staples	Roots and Tubers	Fruits	Vegetables	Milk	Pulses, Legumes and Nuts	Fish	Meat	Eggs	Sweets	Fats and Oils
Iringa	3.7	94.6	20.9	34.9	77.5	7.8	48.8	7.8	8.5	5.4	2.3	59.7
Kagera	3.7	56.3	58.1	36.1	70.1	9.1	59.8	36.1	3.8	1.5	0.6	34.6
Katavi	3.8	95.1	19.8	24.7	98.8	7.4	50.6	33.3	3.7	3.7	1.2	39.5
Kigoma	3.1	90	20	18.7	51.2	1.7	68.8	18.7	1.1	0.8	0.6	34.8
Kilimanjaro	5	72.3	40.2	57.3	72.9	42.4	52.3	37.1	34.3	18.4	15	56.1
Lindi	3.8	82.9	51.4	27	64	37.8	43.2	31.5	3.6	4.5	3.6	27.9
Manyara	4.2	90.3	24.3	34.7	71.7	39	50.3	19.3	18.3	5	5.7	60.3
Mara	4.2	92.8	42	39.6	76.4	20.4	33.6	66.4	19.2	5.6	6	21.2
Mbeya	2.4	92.6	8.8	18.1	54	11.6	25.6	2.8	3.3	0.9	0.5	26
Morogoro	3.6	86.6	40	27.8	81.2	11.9	44.8	23.6	5.1	3.9	4.2	28.4
Mtwara	4.1	95.3	53.8	27.5	90.6	15.2	38.6	40.4	3.5	5.3	4.1	32.2
Mwanza	3.4	89.6	16.2	19	78.4	10.9	25.1	60.2	4.1	1.3	1.8	35
Njombe	3.4	82.1	28.6	37.5	77.7	3.6	42	12.5	6.3	4.5	1.8	41.1
Pwani	4.7	93	51	59.4	90.9	28.7	53.8	44.8	7.7	4.2	6.3	28
Rukwa	3.6	81.6	13.2	12.1	73.6	8	71.3	23	8.6	1.7	1.7	63.2
Ruvuma	3.9	95.2	32.6	38	80.2	13.9	51.9	28.9	9.1	5.9	3.2	31.6
Shinyanga	2.9	90.4	11.6	20.7	72.2	10.6	39.4	14.6	3	0	0.5	27.8
Simiyu	3.7	94.1	7	42.8	86.1	19.8	26.2	61	3.2	1.1	2.1	25.7
Singida	3.6	92.1	16.5	15.9	80.5	17.7	20.7	25	6.1	1.8	1.2	82.3
Songwe	3	59.1	21	24.7	58.1	10.2	30.1	19.9	12.4	8.1	10.2	44.6
Tabora	3.3	87.9	19.4	29.4	69.4	8.2	47.3	27	4.5	3.3	3.6	31.2
Tanga	3.5	90.7	28.6	37.5	79.8	20.2	27	26.2	6	1.2	2	31
Total	**3.7**	**84.9**	**27.8**	**33.7**	**74.8**	**18.8**	**44.4**	**30.3**	**10.4**	**4.8**	**4.2**	**40.3**

3.6.7 Dietary Practices

Nutritional status of Tanzanian children and adolescents is of great importance. Various interventions and modifications aimed at promoting healthy eating behaviors have had limited impacts because of insufficient understanding of dietary habits between different age groups and sex. SMNS explored dietary practices among school children aged between 5 and 9 years and adolescents aged between 10 and 19 years by assessing the following items:

- Eating breakfast
- Eating at fast food restaurants
- Eating favorite foods considered to be healthy
- Eating foods prepared at home
- Eating with family
- Eating alone
- Snacking
- Eating foods because of advertisements.

In the seven days before the survey, 38.7% of the children and adolescents aged between 5 and 19 years never had breakfast, while 23.2% reported that they had ate at a fast-food restaurant at least once in the seven days before the survey. Based on the findings from the survey, 16.9% of pupils said that they ate their favorite healthy food almost daily, 85.2% reported eating foods prepared at home, and 70.5% reported that they typically eat with their families daily. However, 11.3% of the pupils reported that they eat alone. In addition, 27.8% eat snacks at school almost daily, and 18.0% reported to eat food as advertised by the media (Table 21and Figure 28).

Age and Sex

Based on findings from the survey, more boys (39.1%) than girls (38.3%) aged between 5 and 19 years never eat breakfast. Children aged between 15 and 19 years recorded a higher prevalence of not having breakfast (45.7%) compared with the children aged between 5 and 9 years (37.3%).

There was no clear variation in ages observed among children and adolescents aged between 5 and 19 years who reported eating at fast food restaurants at least once in the seven days before the survey. Boys (14.3%) were noted as more likely to eat at fast-food restaurants than girls (13.3%).

Among children and adolescents aged between 5 and 19 years, girls (17.2%) were more likely to eat favorite foods they consider to be healthy than boys (16.6%). No clear variation between ages was observed.

In terms of consumption of foods prepared at home, the percentages were similar between boys (85.0%) and girls (85.3%) and between younger (85.0%) and older (86.0%) children among survey respondents aged between 5 and 19 years.

Eating with family almost daily was a common practice for both boys and girls (70.5% each); this practice was also equally common among younger (72.0%) and older (72.8%) pupils.

No differences were observed between age and sex among children and adolescents aged between 5 and 19 years who reported to eat alone almost daily.

Daily snacking was observed among a higher percentage of pupils (29.7%) in the younger age group compared with 19.8% of older pupils. Eating snacks at school was more common among girls (28.2%) compared with boys (27.4%).

There were no differences observed between girls (18.0%) and boys (18%) who ate food advertised by the media during the seven days preceding the survey, and no significant patterns were observed by age group (Table 21 and Figure 28).

Table 21. Dietary practices among pupils aged between 5 and 19 years by sex and age

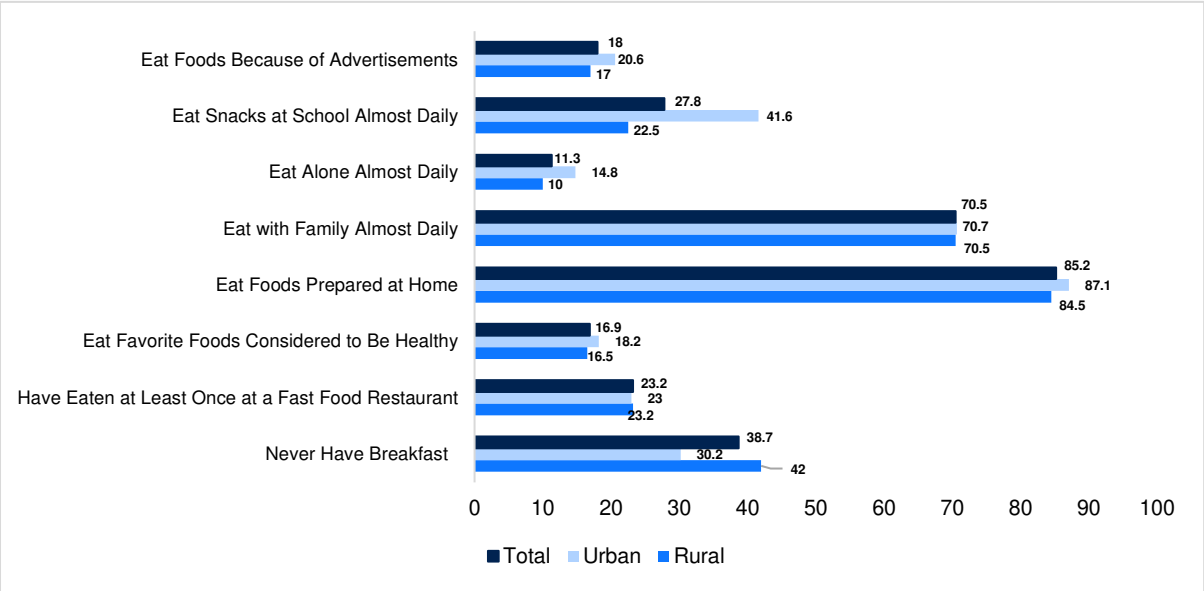
Demographic Characteristics	Percentages (%) of Pupils' Dietary Practices							
	Never Eat Breakfast	Have Eaten at Least One Meal at a Fast-Food Restaurant	Eat Favorite Foods Considered to Be Healthy	Eat Foods Prepared at Home	Eat with Family Almost Daily	Eat Alone Almost Daily	Eat Snacks at School Almost Daily	Eat Foods Because of Advertisements
Sex								
Girls	38.3	22.6	17.2	85.3	70.5	11.5	28.2	18.0
Boys	39.1	23.7	16.6	85.0	70.5	11.1	27.4	18.0
Age (in Years)								
5 to 9	37.3	20.8	16.4	85.0	72.0	11.6	29.7	16.9
10 to 14	38.8	24.6	17.3	85.2	69.4	11.4	27.5	18.7
15 to 19	45.7	23.3	16.4	86.0	72.8	9.2	19.8	17.6
Total	**38.7**	**23.2**	**16.9**	**85.2**	**70.5**	**11.3**	**27.8**	**18.0**

Types of Residence

The proportion of children and adolescents aged between 5 and 19 years who did not have breakfast were higher in rural settings (42.0%) compared to urban settings (30.2%). Among those who ate in fast-food restaurants at least once within seven days prior to the survey date, a slight difference was observed between pupils in rural (23.2%) and urban (22.0%) settings. Among children and adolescents aged between 5 and 19 years who reported regularly eating foods prepared at home, 87.1% were from urban compared with 84.5% from rural settings.

Children and adolescents aged between 5 and 19 years who reported regularly eating with other family members were represented from both rural (70.5%) and urban (70.7%) settings. Children from urban areas were more likely to eat alone compared with those from rural settings. Snacking in school was more common among pupils in urban (41.6%) settings compared with their rural (22.5%) counterparts. Finally, eating food because of advertisements was more common in urban (20.6%) versus rural (17.0%) settings (Figure 29).

Figure 29. Dietary practices among children and adolescents (5–19 years old)



Geographical Zones

The number of children who have low tendencies of having breakfast is heterogenous across geographical zones. Survey findings indicate that more than half of pupils in the Western zone (56.3%) and the Lake zone (54.7%) reported not having any breakfast during the seven days before the survey; the lowest percentage was recorded in the northern zone (11.7%; Table 22).

Eating at fast food restaurants was lowest in the Southern Highlands (16.0%), Western (16.4%), and Southwest Highlands (17.1%) zones.

In the Eastern zone, 24.1% of pupils regularly ate their favorite foods considered to be healthy compared with their counterparts in other zones. Additionally, survey results indicated that eating favorite foods considered to be healthy a few times per week was reported the lowest in Central (8.5%), Lake (13.1%) and Northern (15.0%) zones.

Eating food prepared at home was common in the Southern Highlands (90.3%), Central (89.1%), and Southern (88.4%) zones.

Eating with family on a daily basis is a common practice among pupils living in the Southern (80.8%), Western (77.4%), and Southern Highlands (77.0%) zones. The percentage of pupils who regularly eat alone was high in the Eastern zone (19.6%) compared with the other zones.

Regularly eating snacks in school was higher among pupils in the Eastern (58.5%) and Southern (28.9%) zones; a lower percentage (11.5%) was recorded in the Western zone (Table 22).

The highest percentage of pupils who ate food after seeing an advertisement was observed in the Eastern zone (28.3%), while the Western zone recorded the lowest percentage (11.1%).

Regions

Based on the findings from the survey, not having breakfast was experienced more often by pupils living in the Kigoma (73.5%), Simiyu (65.1%), and Rukwa (60.9%) regions. In contrast, not eating breakfast was less experienced among pupils in the Arusha (9.6%) and Kilimanjaro (8.7%) regions during the seven days before the survey.

The highest percentages of pupils who did not eat at fast-food restaurants were recorded in Iringa (92.3%), Kigoma (92.5%), and Mbeya (90.7%) regions.

High percentages of pupils who ate their least favorite healthy food were observed in Mbeya (70.6%), Simiyu (68.3%), and Geita (62.7%) and lowest in Rukwa (36.8%), Shinyanga (28.5%), and Kigoma (27.5%) regions.

The highest percentages of pupils who reported eating food prepared at home were recorded in Iringa (96.4%), Dodoma (93.1%), Lindi (92.8%), Kigoma (92.1%), and Rukwa (91.3%) regions (Table 22).

The highest percentages of pupils who reported regularly eating with family were recorded in the Kigoma (89.0%), Mtwara (86.6%), and Iringa (83.5%) regions. In comparison, the highest percentages of pupils who reported regularly eating alone was recorded in the Dar es Salaam (23.8%), Shinyanga (19.5%), and Katavi (16.6%) regions.

Snacking in schools was commonly reported in the Dar es Salaam (65.9%) and Pwani (55.3%) regions compared with a low percentage reported by pupils in the Kigoma region (9.4%).

The highest percentages of pupils who reported eating food after seeing an advertisement were recorded in Njombe (36.9%), Morogoro (34.7%), and Pwani (30.3%) regions. The lowest percentages were recorded in the Tabora (7.8%), Iringa (6.6%), and Mbeya (4.7%) regions (Table 22).

Table 22. Dietary practices among school children and adolescents (5–19 years old)

Demographic Characteristics	Percentages (%) of Pupils' Dietary Practices							
	Never Have Breakfast	Have Eaten at Least One Meal at a Fast-Food Restaurant	Eat Favorite Foods Considered to Be Healthy	Eat Foods Prepared at Home	Eat with Family Almost Daily	Eat Alone Almost Daily	Eat Snacks at School Almost Daily	Eat Foods Because of Advertisements
Geographical Zones								
Central	25.8	27.4	8.5	89.1	70.5	5.6	20.4	15.4
Eastern	31.1	28.6	24.1	84.3	64.6	19.6	58.5	28.3
Lake	54.7	20.0	13.1	80.5	76.5	10.0	21.4	15.4
Northern	11.7	28.5	15.0	87.8	58.0	10.0	26.4	17.9
Southern Highlands	39.4	16.0	15.5	90.3	77.0	9.5	21.3	18.8
Southwest Highlands	45.3	17.1	19.0	83.9	68.3	10.6	14.6	14.2
Southern	40.4	31.3	21.8	88.4	80.8	8.1	28.9	18.2
Western	56.3	16.4	20.4	86.3	77.4	9.8	11.5	11.1
Regions								
Arusha	9.6	22.2	11.0	91.1	62.4	13.4	25.5	22.7
Dar es Salaam	23.6	30.4	25.1	84.1	62.7	23.8	65.9	25.5
Dodoma	20.8	21.7	7.6	93.1	75.2	4.4	29.5	14.4
Geita	55.7	22.5	10.1	80.6	71.3	7.0	11.0	10.7
Iringa	29.1	7.7	7.4	96.4	83.5	2.9	17.6	6.6
Kagera	51.0	12.8	11.0	88.2	78.0	9.9	22.2	12.7
Katavi	56.4	16.0	16.4	88.9	71.6	16.6	18.7	18.1
Kigoma	73.5	7.5	27.5	92.1	89.0	9.5	9.4	13.3
Kilimanjaro	8.7	29.1	17.6	83.2	51.6	7.2	17.9	9.7
Lindi	33.5	36.6	26.7	92.8	71.5	14.5	41.8	9.2
Manyara	21.9	40.6	8.3	86.0	64.6	6.8	12.5	17.6
Mara	52.1	25.9	9.4	71.5	72.9	7.6	19.6	13.0
Mbeya	40.7	9.3	7.0	74.1	70.5	13.3	17.0	4.7

Demographic Characteristics	Percentages (%) of Pupils' Dietary Practices							
	Never Have Breakfast	Have Eaten at Least One Meal at a Fast-Food Restaurant	Eat Favorite Foods Considered to Be Healthy	Eat Foods Prepared at Home	Eat with Family Almost Daily	Eat Alone Almost Daily	Eat Snacks at School Almost Daily	Eat Foods Because of Advertisements
Morogoro	48.3	25.7	22.0	84.4	67.8	12.7	40.5	34.7
Mtwara	44.8	27.9	18.7	85.7	86.6	4.0	20.6	23.9
Mwanza	52.7	23.2	13.3	86.8	78.2	10.8	32.1	27.4
Njombe	39.7	15.4	22.1	88.7	73.0	9.1	15.2	36.9
Pwani	36.8	24.8	22.5	85.8	68.9	9.0	55.3	30.3
Rukwa	60.9	20.2	36.8	91.3	74.3	10.5	12.9	16.9
Ruvuma	48.1	23.6	18.3	86.1	73.8	15.4	28.4	17.9
Shinyanga	56.4	21.0	28.5	64.1	78.0	19.5	14.6	9.1
Simiyu	65.1	14.8	8.3	82.9	79.3	5.6	19.2	10.6
Singida	41.9	13.4	10.2	87.8	73.1	5.5	18.6	12.9
Songwe	31.0	23.9	17.5	86.2	58.6	5.0	11.5	21.1
Tabora	31.4	29.3	10.2	78.0	60.7	10.3	14.6	7.8
Tanga	18.3	36.4	17.0	89.0	60.1	8.8	38.4	21.7
Total	**38.7**	**23.21**	**16.9**	**85.2**	**70.5**	**11.3**	**27.8**	**18.0**

3.6.8 Physical Activity Levels

Table 23 presents the prevalence of low, moderate, and high physical activity among school children and adolescents aged between 5 and 19 years. Results indicate that 42.1% of pupils aged between 5 and 19 years reported low physical activity, 38.1% moderate physical activity, and 19.7% high physical activity.

Age and Sex

Based on the survey findings, more girls (43.6%) than boys (40.7%) recorded levels of low physical activity and moderate physical activity (38.9% for girls compared with 37.3% for boys). However, boys recorded a higher percentage of high physical activity (22.0%) compared with girls (17.5%). Across age groups, pupils aged between 5 and 9 years reported a higher prevalence of low physical activity (47.3%) compared with those aged between 15 and 19 years (36.5%). High physical activity was more common among pupils in the older age group (27.5%) when compared with younger pupils (13.9%; Table 23).

Types of Residence

Pupils and adolescents aged between 5 and 19 year from urban areas reported a higher prevalence of low physical activity (43.3%) compared with those from rural settings (41.7%). Most pupils aged between 5 and 19 years from rural settings (20.3%) reported a higher prevalence of high physical activity compared with those in urban (18.3%) areas (Table 23).

Geographical Zones

Pupils aged between 5 and 19 years from the Eastern zone (50.9%) reported a higher prevalence of low physical activity compared with those living in other zones. Pupils from the Southern Highlands zone (29.5%) recorded high physical activity compared with those living in other zones (Table 23).

Regions

Low physical activity was common among pupils from the following regions: Lindi (59.2%), Kigoma (57.3%), Mbeya (56.9%), Morogoro (55.5%), Songwe (54.2%), and Arusha (53.0%). High physical activity was recorded highest among pupils in Rukwa Region (37.4%; Table 23).

Table 23. Physical activity levels among pupils aged between 5 and 19 years

Demographic Characteristics	Percentages (%) of Pupils' Levels of Physical Activity			Total Number of Pupils Reporting
	Low Physical Activity	Moderate Physical Activity	High Physical Activity	
Age (in Years)				
5 to 9	47.3	38.8	13.9	23,985
10 to 14	39.7	37.9	22.4	39,803
15 to 19	36.5	36.0	27.5	4,252
Sex				
Girls	43.6	38.9	17.5	34,145
Boys	40.7	37.3	22.0	33,895
Types of Residence				
Rural	41.7	38.0	20.3	49,246
Urban	43.3	38.4	18.3	18,794
Geographical Zones				
Central	28.4	50.7	20.9	7,532
Eastern	50.9	33.2	16.0	13,442

Demographic Characteristics	Percentages (%) of Pupils' Levels of Physical Activity			Total Number of Pupils Reporting
	Low Physical Activity	Moderate Physical Activity	High Physical Activity	
Lake	35.6	41.8	22.6	15,991
Northern	46.3	39.5	14.1	9,103
Southern Highlands	41.5	29.0	29.5	4,651
Southwest Highlands	47.2	29.4	23.4	6,554
Southern	47.0	36.2	16.8	2,837
Western	43.3	38.7	18.0	7,930
Regions				
Arusha	53.3	36.0	10.7	3,421
Dar es Salaam	49.0	34.7	16.3	8,724
Dodoma	29.7	54.5	15.8	2,900
Geita	48.1	33.0	18.9	2,108
Iringa	42.6	24.4	33.0	1,614
Kagera	28.3	56.5	15.3	3,417
Katavi	35.5	31.8	32.8	818
Kigoma	57.3	29.3	13.4	4,680
Kilimanjaro	49.9	36.1	13.9	3,191
Lindi	59.2	25.5	15.4	1,107
Manyara	35.0	47.2	17.8	2,987
Mara	43.3	29.8	26.9	2,563
Mbeya	56.9	33.4	9.7	2,164
Morogoro	55.5	30.9	13.6	3,334
Mtwara	39.2	43.1	17.7	1,730
Mwanza	35.3	31.0	33.7	3,895
Njombe	39.8	25.8	34.3	1,165
Pwani	51.2	29.0	19.9	1,384
Rukwa	33.1	29.5	37.4	1,738
Ruvuma	41.6	34.8	23.6	1,872
Shinyanga	36.3	46.1	17.6	1,992
Simiyu	24.9	58.1	17.0	2,016
Singida	14.3	50.3	35.4	1,645
Songwe	54.2	23.5	22.3	1,834
Tabora	23.2	52.2	24.6	3,250
Tanga	32.2	48.7	19.1	2,491
Total	**42.1**	**38.1**	**19.7**	**68,040**

3.6.9 Source of Nutrition Messages

Radio, television, and the schools were cited as major sources of nutrition information provided to pupils aged between 10 and 19 years. Based on the findings from the survey, radio was the largest source of nutrition information (42.2%), followed by television (20.3%), schools (19.6%), leaflets and posters (8.5%), billboards (3.9%), HFs and newspapers (each with 1.9%), and family (1.8%). Small differences were observed between sex in terms of sources

of nutrition information; girls (43.4%) were more exposed to messaging through the radio compared with boys (41.0%), although boys were more informed by television (21.6%) compared with girls (19.1%; Table 24).

Age and Sex

Data were disaggregated according to two age groups. The highest percentage of pupils exposed to nutrition messages through the radio were aged between 15 and 19 years (43.1%), followed by those aged between 10 and 14 years (42.1%). A similar trend was observed when measuring the school as the source of nutrition messaging; pupils aged between 15 and 19 years recorded the highest percentage (27.6%), followed by those aged between 10 and 14 years (18.6%). Pupils aged between 10 and 14 years reported receiving their messaging from television sources (21.4%) compared with those aged between 15 and 19 years (11.3%; Table 24).

Malaria Epidemiological Strata

Exposure to nutrition messages via different sources varies across malaria burden strata, with radio reported as the primary source in all high (50.6%), moderate (45.1%), very low (42.8%), and low (32.8%) burden strata (Table 24).

Types of Residence

Radio was the common source of nutrition messages among pupils in both rural (45.4%) and urban (35.6%) areas. Television was the second common source of nutrition messages reported by pupils in urban setting (31.3%; Table 24).

Geographical Zones

Pupils cited radio as the primary source of nutrition messages among Tanzania's zones, with the highest percentage recorded in the lake zone (55.8%). The lowest percentages were from the following zones: Western (48.6%), Central (45.7%), Northern (39.7%), Southwest Highlands (35.6%), Eastern (32.9%), Southern Highlands (32.6%), and Southern (29.5%). Television was the most prevalent source of nutrition messages in the Eastern (40.0%) and Northern (25.5%) zones. Pupils in the Southwest Highlands zone (37.6%) cited school as the primary source of nutrition messages.

Regions

Pupils cited radio as the main source of nutrition messages across all regions, with the highest percentage recorded in Shinyanga Region (71.2%); the lowest percentages were recorded in the following regions: Mara (66.2%), Tabora (60.5%), Manyara (59.7%), Geita (57.4%), Mwanza (56.7%), and Kagera (55.3%). Television was cited most often in Dar es Salaam (52.4%), Tanga (31.3%), and Arusha (26.5%) regions. Pupils in Songwe (51.7%), Katavi (39.1%), and Simiyu (37.0%) regions cited the school as their primary source of nutrition messages. More than 20% of pupils in Mbeya (25.5%), Simiyu (24.9%) and Lindi (20.6%) also reported Leaflets and Posters as their source of nutrition messages (Table 24).

Table 24. Exposure to nutrition messages

Demographic Characteristics	Percentages (%) of Pupils' Exposure to Nutrition Messages								Total (n)
	Billboards	Family	HF	Leaflets and Posters	Newspaper	Radio	School	TV	
Sex									
Girls	3.8	2.0	1.8	8.3	2.0	43.4	19.6	19.1	**7,581**
Boys	3.9	1.6	1.9	8.7	1.8	41.0	19.5	21.6	**7,596**
Age (in Years)									
10 to 14	3.9	1.8	1.8	8.4	2.0	42.1	18.6	21.4	**13,558**
15 to 19	4.1	1.5	2.3	8.9	1.2	43.1	27.6	11.3	**1,619**
Malaria Epidemiological Strata									
High	4.4	2.1	2.3	9.3	2.7	50.6	17.6	10.9	**4,300**
Low	3.1	1.6	2.2	5.8	1.5	32.8	20.2	32.7	**4,945**
Moderate	3.8	2.2	1.6	10.7	1.7	45.1	19.1	15.8	**3,212**
Very low	4.5	1.3	0.7	9.3	1.4	42.8	21.9	18.2	**2,720**
Types of Residence									
Rural	3.7	1.6	1.8	10.1	2.1	45.4	20.3	15.1	**10,260**
Urban	4.3	2.3	2.0	5.1	1.4	35.6	18.1	31.3	**4,917**
Geographical Zones									
Central	4.0	0.9	2.4	12.4	1.2	45.7	20.7	12.7	**1,902**
Eastern	4.2	1.1	1.4	3.7	3.3	32.9	13.3	40.0	**3,691**
Lake	3.3	0.9	1.3	10.2	1.3	55.8	16.8	10.3	**3,838**
Northern	5.0	0.6	0.8	7.4	1.2	39.7	19.7	25.5	**2,020**
Southern Highlands	4.6	9.5	5.7	11.3	0.5	32.6	19.8	16.1	**1,110**
Southwest Highlands	1.9	2.1	1.0	9.1	2.8	35.6	37.6	10.0	**1,364**
Southern	4.2	6.9	5.2	15.1	3.5	29.5	20.6	14.9	**403**
Western	4.0	1.1	2.2	7.4	0.9	48.6	26.3	9.4	**849**
Regions									
Arusha	3.5	0.4	1.2	10.3	1.1	37.2	19.8	26.5	**992**
Dar es Salaam	3.5	0.7	1.5	2.4	1.8	29.3	8.4	52.4	**2,611**

Demographic Characteristics	Percentages (%) of Pupils' Exposure to Nutrition Messages								Total (n)
	Billboards	Family	HF	Leaflets and Posters	Newspaper	Radio	School	TV	
Dodoma	2.1	0.6	4.6	13.5	1.8	34.3	26.6	16.5	**867**
Geita	5.7	3.2	0.5	2.7	1.5	57.4	22.9	6.0	**401**
Iringa	3.3	6.9	7.5	15.7	0.7	32.1	22.3	11.5	**305**
Kagera	5.2	0.8	2.9	9.1	2.0	55.3	12.5	12.2	**713**
Katavi	6.0	0.8	2.3	4.5	4.5	31.6	39.1	11.3	**133**
Kigoma	4.2	1.0	3.0	6.9	1.0	40.6	30.3	13.1	**505**
Kilimanjaro	5.3	1.0	0.4	3.6	1.3	45.4	24.7	18.3	**526**
Lindi	6.0	6.0	4.5	20.6	6.0	30.7	8.0	18.1	**199**
Manyara	7.7	1.4	0.0	16.1	1.1	59.7	7.4	6.8	**665**
Mara	2.1	0.4	0.0	3.3	2.5	66.2	12.1	13.5	**571**
Mbeya	0.9	2.6	1.3	25.5	5.5	31.5	16.2	16.6	**235**
Morogoro	4.2	2.2	1.1	7.0	8.5	39.2	27.5	10.2	**854**
Mtwara	2.5	7.8	5.9	9.8	1.0	28.4	32.8	11.8	**204**
Mwanza	2.3	0.9	1.2	15.8	1.1	56.7	9.8	12.2	**984**
Njombe	3.6	7.5	2.9	2.9	0.0	45.3	21.5	16.3	**307**
Pwani	12.4	0.9	1.3	6.2	0.9	50.9	16.8	10.6	**226**
Rukwa	1.1	3.0	1.1	5.1	0.8	45.6	32.2	11.2	**472**
Ruvuma	6.0	12.2	6.2	13.7	0.6	25.1	17.3	18.9	**498**
Shinyanga	2.0	0.6	0.3	1.7	0.8	71.2	16.3	7.0	**639**
Simiyu	3.6	0.2	2.6	24.9	0.2	23.8	37.0	7.7	**530**
Singida	1.9	0.8	1.4	3.0	0.0	47.6	30.8	14.6	**370**
Songwe	2.1	1.3	0.6	6.5	2.9	29.4	51.7	5.5	**524**
Tabora	3.8	1.2	1.2	8.1	0.9	60.5	20.3	4.1	**344**
Tanga	7.8	0.6	0.6	5.6	1.4	38.6	14.1	31.3	**502**
Total	**3.9**	**1.8**	**1.9**	**8.5**	**1.9**	**42.2**	**19.6**	**20.3**	**15,177**

Chapter Four: Discussion

4.1 Malaria Prevalence

This nationwide cross-sectional survey was conducted among primary school pupils in Mainland Tanzania between August and October 2019. Results indicate that 14.1% of school-aged children had a malaria infection with marked heterogeneity across geographical zones, regions, and age groups. Results from the three SMPSs conducted during 2015, 2017, and 2019 were similar, persistently recording higher malaria infection in the Southern, Lake, and Western zones and among children aged between 12 and 16 years (Figures 30 and 31). Cross-sectional studies conducted in Malawi and Kenya revealed that school-aged children are reservoirs for malaria infection compared with younger children in all transmission settings and that they are less likely to be exposed to malaria control interventions (46–48). Similar results were observed during a study of school-aged children that was conducted in the Southern and Western parts of Nigeria where it was revealed that school location, age, and gender contribute to malaria infection (49). Older children may serve as transmission reservoirs because of acquired antimalarial immunity that leads to persistent asymptomatic infections, which are less likely to be treated with antimalarial drugs than acute febrile illnesses that present in young children (46). In this survey 8,603 children (89.5%) had normal body temperature. Most malaria infections do not present with fever as is the main sign in older children and adults; as a result, low numbers of malaria infection may be missed in surveillance strategies that rely on microscopy or antigen detection and can persist between seasons and perpetuate transmission (46).

Malaria prevalence in Tanzania progressively declined among school-aged children for the three consecutive SMPSs conducted biennially (Figure 29 and Figure 31**)**. A 26.9% decline was observed from 2015 (21.6%) to 2017 (15.8%) and 10.8% decline between 2017 (15.8%) and 2019 (14.1%). Overall, during the 5-year period (from 2015 through 2019), malaria infection declined by 34.7%. This reduction can be attributed to increased community access to different malaria control measures deployed by the NMCP, including effective communication promoting the prevention and control of malaria.

Figure 30. Malaria prevalence trends by geographical zone from 2015 through 2019

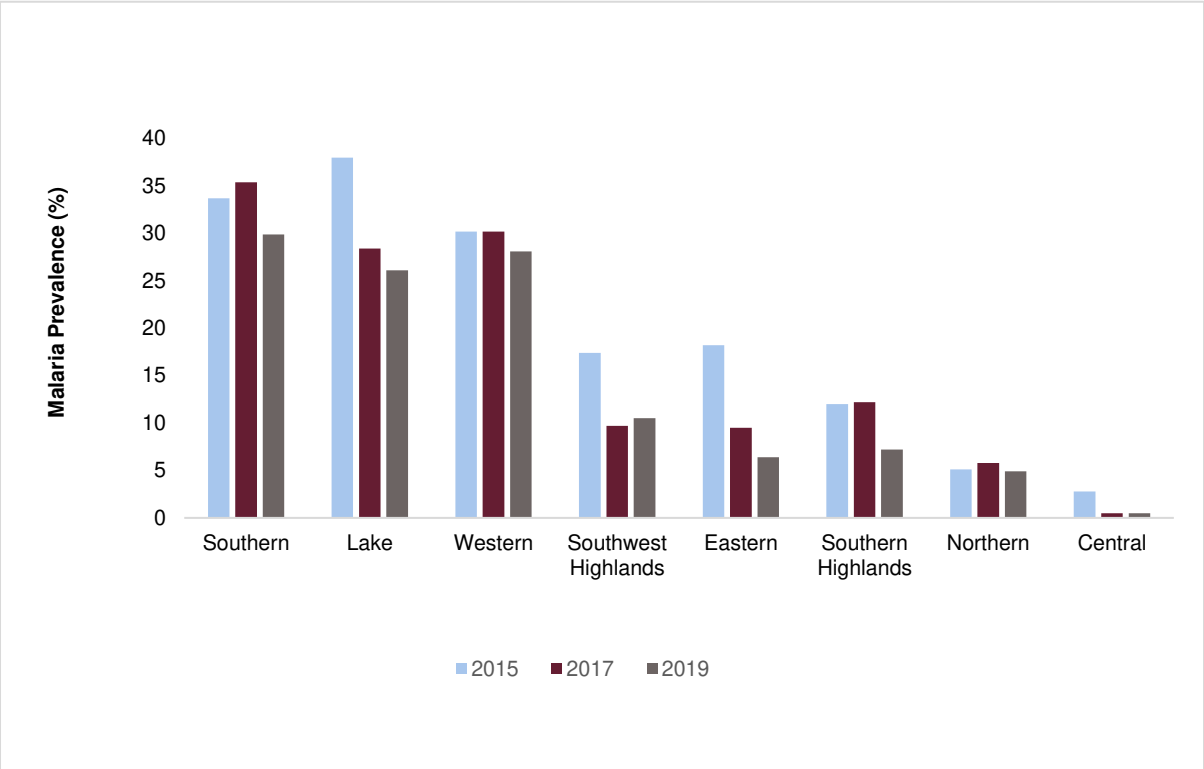
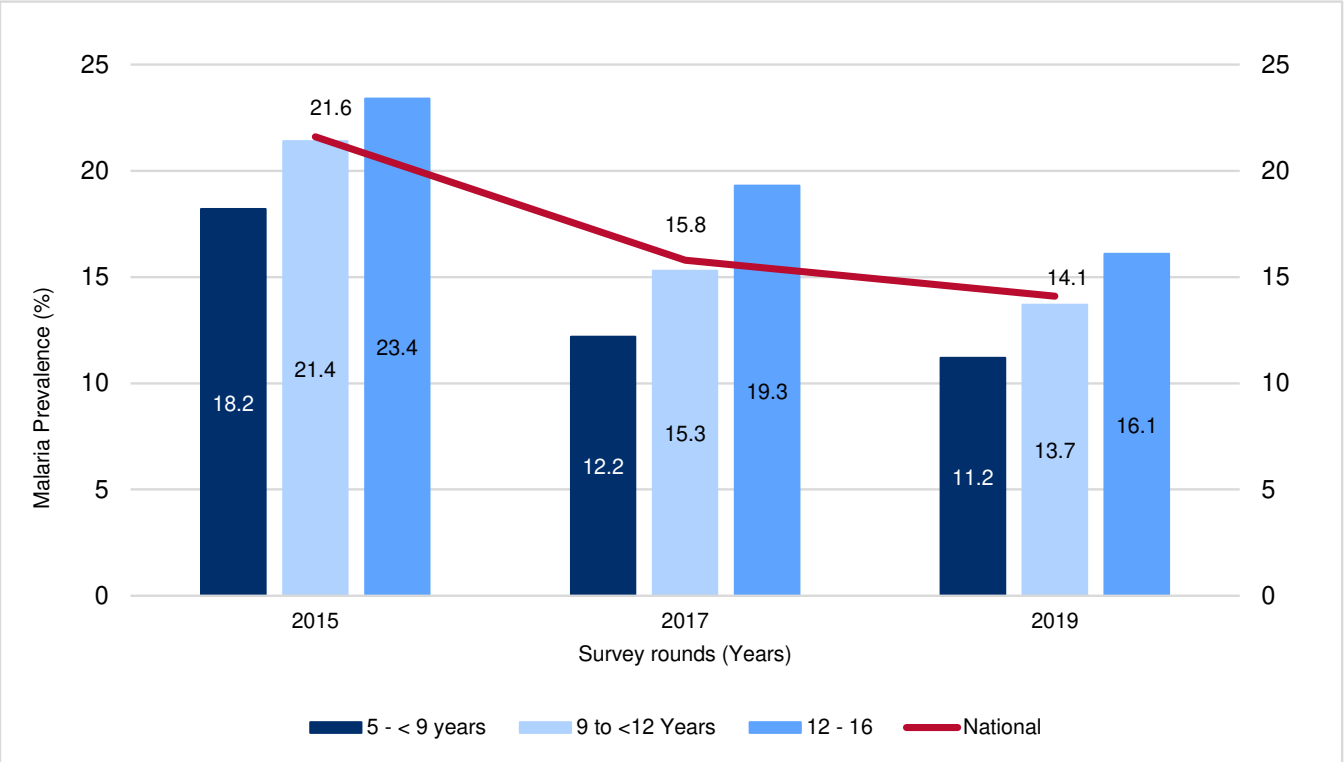


Figure 31. Malaria prevalence trends among school-aged children in 2015 through 2019



Over the three SMPSs conducted during 2015, 2017, and 2019, the risk of malaria infection among pupils varied between high and low malaria burden areas. High prevalence was reported around Lake Victoria, Tanganyika, and Nyasa, and along the coastal region and

southern portion of Mainland Tanzania compared with lower rates in the Northern, Central, and Southern Highlands zones. Similar results were observed in the standalone MIS conducted in 2017 (7) and in routine HF surveillance data (5). The 2015/16 DHS/MIS reported the highest malaria prevalence among children U5 in the Western zone (27.7%) and in regions around Lake Victoria (23.5%) (23). Malaria incidence, calculated by using outpatient data and confirmed by Pf/Pan mRDT and/or microscopy, is high around Lake Victoria, in the Western zone along Lake Tanganyika and Nyasa, in the Southern zone, and along the Indian Ocean, with an average of 150 incidences per 1,000 persons per year. Extremely low malaria incidence (less than 15 incidences per 1,000 persons per year) is observed in the central, southwestern, and northeastern areas of Tanzania (45). The highest malaria prevalence and incidence rates recorded in the northwest along Lake Tanganyika, in the south, and along the coastal regions may be explained in part by long rainfall and the short rainfall which, in turn, favors mosquito breeding sites that support malaria vector reproduction and survival.

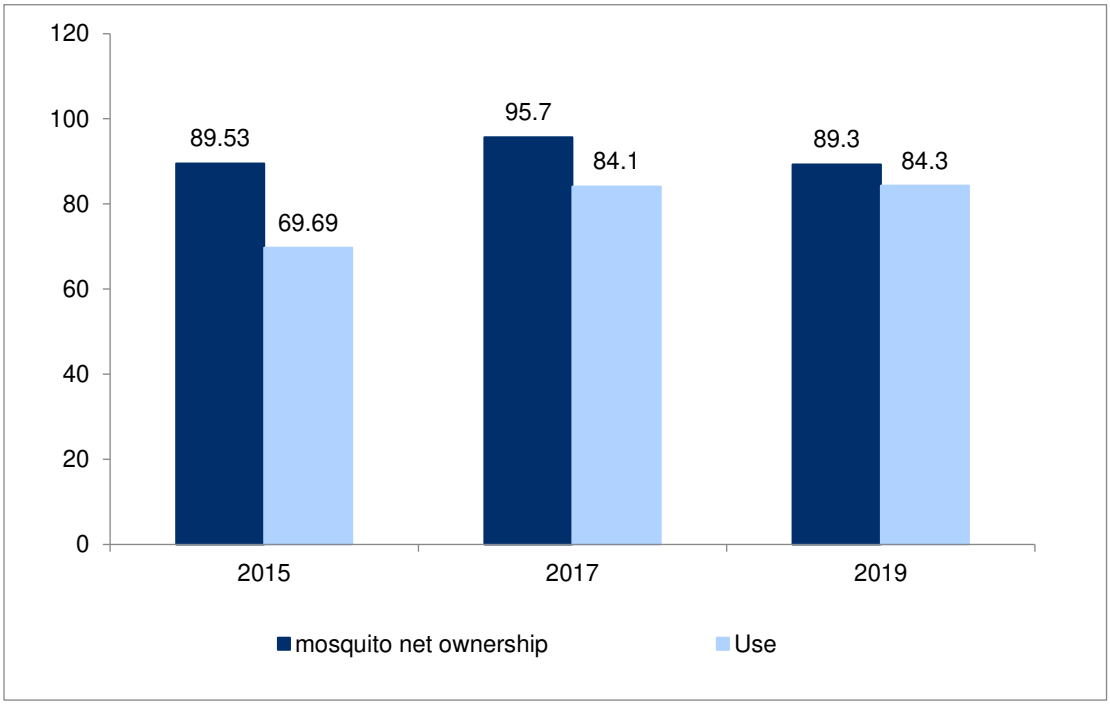
4.2 Mosquito Net Ownership and Use

Mosquito nets are an important tool in the control and reduction of malaria infection in Tanzania. LLINs are key in the control of malaria infection in the country and show demonstrable benefits among young children and pregnant women. The Malaria Strategic Plan for 2018–2020 aimed at attaining 85.0% coverage of LLINs within the population living in all transmission settings and across all control stages (4).

In this survey, pupils reported overall high ownership of mosquito nets at 89.3%, although a slightly lower percentage (84.3%) in terms of use. Children aged between 10 and 16 years recorded high ownership of mosquito nets, but low use. Lower mosquito net usage was more pronounced in older pupils aged between 17 and 19 years than those in younger age categories. A similar pattern where use of mosquito nets was higher in younger children but very low among older children was recorded more than a decade ago (50); a gap that continues currently (Figure 32). Low usage of mosquito nets has also been reported in various parts of Africa and is attributed to an array of reasons, including hot tropical weather in many areas of sub-Saharan Africa, the perception of the limited availability of mosquito nets, or simply not liking the smell of the treated nets (51,52).

Validation of ownership of any mosquito net performed during household visits; indicated that recorded ownership at the household level was slightly lower than what was reported by pupils. The survey further revealed that overall ownership of LLINs at the household level was significantly less (73.1%) than ownership of any mosquito net (83.2) (Table 11). These results align with the 2017 MIS report, which indicated that LLIN use, especially among children and pregnant women, is low nationwide (7).

Figure 32. Ownership and use of any mosquito net in pupils (5–16 years old)



Results from the three surveys indicate a slight decline in the overall ownership of any mosquito net between 2017 and 2019. However, the use of mosquito nets has increased between the 2015 and 2019 survey rounds.

The findings of this survey indicate six in ten (62.8%) of the household population slept under any mosquito net the night prior to the survey, this is an increase compared to the 2017 Malaria Indicator survey (7) which reported 56.5 % use of any mosquito net and to the 2015 Tanzania Demographic and Health survey and Malaria indicator survey (23). The results further indicate eight in ten (85.1%) of the household population who reported to have slept under a mosquito net the previous night, slept under an LLINs, showing that out of those who use nets, the majority use LLINs. However, the use of LLINs out of the total household population was low compared to the national target of 80% (26) at 53.4 %, which is slightly an increase in comparison to household use of LLINs (45.5%) reported in 2015 and 52.2% reported in 2017 (7,23).

4.3 Knowledge of Malaria Prevention

Knowledge is an important factor in the adoption of recommended malaria prevention behaviors. The results presented in this report indicate that more than 65.0% of school-aged children demonstrated having knowledge of malaria preventive measures. Findings indicate that 7 out of 10 pupils knew that sleeping under a mosquito net is one way to prevent malaria. A case-control study conducted in Ghana in 2010 among school-aged children indicated that improved knowledge of ITN use is associated with a significant reduction of malaria infection (53). Other less recommended malaria control and prevention measures, including keeping surrounding areas clean, cutting grass, removing standing water, and using sprays and repellents, were mentioned in the current study, although in small magnitude.

Based on the findings from the studies, areas of residence influence the knowledge of malaria prevention methods—a higher percentage of pupils from urban areas are aware of malaria prevention methods compared with their rural counterparts. This finding may be attributed to

their easy access to information through television and other media outlets, including newspapers. There is no clear pattern of knowledge of malaria prevention methods across malaria epidemiological strata, although a higher percentage of pupils from moderate, high, and low malaria risk areas claimed to have this knowledge compared with those in very low malaria risk strata.

Findings revealed from the household visits for this survey indicate that more than 80.0% of adults demonstrated a better understanding of recommended malaria prevention methods, similar to results reported in the 2017 MIS report (84%) (7). Most adults cited sleeping under a mosquito net as a way to prevent malaria in the 2017 MIS report (98%) (7).

4.4 Exposure to Malaria Messages

In the 2019 SMNS, the role of mass media communication to promote positive behavior change to control malaria was assessed among school-aged children. Based on the findings from this study, 41.3% of pupils reported that they had seen or heard specific malaria prevention and control messages, and the pupils cited radio and television as the most common communication channels through which these messages were seen or heard. This percentage was slightly higher for older children (≥12 years), in which more than half of them reported that they had seen or heard malaria messages. Although these results were obtained from younger populations and may not reflect exposure in the general Tanzanian population, the findings seem to be far from achieving the 2020 national target of 95.0% of the population having knowledge of malaria prevention and control measures.

The ability to reach the population with information about testing and treatment is a key element of Tanzania's malaria elimination agenda. Survey findings indicate that only one out of three pupils reported that they had seen or heard testing messages, and approximately 4 out of 10 reported that they had seen or heard malaria treatment messages that advocate testing for malaria parasites before seeking treatment, e.g., *Sio Kila Homa ni Malaria* (not all fever is due to malaria). The survey observed limited knowledge among pupils across residence, regions, and in rural areas than their counterparts of both malaria testing and treatment messages. For example, pupils from Kigoma, Mtwara, Iringa, and Mbeya regions have limited knowledge compared with their counterparts in other regions. Hence, the survey results draw attention to the need to increase advocacy in regions, such as Kigoma and Mtwara where malaria prevalence is high, but knowledge of malaria prevention and control is very low.

4.5 Knowledge of Malaria Signs and Symptoms

Knowledge of malaria signs and symptoms in children is critical to enhance early care-seeking behavior. Among a list of signs of malaria, fever is the most common that can and should be easily recognized by parents, guardians, and other caregivers. During the survey, heads of households were asked to name the signs and symptoms of malaria in a young child. Three quarters of respondents cited fever as the most common sign of malaria in young children, followed by vomiting and headache, which are also symptoms. Among the signs and symptoms presented by women, fever, a history of fever, headache, and dizziness (both symptoms) had a positive predictive value of approximately 50%.

4.6 Anemia

This SMNS survey indicated that anemia is a common problem among school-aged children and adolescents in Tanzania. The study provides evidence regarding the existing disparities of anemia across age groups, sex, types of residence, malaria epidemiological strata, geographical zones, and regions. A nationally comprehensive assessment of anemia in

Tanzanian school-aged children and adolescents has not been previously conducted. Previously conducted studies in Tanzania only reviewed comprehensive information about anemia status for children U5 and women of reproductive age (23). The 2019 SMNS is the first of its kind that focuses on school-aged children and adolescents.

Remarkable variations of anemia were observed among adolescents aged between 15 and 19 years; more than half were identified as being anemic. The high prevalence of anemia observed in this group is of severe public health significance as per WHO guidelines (54). Other age groups demonstrated significant variation in terms of anemia status, concurring with previous studies in which the prevalence of anemia among adolescents were higher compared with other groups (55). Adolescents undergoing rapid physiological changes involving intense growth and development requires an increased demand for iron and other nutrients to counteract the additional nutrients required during puberty.

A slight difference in anemia prevalence was observed between boys and girls, with boys having an elevated prevalence. Similar observations among children U5 in Tanzania have also been reported (13). In other portions of Africa, including Kenya and Ghana, the findings from similar studies showed that boys have significantly higher levels of anemia compared to girls (56,57). This matches findings reported in India and Nepal, which documented a higher prevalence of anemia in female children and adolescents than their male counterparts (58–60).

During this survey, urban and rural disparities were observed regarding anemia prevalence. Children in rural areas (37.0%) were more affected than those in urban areas (26.0%). Similar patterns were observed across age groups, with anemia prevalence among children aged between 5 and 9 years highest in rural areas (36.5%) compared with their urban counterparts (28.4%). Likewise, prevalence of any form of anemia among school-aged adolescents aged between 10 and 19 years was higher in pupils from rural areas (37.9%) than those in urban areas (24.6%). Comparable observations on the disparities of anemia between rural and urban areas were recorded in other studies, where the burden of anemia was higher in rural versus urban areas (61,62).

Anemia and malaria co-existed in this study. A high prevalence of malaria was observed among children who were anemic and those residing in high malaria burden strata. Also, the numbers of anemic children increased in the 5 to 9 years age group compared to other age groups. A study conducted in Cameroon reported that the odds of having malaria were highest among children aged between 5 and 9 years, putting this age group at a higher risk of also having anemia (63). A study conducted in Uganda among pre-school children identified that malaria was the only factor associated with anemia in high malaria endemic areas after adjusting for the sex and age of the child (64).

Zonal and regional differences were observed in this SMNS survey. Some regions revealed a higher prevalence of anemia, even when levels within their zone were generally low. Within regions, some councils recorded very high levels, whereas others reported very low levels; as a result, regional prevalence may not represent the actual situation in councils. For example, in the Ruvuma Region, the Tunduru DC reflected an anemia prevalence of 100.0%, but the Mbinga TC had only a 2.4% prevalence rate. Similar variations were reported (65) indicating that anemia among children U5 decreased between 2004 and 2015 in various regions, though no specific pattern to the variations could be established.

4.7 Nutrition Status

4.7.1 Stunting

The findings from this survey indicate that stunting prevalence was moderate (25.0%) among school children and adolescents, the prevalence was higher in boys than girls and increased with an increase in age. A comparable observation was made from studies done in Tanzania and other African countries where boys were more likely to become stunted than girls and the likelihood of a child to be stunted increased as the age increase (66–69). This might be explained by the fact that stunting is a chronic form of malnutrition and manifests more in late childhood because it becomes difficult to reverse the condition as the age of the child increases beyond the window of opportunity. Furthermore, findings from this SMNS revealed that children from high malaria epidemiological strata were more stunted than those from low malaria strata, stunting was also more prevalent among children who tested positive with malaria than their counterparts. Other studies conducted in African countries recorded a similar trend, where stunting was higher among children in high malaria epidemiological strata than those from low malaria strata (63,70). Similarly, a cohort study conducted in Ethiopia among children aged between 6 and 59 months, revealed that the children who tested positive with malaria were nearly two times as likely to be stunted compared with those who tested negative (71).

The linkage between malaria and under-nutrition is complex and remains uncertain. Previous research shows mixed findings: a community-based survey in Ghana that showed being underweight is a contributing risk to malaria infection (72), and a cross-sectional survey showed stunting as a contributing risk to malaria (73). Stunting was high in rural areas of Ghana compared with urban areas. These observed differences may be because of differences in socioeconomic status. Low levels of stunting among children were also observed in those in the richest quintile (14.7%) compared with those in the poorest quintile (39.6%) (74). In Nigeria, identified risk factors linked with stunting include attendance of public schools ($p<0.001$) (75), although caution should be used when interpreting its results because the children involved were from public primary schools only; observed values may be exaggerated.

Underweight

Childhood underweight increases the risk of overweight and obesity later in life. Therefore, determining the current prevalence and understanding the factors related to underweight in children is vital. This study is the first country wide survey that provides the benchmark of current nutrition status of school-aged children. This survey identified moderate prevalence (11.7%) of underweight among school children, which is slightly higher than underweight school-aged children aged between 6 and 14 years observed in Sudan (6.2%) (76) but lower than the prevalence observed in Ethiopia (19.0%) and South Africa (66.0%) (77).

Higher prevalence of underweight is seen among boys (12.8%) when compared to girls (10.7%). The differences could be contributed by differences in lifestyle, feeding habits, education of the parents, and socioeconomic status, which were also observed in this study. Children from the rural areas are more affected with underweight than their fellows in the urban areas. Although this is a different population, rural urban variation has been reporting similar trends even among younger children below five years of age in other studies (12,23,78).

Thinness

In this SMNS, about 11.2% of school-age children 5–19 years were thin. This finding is nearly similar to the report from Pakistan where the prevalence of thinness was 10% (79). However,

the magnitude was lower compared to the study findings in Ghana (19.4%) (80), from Fogera, Ethiopia (21.4%) (81), Southeast Ethiopia (13.6%), Northern Ethiopia (26.1%), Nigeria (18.9 %) and West Bengal, India (28 %) (82–85). The discrepancy might be due to the time gap in data collection and implementation of nutritional programs.

The likelihood of thinness was higher among boys (12.5%) compared to girls (9.9%). This result was in line with the study findings in different parts of Ethiopia and Nigeria (82,83,86). The reason for high prevalence of under-nutrition among males than females might be related to biological, behavioral, and sociocultural mechanisms. Thinness has been adopted recently as a more appropriate indicator than underweight in older children. It is indicative of relatively recent nutritional deprivation, such as insufficient dietary intakes of energy, protein, or several micronutrients, impaired absorption, or excess nutrient losses (87). Thinness in school-aged children can result in delayed maturation, deficiencies in muscular strength and work capacity, and reduced bone density later in life (87).

Overweight and Obesity

This study established the prevalence of obesity in a representative sample of primary school children in Tanzania. SMNS 2019 results showed that the combined prevalence of obesity among pupils aged 5–19 years was low (5.1%). The prevalence of child obesity found in this study was comparable to that found in previous studies conducted in Tanzania. For example, in a study conducted in Dodoma and Kinondoni, showed that the prevalence of obesity among children aged 6–9 years was 5.6% and 6.3% respectively (88). A similar low prevalence of child obesity (5.3%) was also reported by Chillo et al. (2009) in a study conducted in Dar es Salaam and Morogoro regions (89). Slightly higher prevalence of obesity among school children compared to that was reported in South Africa (90). Higher prevalence of child obesity has been reported from North Africa (91), and other developing countries (92,93).

In this study, prevalence of child obesity was higher among girls than boys. This implied that females were more likely to be overweight or obese than male counterparts. Other studies conducted among children in Africa have reported similar gender difference in the prevalence of child obesity (90,91).

This 2019 SMNS showed that lower age groups (5–9 years) were more likely to be overweight or obese than age groups 10–14 and 15–19 years. Concurrently, worldwide studies showed that the prevalence of overweight and obesity combined among children aged 6 to 11 years increased from 6.5% in 1980 to 19.6% in 2008, while in children aged 12 to 19 years, the prevalence increased from 5.0% to 18.1% in 2008 (94). These findings suggest that the prevalence of overweight and obesity is on the rise. The possible explanations can be attributed to the increased lifestyle sophistication to which new generations are exposed. For instance, the SMNS indicated that about 42% of pupils aged 5–19 years had low physical activity levels with higher numbers in those from urban settings. It is indicated that the impact of urbanization on lifestyle is likely to be reflected in urban adolescents' lower level of physical activity and higher indices of adiposity than of the rural counterparts (95). The increased prevalence of obesity among school children and adolescents reinforces the country need for improved prevention strategies. The rationale is to be able to use available evidence to develop culturally relevant school-based prevention interventions for promotion of lifestyle and health education among school children (5–19 years old) in Tanzania. The intervention needs to target behavioral nutrition and physical activity. In addition, recommendations for achieving optimal health and wellbeing for children and adolescents need to include nutrition modifiable factors

4.7.2 Dietary Diversity

This SMNS provides key highlights about the existing dietary practices among the study population. Based on the findings from the survey, dietary diversification is very low among pupils and household members; diets primarily consist of cereals, vegetables, legumes, and nuts. Most household members reported consuming four or fewer food groups and limited the consumption of fruits and animal source foods, including meat, eggs, and milk. A similar pattern of consumption of a monotonous diet, rich in starchy staples, small portions of vegetables, and limited or no animal source food is practiced in different portions of Tanzania (65,96,97). These sub-optimal dietary practices expose individuals to micronutrient deficiencies and consequently affect their overall nutrition.

Variations among food groups consumed were noted across education levels, geographical zones, and regions in the surveyed population. Households with limited or no formal education recorded lower household dietary diversity than those who attained secondary school or higher levels of education. Previous studies done in Tanzania and other parts of Africa on the determinants and correlates of dietary diversity have linked high levels of education with improved dietary diversity (96).

Survey findings showed notable variations in the consumption of different food groups across geographical zones and regions, with higher levels of different food groups consumed among respondents in the Eastern and Northern zones, specifically in the Dar es Salaam and Kilimanjaro regions. Existing disparities in the consumption of specific food groups may be explained because of the availability and accessibility of specific food items based on locality. For example, the survey showed that fish consumption was higher in the Lake (Mwanza, Mara, and Geita), Eastern (Dar es Salaam and Pwani), and Southern (Mtwara) zones. Similar findings revealed that the ability of a household or individual to diversify the diet is primarily based on food availability and accessibility in addition to other factors, including nutrition knowledge and income.

The SMNS further identified dietary practices related with overweight and obesity among school children and adolescents aged between 5 and 19 years, including the following:

- One-third of respondents do not eat breakfast.
- Those from urban settings eat at fast food restaurants.
- Few pupils eat their favorite health food regularly.
- One quarter of respondents snack daily.
- Respondents make food decisions based on what is advertised by the media.
- Most pupils eat food prepared at home and with their families.
- Some respondents in urban settings eat alone.

Dietary Practice

Survey results identified that, on average, respondents had good eating habits, with most pupils eating breakfast daily. Because breakfast is the first meal consumed during the day, a healthy breakfast provides school-aged children with the essential nutrients required to perform their daily activities and is linked to long-term health throughout their lives (98). One-third of pupils reported regularly missing breakfast. Several studies, conducted both in Tanzania and worldwide, have demonstrated that skipping breakfast is a public health issue that negatively impacts school-aged children (98). Missing breakfast is linked with many health problems and reduced performance in cognitive and psychosocial functions, as well as in

academic learning and achievement. Additionally, eating breakfast reduces the likelihood of consuming snacks at school.

Some pupils aged between 5 and 19 years reported to have eaten at a fast-food or other restaurant within the two days before the SMNS survey. There is a growing concern about energy-dense snacking preferences, as well as eating in a fast-food or other restaurant in developing countries and its impact on the prevalence of lifestyle diseases (99).

Identifying snacking trends among school-aged children is potentially of great importance to develop interventions toward promoting health eating habits at an early age. This survey aimed to assess snack consumption at schools among Tanzanian primary school pupils. Survey results identified that some pupils (27.8%) aged between 5 and 19 years eat snacks at school. The survey found that the frequency of consuming fast foods and non-nutritious snacks decreases with age. Junk food (e.g., chips, soft drinks, and sweets) is widely available in schools (100). These items are generally, if not always, high in fat and sugar and offer limited or no nutritional value. The results of this survey indicate an emerging trend of the consumption of high-energy snacks and beverages, particularly in urban areas. A study conducted in developing countries reported that the consumption of high-calorie foods is becoming increasingly popular among school-aged children and adolescents in urban areas (101). The consumption of fast and high-energy food items is a major contributing factor to the overweight and obesity public health crisis and the occurrence of non-communicable diseases. There is increased need for nutrition education for school leaders, children, adolescents, parents, and the community at large to sensitize them about healthy eating habits. Establishing and maintaining good eating habits early in life are important protective factors that build strong foundations for healthy eating into adulthood.

Nutrition Knowledge

In this survey, pupils aged between 14 and 19 years were assessed on their knowledge of mass media communications used to promote positive eating behaviors in Tanzania. According to the findings, radio was the primary source through which pupils receive nutrition messages particularly in rural areas, while television was the most common source in urban settings. The school setting was also mentioned as a source through which pupils received nutrition information. This trend could be influenced by a variety of factors, including socioeconomic level, geographical location, and the readily available local, national, and international radio channels accessible across Tanzania. Newspapers were the least cited source by pupils, indicating low access to newspapers among children.

Generally, girls were more exposed to nutrition information than boys. This could be due to the social responsibilities of girls, particularly, food preparation, leading them to seek additional information. Older pupils aged between 15 and 19 years were more exposed to nutrition messages through the radio and school. This finding could be because of the school curriculum where older children are taught on nutrition aspects as part of their school subjects. Conversely, younger pupils in the 10 to 14 age group reported receiving nutrition messages through television, which may be attributed to their spending more time viewing educational/entertainment programs.

Effective exposure to nutrition messages may have a positive influence on short-term food choices in adult and children (102–105). Thus, targeted nutrition messages should always consider the main sources of information that is commonly used by users.

Chapter Five: Conclusions

The SMNS provides malaria and nutrition data addressing school-aged children and adolescents and complements other national representative surveys to facilitate informed decision making. Results of the survey showed high variation in malaria infections in pupils by age, with older children affected more than their younger counterparts, and marked heterogeneity across high-low disease burden areas. Prevalence levels vary highly between regions and subregions with Southern and Northern regions carrying the most burden. High proportions of asymptomatic malaria infection were observed in many councils. Understanding malaria prevention and control methods is a critical milestone toward reducing malaria infection. The survey revealed high levels of knowledge among pupils and household members on core and effective malaria intervention, such as the use of mosquito nets. This awareness varied across age groups, types of residence, malaria epidemiological strata, and regions.

Overall, high proportion of household population are protected with LLINs, however there was marked variations across regions, education level and social economic status of heads of household. These variations call for reinforcement on knowledge, attitude and practice amongst all community members on appropriate malaria prevention tools.

Survey results indicate that the prevalence of anemia was higher among boys than girls and among late adolescents. As expected, the co-existence of malaria and anemia was observed, indicating that strategies employed to curb malaria should go hand-in-hand with those used to combat anemia. Similarly, these results indicate significant variations across geographical zones, regions, and councils. Stunting was the main nutrition problem observed in children; prevalence was higher among boys than girls, increased with age, higher in rural settings compared to urban areas, and there was a high level of heterogeneity between councils.

This SMNS report provide key highlights on the status of overweight and obese among pupils aged between 5 and 19 years in public primary schools in Mainland Tanzania, both reported to be low. The prevalence of overweight pupils was higher in urban areas than rural, with most overweight pupils observed in the Dar es Salaam Region. Thinning was less prevalent, with most regions ranging between low and medium levels; however, higher percentages were reflected in rural settings compared with their urban counterparts.

Dietary diversity at both the household and individual levels was below the minimum average and was tied to the limited consumption of only a few food groups. These findings indicate the existence of suboptimal dietary practices across the studied population and calls for nutrition education and behavior change interventions to address the gaps. Variations in dietary diversity were observed across geographical zones, regions, and education levels. Further investigation is needed regarding the specific determinants of dietary diversity; however, survey results indicate that on average, the survey respondents have good eating habits, with most of the children eating breakfast daily.

Although the prevalence of habitual physical activity has remained relatively stable, most adolescents do not meet current physical activity recommendations. Overall survey results indicate high levels of inactivity in school children and adolescents with only a small proportion reported to undertake moderate physical activity, much less being active.

Based on the survey results, three sources were mentioned as the primary means by which pupils receive nutrition messages: radio, television, and school. Care should be given when selecting the appropriate communication method for nutrition messages to ensure the appropriate targeting based on age, sex, location, education level, and socioeconomic status.

Chapter Six: Recommendations

Based on the findings from the survey, the following items are recommended:

- The GOT should facilitate conducting operational research to determine the drivers for persistence of malaria (hot spots); asymptomatic infections; and low use of mosquito nets in some regions, councils, and sub-councils despite the high coverage of interventions.
- Initiate recommended mass drug administration (MDA) for antimalarial medicine program for school-aged pupils in school with high malaria prevalence (>35%) and the surrounding community(ies). Also, provision of MDA should be applied in regions/councils with demonstrated high malaria prevalence (>50%). Deployment of MDA should be in-line with invasive vector control interventions, including supply of LLINs, larvicidings and IRS for burden reduction.
- Multi-sectorial collaboration should be established to develop/initiate joint strategies and interventions for malaria control towards burden reduction and its eventual elimination. The sectors to be involved include health, agriculture, education, public works, and local government.
- The government, through the MoHCDGEC and other relevant sectors, should harmonize strategies and interventions to address the co-existence of malaria anemia and malnutrition among primary school pupils in high malaria endemic zones.
- The government should facilitate operational research to establish the non-nutritional causes of anemia (e.g., inadequate health care services, worm infestation, and genetic factors).
- The government, through PO-RALG, should ensure school feeding programs are mandatory. This will ensure provision of school meals and alleviate short-term hunger and chronic malnutrition among school children and adolescents.
- The MoHCDGEC should strengthen adolescent nutrition by promoting dietary diversity, consumption of fortified foods, and physical activities through tailored nutrition training programs on integrated nutrition services to school pupils, adolescents, and teachers.
- The Ministry of Education, Science and Technology should provide guidelines on physical activity programs by allocating space, specific times, and days in a routine school timetable. This action area reflects the importance of environmental determinants of malnutrition outcomes. It spurs commitment and policy action for addressing the social and environmental determinants of malnutrition, including in school.

Chapter Seven: Survey Limitations

It is important to note that the survey had the following limitations:

- Quality of mosquito nets at the household level was not assessed.
- Selection of the households were not linked with sampled pupils. Thus, limiting the linkages of the household findings with respective surveyed pupils. However, further analysis may establish the number of pupils whose households were surveyed.
- Although the reported use of mosquito nets was high among older pupils, reasons for not using mosquito nets was not established as part of the survey.
- Dietary assessment measures did not account for seasonal variations, and the list of food items included in the food frequency questionnaire was not exhaustive. As a result, it was not possible to establish consumption patterns based on a specific season or food item.
- The study was unable to map vector occurrence and entomological characterizations, particularly in high malaria endemic areas. The goal of this survey was to introduce novel vector control strategies, including the outdoor prevention of mosquitoes, as part of an integrated prevention and control approach.

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Annexes

Annex 1. Information Sheet (*Taarifa muhimu ya Utafiti*)

KAMATI ZA SHULE, WAZAZI NA WALEZI

Utangulizi

Sisi ni wafanyakazi wa halmashauri ya _____ na Wizara ya Afya na Maendeleo ya Jamii, Jinsia, Wazee, na Watoto kupitia Mpango wa Taifa wa Kudhibiti Malaria na Kitengo cha Lishe. Tunafanya utafiti kwa watoto wa shule za msingi za serikali ili kutambua kiwango cha maambukizi ya vimelea vya malaria, wingi wa damu, hali ya lishe na matumizi ya vyandarua vilivyowekewa dawa kwa ajili ya kujikinga na malaria. Kama kamati ya shule, walimu, wazazi na walezi wa wanafunzi watakaoshiriki katika utafiti; tunaomba ushirikiano wenu wa dhati ikiwa ni pamoja na kuwaruhusu watoto wenu kufanyiwa utafiti.

Nini maana ya Utafiti?

Mpango wa taifa wa Kudhibiti malaria (NMCP) ni taasisi ya serikali ndani ya wizara ya Afya na Maendeleo ya Jamii, Jinsia, Wazee, na Watoto ikiwa na majukumu ya kuhakikisha inadhibiti malaria nchini. Pia NMCP inasimamia kazi zilizokusudiwa kufanywa na wadau ili kuhakikisha malaengo yaliyokusudiwa yanafikiwa. Hii ni pamoja na kufanya tafiti mbalimbali kwa kila mmoja na makundi pia ambayo malaria imeonesha kuwa tatizo zaidi. Utafiti huu ni mojawapo wa shughuli zinazofanywa na programu ya malaria.

Utafiti huu unahusu nini?

Katika utafiti huu, NMCP inataka kujua zaidi jinsi ugonjwa wa malaria unavyotokea na matumizi ya vyandarua vilivyotiwa dawa ya viuatilifu kwa watoto wa shule za msingi katika mikoa iliyochaguliwa. Pia, utafiti huu utahusisha kufahamu hali ya chakula na lishe kwa wanafunzi na kutambua kiwango cha damu. Utafiti huu utawahusu watoto wa shule za msingi zilizochaguliwa katika mikoa yote 26 ya Tanzania Bara na katika kila shule kwa kutumia njia ya nasibu wastani wa watoto 100 wanatarajiwa kuchaguliwa.

Ni vitu gani vitakavyohiusiana na mtoto/watoto wako?

Watafiti watakuwa wanachukua sampuli kidogo ya damu kwa ajili ya kuipima ili kuangalia kama ina maambukizi ya vimelea vya malaria na kujua kiwango cha damu. Aidha, sindano zilizotakaswa zitatumika kutoa sampuli ya damu katika kidole na kisha kiasi kidogo cha sampuli ya damu kitachukuliwa kama mililita 2 hivi. Sampuli ya damu itakayochukuliwa itatumika kupima uwepo wa vimelea vya malaria kwa kutumia kipimo cha kutambua malaria kwa haraka yaani kwa kimombo “Rapid Diagnostic Tests” (RDT). Kiasi kidogo cha damu kitawekwa kwenye karatasi maalum na kitatumika kufanya uchambuzi kubaini kama vimelea vya malaria vilivyoko kwenye enoe lako vimeota usugu dhidi ya dawa za kutibu ugonkwa wa malaria na hali ya maambuzi ya ugonjwa wa malaria. Kiasi kidogo cha sampuli ya damu itatumika kupima kiwango cha damu kwa kila mtoto. Pia wanafunzi watakaochaguliwa wataulizwa maswali yanayohusiana na matumizi ya vyandarua majumbani na hali ya lishe na chakula.

Je, kuna madhara yoyote yanayopatikana kama mwanao/wanao watashiriki katika utafiti huu?

Kwa kweli hakuna madhara yatokanayo na kushiriki katika utafiti huu. Ila kuna maudhi madogo madogo yanayoweza kutokea hasa wakati wa kutobolewa ili kuchukua sampuli ya damu ambayo yanachukua muda mfupi na kisha kutoweka.

Ni faida zipi mwanao/wanao watazipata iwapo watashiriki katika utafiti huu?

Mtoto yeyote ambae atagundulika ana vimelea vya malaria watapatiwa matibabu bure, kulingana na mwongozo uliopo wa kitaifa wa kutibu malaria. Aidha, dawa zitakazotumika katika utafiti huu zinajulikana nchini na ni salama kabisa. Pia hizi dawa zimeidhinishwa na serikali kwa ajili ya matibabu ya malaria; ambayo ni dawa mseto ya malaria. Pia, elimu ya chakula bora itatolewa. Taarifa itakayopatikana kutokana na utafiti huu ni muhimu sana katika kuiwezesha programu ya malaria kufanya maamuzi juu ya udhibiti wa malaria katika jamii zetu na Taifa kwa ujumla.

Ni nini kitatokea kama sintaruhusu mwanangu/wanangu kushiriki katika utafiti huu?

Ushiriki katika utafiti huu ni wa hiari. Uko huru kuamua endapo mwanao/wanao washiriki katika utafiti huu au la. Endapo utakubali kumruhusu mwanao/wanao kushiriki katika utafiti huu, unaweza kubadilisha mawazo na kumzuia/kuwazuia wasiendelee na utafiti. Yote haya hayatakuwa na madhara yoyote ya baadae kwa mwanao/wanao.

Ni kitu gani kinachofanyika kwenye sampuli ya damu itakayochukuliwa?

Baada ya sampuli ya damu kuchukuliwa, kipimo kitafanyika katika eneo husika na majibu kutolewa papo hapo. Pia hii itawezesha kuwapatia matibabu watoto ambao watagundulika wana malaria mara moja. Kama utatoa idhini kwa mwanao kushiriki, sampuli zitakazochukuwa zitafanyiwa vipimo zaidi vitakavyofanyika kwenye maabara za NIMR Tanga na kwenye kituo cha kuzuia magonjwa ya binadamu cha Atlanta, huko Marekani.

Ni nani mwenye haki ya kuona taarifa za utafiti huu?

Tahadhari kubwa imechukuliwa kuhakikisha taarifa za mwanao/wanao hazifikiwi kirahisi na mtu yeyote. Hii ni pamoja na kuhakikisha taarifa imehifadhiwa kwa siri ikiwa ni pamoja na kutumia funguo kwenye makabati yatakayoifadhia fomu za maswali yatakayotumika kuhoji wanafunzi na kuweka namba za siri kwenye kompyuta zitazotumika kuzihifadhi taarifa. Watu wachache tu wataruhisiwa kuona taarifa hizi za utafiti ikiwa ni pamoja na watakaoshiriki katika utafiti huu.

Ni nani ameruhusu utafiti huu kufanyika ?

Tafiti zote zinazofanywa na program ya malaria (NMCP) zinaidhinishwa na bodi maalumu ya utafiti wa magonjwa ya binadamu iliyoko Dar es Salaam ikiwa na lengo la kuhakikisha utafiti unafanyika kwa usahihi na haki na usalama wa mshiriki unazingatiwa.

Inakuwaje kama nitakuwa na maswali ?

Unaweza kumwuliza mmojawapo wa mtafiti wakati wowote. Unaweza kuwasiliana na mhusika moja kwa moja kwa mtu ambae anaejali afya ya mwanao/wano na pia anahusika na utafiti huu : Frank Chacky – NMCP, S.L.P 743, Dodoma. Simu na. +255 754 625 131

Kama utakuwa na maswali juu ya haki uliyonayo kama mzazi wa mshiriki, au juu ya utafiti huu, au maswali mengineyo ambayo hayahusiani na utafiti huu, tafadhali wasilina na : Mwenyekiti, Tume ya Utafiti wa Magonjwa ya binadamu (“MRCC”), S.L.P. Box 9356 Dar es Salaam, Simu na. : +25522 2121400.

Ridhaa ya Kamati ya shule

Habari. Jina langu ni _____. Nafanya kazi/kwa niaba ya mpango wa Taifa wa Kudhibiti Malaria nchini – NMCP. Tunafanya utafiti juu ya ugonjwa wa malaria na upungufu wa damu kwa watoto wa shule za msingi wa mikoa 26 nchini. Ripoti itakayopatikana kutokana na utafiti huu itaiwezesha program ya malaria kupanga mikakati yake na kutathmini matokeo ya mikakati yake. Wanafunzi wamechaguliwa kwa nasibu. Wanafunzi wataulizwa maswali yanayohusiana na matumizi ya vyandarua vilivyotiwa viuatilifu majumbani pamoja na kuchukua sampuli ya damu kwa ajili ya kupima vimelea vya malaria na wingi wa damu. Zoezi hili litachgukua taribani dakika 15 mpaka 20. Matokeo ya vipimo na majibu ya wanafunzi yatakuwa ya siri na hamna atakaeruhusiwa kuyafikia isipokuwa kwa walioshiriki katika utafiti huu.

Ushiriki katika utafiti huu ni wa hiari na kamati ya shule kwa niaba ya wazaziiko huru kuamua iwapo wanafunzi washiriki au la. Pia kama kamati ya shule ikiamua wanafunzi washiriki inaruhusiwa kubadilisha maamuzi na kujitoa katika utafiti huu. Hii h haitaathiri wanafunzi kwa sasa wala kwa baadae. Aidha, wanafunzi wanaweza kuamua kutokujibu maswali yote atakayoulizwa ; atakachofanya ni kuniambia tu nami nitaliruka hilo swali na kuendelea na mengine.

Kamati ya shule ina swali lolote mpaka sasa?

Je, naweza kuanza kuwahoji wanafunzi maswali na kuchukua sampuli ya damu kwa sasa?

KAMATI YA SHULE IMEKUBALI/IMEKATAA WANAFUNZI KUHOJIWA

Kama kamti ya shule imeridhia, mwenekiti ya kamati asaini

_____

Sahihi ya mwenyekiti wa kamati ya shule _____

Fomu ya ridhaa (Dodoso la kaya)

Sisi ni wafanyakazi wa Halmashauri ya _____. Tunawakilisha Wizara ya Afya, Maendeleo ya Jamii, Jinsia, Wazee, na Watoto kupitia Mpango wa Taifa wa Kudhibiti Malaria (NMCP) kuendesha utafiti kwa watoto wa shule za msingi za serikali ili kutambua kiwango cha maambukizi ya ugonjwa wa malaria, matumizi ya vyandarua vilivyowekwa dawa, upungufu wa damu na hali ya lishe. Kaya yako/yenu imechaguliwa kushiriki katika mahojiano mafupi yanayohusu utafiti huu. Mahojiano yatachukua takribani wastani wa dakika 20 ; na yatahusisha kuangalia baadhi ya maeneo ya nyumba yako ikiwa ni pamoja na uhakiki wa uwepo na matumizi ya vyandarua katika kaya. Majibu yote yatakayopatikana yatahifadhiwa kwa usiri na kutumika tu kwa lengo la kazi hii.

Ushiriki katika zoezi hili ni wa hiari ; hivyo una uamuzi wa kushiriki au kutoshiriki. Pia, unaweza kujitoa wakati wowote kuendelea na mahojiano hata kama umesharidhia kushiriki. Endapo utaamua kushiriki na baadae ukabadili mawazo, una hiari ya kujitoa na una maamuzi ya kutokujibu swali lolote ambalo hautapenda kujibu. Ila tuna imani utapenda kushirikiana nasi kwa ajili ya kupata mchango wako katika kuboresha shughuli za udhibiti wa ugonjwa wa malaria.

Unaweza kuuliza mmojawapo wa watafiti wakati wowote. Pia, unaweza kuwasiliana na mhusika mkuu wa utafiti huu moja kwa moja ; **Frank Chacky** – NMCP, S.L.P 743, Dodoma.

Simu na. **+255 754 625 131**

Kama utakuwa na maswali juu ya haki yako kama mshiriki juu ya utafiti huu, au maswali mengineyo ambayo yana uhusiano na utafiti huu, tafadhali wasiliana na Mwenyekiti, Tume ya Utafiti wa Magonjwa ya binadamu (“**NIMR”), S.L.P. Box 9356 Dar es Salaam, Simu na: +25522 2121400**.

Una swali lolote mpaka sasa?

Je, naweza kuanza mahojiano sasa?

AMETOA RIDHAA (Zungushia jibu sahihi)

NDIO = 1 **HAPANA= 2 →→→** **FUNGA MAHOJIANO**

SAHIHI YA MHOJIWA _____ **TAREHE** _____

Annex 2. Survey Tools

Table 2-1: Tool 1: School Identification Form (*Fomu ya Utambulisho wa shule*)

No.	School Name	School ID	Nambari ya simu ya Mwalimu Mkuu (mobile)	Jumla ya wanafunzi			Idadi ya wanafunzi waliopimwa vimelea vya	Idadi ya wanafunzi waliokutwa na vimelea vya	Waliopimwa Hb	Waliokutwana Hb<8g/dl	Jina la kituo cha kutolea huduma ya afya karibu zaidi na shule	Umbali (km) au muda (dk) toka shule hadi kituo cha
				KE	ME	Total Pupils						
1												
2												
3												
4												
5												
6												
7												

Name of Reporting Officer _____ Signature _____ Date _____

Name of Supervisor _____ Signature _____ Date _____

Table 2-2. Tool 2: Malaria RDT, Hb, and DBS collection form

No.	Pupil's ID	Name of the Pupil	Hb Level (g/dl)	Malaria Test					DBS Collected (Y = Yes, N = No)
				Control	Pf	Pan	Tafsiri (Positive, Negative)	Remarks (e.g., Invalid, Repeated Test)	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									

No.	Pupil's ID	Name of the Pupil	Hb Level (g/dl)	Malaria Test					DBS Collected (Y = Yes, N = No)
				Control	Pf	Pan	Tafsiri (Positive, Negative)	Remarks (e.g., Invalid, Repeated Test)	
19									
20									
21									
22									
23									
24									
25									

Table 2-3. Tool 3: Hojaji la Mwanafunzi (Pupils' Questionnaire)

Muda wa kuanza mahojiano |__|__|__|__| 24 hours format	
TAARIFA ZA MHOJIWA	
Jina la Mwanafunzi : _____ Pupil's ID : _____	Darasa la |_____|
Tarehe ya kuzaliwa: |_____|_____|_____| (DD/MM/YR) Umri |_____| *aliozaliwa)* Jinsi ya mwanafunzi 1. ME 2. KE (*Zungushia jibu tajwa)*	Uzito (kg) |_____|_____|:|_____| Urefu (cm) |_____|_____|_____|:|_____| Joto la Mwili (^{0}C) |_____|_____|:|_____|
SEHEMU A: TAARIFA ZA KAYA	
A1. Kwa kawaida mnaishi watu wangapi nyumbani kwenu? *(Ikiwa ni pamoja na wewe)* (Ikiwa idadi ni Zaidi ya 10, andika "10")	[___ [___]
A2. Usiku wa kuamkia leo; nyumbani mmelala watu wangapi? *(Ikiwa ni pamoja na wewe)* (Ikiwa idadi ni Zaidi ya 10, andika "10")	[___] [___]
A3. Nyumbani kwenu unalelewa na nani ? 1.Baba na mama 2. Mama tu 3.Baba tu 4.Wengine taja.....	[___] [___]
SEHEMU B: KUTIBU NA NJIA ZINAZOTUMIKA KUZUIA/KUJIKINGA NA MALARIA	
B1. Taja njia zinazotumika kuzuia/kujikinga na ugonjwa wa malaria. *(zungushia jibu/majibu tajwa)* 1. Chandarua 2. Dawa ya ukoko (IRS) 3.Dawa za kupaka (Repellent), dawa za kupulizia ndani *(Sprays)* 4.Kusafisha mazingira mf. kufyeka nyasi 5.Nyingine..... 6.Sijui	
B2 Umeshawahi kuona/kusikia ujumbe unaoelezea namna ya kuzuia/kujikinga na ugonjwa wa malaria? 1. Ndiyo 2. Hapana 3. Sijui Kama jibu tajwa ni ndio, ulisikia wapi (*zungushia jibu tajwa*) ☐ Runinga (television) ☐ redio ☐ Matangazo ya barabarani ☐ magazeti ☐ mabango na vipeperushi ☐ Nyingine tajwa	
B3. Kuna vyandarua/net ngapi katika kaya/familia yenu? Kama ni 0 nenda C1 (Ikiwa ni zaidi ya 7 dadisi zaidi kisha andika "7")	[___|___]
B4. Je, kwa kawaida unalala katika chandarua/net? 1. Ndiyo; 2. Hapana Kama hapana, nenda swali la C1	
B5. Je, ulilala kwenye chandarua/net usiku wa kuamkia leo? 1. Ndiyo; 2. Hapana *kama hapana nenda C1*	

B6. Je, jana (usiku wa kuamkia leo) mlilala wangapi ndani ya chandarua/net moja?
(Ikiwa ni zaidi ya 4dadisi zaidi kisha andika "4")[_ _]

SEHEMU C KUKOSA SHULE NA HALI YA HOMA SIKU ZA KARIBUNI

C1. Katika kipindi cha wiki 2 zilizopita, je, umeshawahi kuwa na homa au mwili kuwa na joto kali?
1. Ndiyo;
2. Hapana
Kama hapana, nenda swali la D1

C2. Katika kipindi cha wiki 2 zilizopita, je, umeshawahi kukosa shule kwa sababu ya kuwa na homa au mwili kuwa na joto kali?
1. Ndiyo;
2. Hapana
Kama hapana, nenda swali la D1

C3.Wakati ulipokuwa una homakatika kipindi cha wiki 2 zilizopita; je, ulipelekwa katika kituo cha afya/hospitali/zahanati/duka la dawa muhimu kwa matibabu au kupata ushauri?
1. Ndiyo;
2. Hapana;
Kama hapananenda swali la D1

C4. Je, ulipofika katika kituo cha kutolea huduma za afya (kituo cha afya/hospitali/zahanati/duka la dawa muhimu) ulitolewa damu kwa ajili ya kufanya kipimo cha malaria?
1. Ndio
2. Hapana
3. Sikumbuki/sifahamu

C5. Je, uliambiwa unaumwa malaria?
1. Ndiyo;
2. Hapana;
3. Sijui

C6. Je, ulipatiwa dawa?
1. Ndiyo ;
2. Hapana;

C7. Ikiwa C6 ni NDIYO, unakumbuka ulipewa dawa gani?
1. Mseto
2. Nyingine taja:_____
3. Sijui

SEHEMU D: UELEWA WA MATIBABU YA UGONJWA WA MALARIA

D1. Umeshawahi kuona tangazo au kusikia ujumbe unaohamasisha kupima kabla ya kutumia dawa (mf. Sio kila homa ni malaria)
1. ndiyo
2. hapana

D2. Umeshawahi kuona tangazo au kusikia ujumbe unaoelezea namna ya kutibu ugonjwa wa malaria
1. Ndiyo
2. Hapana
3. Sijui
Kama jibu tajwa ni ndio uliona au kusikia wapi? (*zungushia jibu tajwa*)
☐Runinga (televisión)
☐redio
☐Matangazo ya barabarani
☐magazeti
☐mabango na vipeperushi
☐Nyingine tajwa _____

☐Sikumbuki

D3. Dawa gani inashauriwa kutumiwa kwa mtu mwenye malaria?

Zungushia jibu tajwa

☐Dawa mseto (ALU)

☐Dawa ya sindano ya artesunate

☐Chloroquine

☐Nyingine taja_____

☐Sijui

SEHEMU E: MAZOEZI NA VYAKULA

MAZOEZI

Maswali yanayofuata yanauliza kuhusu mazoezi ya mwili. Mazoezi ya mwili ni shughuli yoyote inayoongeza msukumo wako wa mapigo ya moyo na unaosababisha upumue kwa haraka na wakati mwingine kutokwa na jasho. Mazoezi yanaweza ckufanywa kwenye michezo, kucheza na marafiki au kutembea kwenda shuleni, kukimbia, kutembea haraka, kuendesha baiskeli,].

Mazoezi Mepesi

	Je, katika kipindi cha siku 7 zilizopita, ulifanya mazoezi/shughuli nyepesi ambazo hazikusababisha kutokwa na jasho au kutokupumua kwa haraka? ORODHA YA MAZOEZI MEPESI: Kutembea kwenda shule, Kuendesha baiskeli taratibu, kukimbia kwa kasi ya wastani, kuruka Kamba, kuogelea, kucheza muziki na kazi za kila siku kama vile shughuli za shamba na usafi wa nyumbani)					Ndio		Hapana
	Kama ndio, je ulifanya mazoezi mepesi mara ngapi katika kipindi cha siku 7 zilizopita?	Mara 1	Mara 2	Mara 3	Mara 4	Mara 5	Mara 6	Mara 7
	Kama ndio, je muda wa kawaida ambao ulifanyamazoezi mepesi pale juu kwa kawaida uliisha baada ya?			Chini ya ½ saa	Chini ya saa 1	Chini ya saa 1½		Zaidi ya saa 1½

MAZOEZI MAZITO

	Je, katika kipindi cha siku 7 zilizopita, ulifanya mazoezi mazito ambayo yaliababisha kutokwa na jasho au kupumua kwa haraka? ORODHA YA MAZOEZI MAZITO: Kubeba vitu vizito, kufanya kazi ngumu na kukimbia mbio fupi za kasi)					Ndio		Hapana
	Kama ndio, je ulifanya mazoezi mazito mara ngapi katika kipindi cha siku 7 zilizopita?	Mara 1	Mara 2	Mara 3	Mara 4	Mara 5	Mara 6	Mara 7
	Kama ndio, je muda wa kawaida ambao ulifanya mazoezi mazito pale juu kwa kawaida uliisha baada gani?			Chini ya ½ saa	Chini ya saa 1	Chini ya saa 1½		Zaidi ya saa 1½

MAZOEA KATIKA ULAJI WA CHAKULA

	Je ni mara ngapi huwa unapata kifungua kinywa (breakfast)	Sipati kabisa	Karibu kila siku	Mara 2 hadi 4 kwa wiki	Mara moja kwa wiki	Mara 1 hadi 3 kwa mwezi
	Je ni mara ngapi umekula katika mgahawa katika kipindi cha siku 2 zilizopita?	Sijala kabisa	Mara 1	Mara 2	Mara 3 au zaidi	
	Je ni mara ngapi huwa unakula chakula ukipendacho zaidi ikiwa unatambua kuwa ni mlo kamili.	Karibu kila siku	Mara 1 hadi 4 kwa wiki	Mara 1 hadi 3 kwa mwezi	Mara chache	
	Je ni mara ngapi wewe hula chakula pamoja na familia yako?	Karibu kila siku	Mara 1 hadi 4 kwa wiku	Mara 1 hadi 3 kwa mwezi	Mara chache	
	Je ni mara ngapi wewe hula chakula peke yako?	Karibu kila siku	Mara 1 hadi 4 kwa wiki	Mara 1 hadi 3 kwa mwezi	Mara chache	
	Je ni mara ngapi wewe hula vitafunwa (snacks) ukiwa shule?	Huwa sili kabisa	Karibu kila siku	Mara 1 hadi 4 kwa wiki	Mara 1 hadi 3 kwa mwezi	
	Je wewe hula vyakula vingine kwa sababu tu umesikia vikitangazwa ?	Ndio	Hapana			
	Je wewe hula vyakula vyovyote ambavyo vimetayarishwa nyumbani?	Ndio	Hapana			

MASWALI KUHUSU ULAJI WA VYAKULA KWA WATOTO WA SHULE

Sehemu hii inaulizia tabia ya kawaida ya ulaji wa chakula ya mwanafunzi katika kipindi cha juma moja lililopita. Hii inajumuisha milo yote mikuu, vitafunwa, na vinywaji vilivyoliwa katika kipindi hiki. Unapaswa pia kujumuisha vyakula na vinywaji vyovyote ambavyo mwanafunzi alikula nje ya nyumbani, ikiwa ni pamoja na shuleni, kwenye migahawa au na watu wengine wa familia.

MILO NA VYAKULA VILIVYOLIWA

Tafadhali, weka alama ya VEMA kwenye chaguo sahihi zaidi ambalo linaelezea ni mara ngapi mtoto amekula milo ifuatayo: Kumbuka: Kinywaji peke yake (kikombe kimoja cha maziwa, kipande cha tunda au biskuti) haiwezi kuhesabika kama mlo.

Je ni mara ngapi mwanafunzi amekula vyakula vifuatavyo katika kipindi cha juma moja (siku 7 zilizopita)?		Hajala kabisa/Hajanywa	Mara moja kwa wiki	Mara 2- 4 kwa wiki	Mara 5-6 kwa wiki	Kila siku
VYAKULA VYA NAFAKA	Uji, Ugali, Mkate, Tambi, Chapati, Wali, (pamoja na pilau)	1				
MATUNDA NA JUISI ZA MATUNDA HALISI	Ndizi mbivu, Embe, Ukwaju, Matunda damu (Plum), Papai, Chenza, Limao, Fenesi, Tikiti maji, Pera, Fyurisi (Peaches), Parachichi, Nanasi, Pasheni, Chungwa.	10				
MBOGAMBOGA	Spinachi, Mchicha wa kijani, Majani ya maboga, Majani ya kunde, Kisamvu, Kabichi	7				
MAZIWA NA BIDHAA ZA MAZIWA	Maziwa/mtindi, jibini, Siagi, Kirimu	4				
VYAKULA JAMII YA KUNDE	Maharage, Njugumawe, Choroko, Mbaazi, Karanga, Kunde, Njegere	2 & 3				

SAMAKI NA JAMII ZAKE	Samaki wa kukaanga, Samaki wabichi, Dagaa, Samaki waliokaushwa	5				
NYAMA	Kuku, ng'ombe, mbuzi, nguruwe, bata, sungura, kanga, kondoo	5				
NYAMA CHOMA	Nyama iliyotiwa chumvi na kuchomwa kwa moshi na vyakula vingine: Kuku, Mishikaki, samaki choma	5				
VYAKULA VITAMU NA VYA MTAANI (Junk)	Pipi, chipsi, aisikrimu, chama, krispi, tambi za kutafuna, kachori					
VINYWAJI VILIVYOONGEZ WA SUKARI	Soda, juisi za kopo, boksi au chupa					
VYAKULA VYA KUKAANGA KWENYE MAFUTA	Chips, nyama za kukaanga, maandazi, bagia,					
VYAKULA VYENYE ASILI YA MIZIZI	Viazi, Mihogo, Magimbi	1				
MAYAI	Mayai	6				

1. Umeshawahi kuona tangazo au kusikia ujumbe unaoelezea masuala ya lishe
2 Ndiyo
3. Hapana
4. Sijui

Kama jibu tajwa ni ndio uliona au kusikia wapi? (***zungushia jibu tajwa***)

1. Runinga (televisión)
2. redio
3 Matangazo ya barabarani
4. magazeti
5. mabango na vipeperushi
6. Nyingine tajwa_____
7. Sikumbuki

SEHEMU F: HALI YA AFYA SEHEMU HII IJAZWE NA MTOA DAWA NA MTAALAMU WA MAABARA
F1. Matokeo ya kipimo cha malaria 1. Chanya 2. Hasi [_____]
F2. Kama matokeo ya kipimo ni chanya. Je, amepatiwa dawa? 1. Ndiyo 2. Hapana

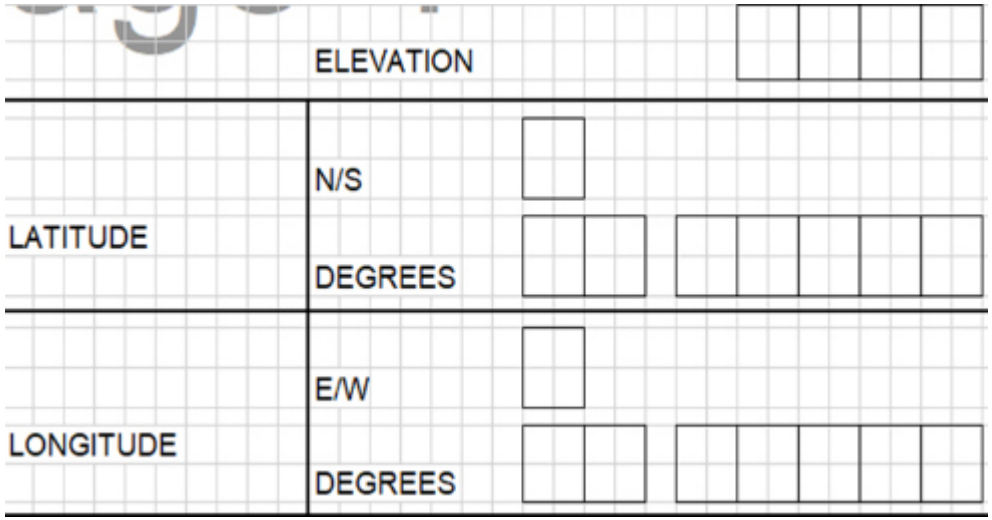
kama hapana toa sababu _____
F3 Kiwango/wingi wa damu 1. (Hb-g/dl) _____
2. Sahihi ya mhojaji _____ 3. Muda wa kumaliza mahojiano |__|__|__|__|(AM/PM)

Table 2-4. Tool 4: Dodoso la Kaya (Household Questionnaire)

			SIRI
JAMHURI YA MUUNGANO WA TANZANIA			
WIZARA YA AFYA, MAENDELEO YA JAMII, JINSIA, WAZEE, NA WATOTO			
MPANGO WA TAIFA WA KUDHIBITI MALARIA – NMCP			
UTAFITI WA MALARIA KWA WATOTO WA SHULE – 2019			
DODOSO LA KAYA			
		DODOSO Na.	
UTAMBULISHO			
MKOA			
	WILAYA		
	KATA / SHEHIA		
	JINA LA MTAA/KIJIJI		

	WILAYA/JIJI / MANISPAA / MJI MWINGINE / KIJIJINI						
		KIJIJIN					
	(WILAYA=1, JIJI=2, MANISPAA=3, MJI MWINGINE=4, KIJIJINI=5)						
	JINA LA MKUU WA KAYA						
	NAMBA YA MSTARI YA MHOJIWA WA DODOSO LA KAYA						
		TAREHE YA MAHOJIANO					
		SIKU					
		MWAKA		2	0	1	9
		JUMLA YA WATU					

	KATIKA KAYA
	IDADI YA WANAWAKE
	UMRI WA MIAKA 15-49
GPS Coordinates	



MDADISI		MSIMAMIZI KWENYE ENEO		IMEINGIZWA NA	

JINA		JINA		JINA		JINA	

SIMU NO.		SIMU NO.		SIMU NO	

UTAMBULISHO NA IDHINI

Habari, sisi ni wafanyakazi wa Halmashauri ya _____. Tunawakilisha Wizara ya Afya, Maendeleo ya Jamii, Jinsia, Wazee, na Watoto kupitia Mpango wa Taifa wa Kudhibiti Malaria (NMCP) na kufuatilia masuala ya lishe kuendesha utafiti kwa watoto wa shule za msingi za serikali ili kutambua kiwango cha maambukizi ya ugonjwa wa malaria na matumizi ya vyandarua vilivyowekwa dawa na kufuatilia masuala ya lishe. Kaya yako/yenu imechaguliwa kushiriki katika mahojiano mafupi yanayohusu utafiti huu. Mahojiano yatachukua takribani wastani wa dakika 20; na yatahusisha kuangalia baadhi ya maeneo ya nyumba yako ikiwa ni pamoja na uhakiki wa uwepo na matumizi ya vyandarua katika kaya. Majibu yote yatakayopatikana yatahifadhiwa kwa usiri na kutumika tu kwa lengo la kazi hii.

Ushiriki katika zoezi hili ni wa hiari; hivyo una uamuzi wa kushiriki au kutoshiriki. Pia, unaweza kujitoa wakati wowote kuendelea na mahojiano hata kama umesharidhia kushiriki. Endapo utaamua kushiriki na baadae ukabadili mawazo, una hiari ya kujitoa na una maamuzi ya kutokujibu swali lolote ambalo hautapenda kujibu. Ila tuna imani utapenda kushirikiana nasi kwa ajili ya kupata mchango wako katika kuboresha shughuli za udhibiti wa ugonjwa wa malaria.

Unaweza kuuliza mmojawapo wa watafiti wakati wowote. Pia, unaweza kuwasiliana na mhusika mkuu wa utafiti huu moja kwa moja: **Frank Chacky – NMCP, S.L.P 743, Dodoma. Simu na. +255 754 625 131**

Kama utakuwa na maswali juu ya haki yako kama mshiriki juu ya utafiti huu, au maswali mengineyo ambayo yana uhusiano na utafiti huu, tafadhali wasiliana na: Mwenyekiti, Tume ya Utafiti wa Magonjwa ya binadamu ("MRCC"), **S.L.P. Box 9356 Dar es Salaam, Simu na.: +25522 2121400.**

Una swali lolote mpaka sasa?

Je, naweza kuanza mahojiano sasa?

SAINI YA MDADISI		TAREHE	

MHOJIWA AMEKUBALI

KUHOJIWA . 1

SAHIHI YA MHOJIWA ……..

MHOJIWA AMEKATAA

KUHOJIWA …… 2

FUNGA MAHOJIANO

100 ANDIKA MUDA WA KUANZA MAHOJIANO

SAA . .

DAKIKA . .

ASUBUHI	. . . . .	1
MCHANA	. . . . .	2
JIONI / USIKU	. . . . .	3

ORODHA YA WANAKAYA

NA. YA	WAKAZI WA KAWAIDA	UHUSIANO NA	JINSI	MAKAZI	UMRI	WANAOSTAHILI	
MSTARI	NA WAGENI	MKUU WA KAYA				**ANGALIA SAFUWIMA 4 NA 7**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Tafadhali naomba unitajie majina ya watu wote ambao kwa kawaida wanaishi kwenye kaya yako na wageni wa kaya ambao walilala hapa usiku wa kuamkia leo, tukianzia na mkuu wa kaya.	Nini uhusiano wa (JINA) na mkuu wa kaya?	Je, (JINA) ni wa kiume au wa kike?	Je, (JINA) kwa kawaida anaishi hapa?	Je, (JINA) alilala hapa usiku wa kuamkia leo?	Je, (JINA) ana umri gani?	ZUNGUSHIA NAMBA YA MSTARI YA WANAWAKE WOTE WENYE UMRI WA MIAKA 15-49	ZUNGUSHIA NAMBA YA MSTARI YA WANAWAKE WOTE WENYE UMRI WA MIAKA 15-49 NA WANA UJAUZITO	ZUNGUSHIA NAMBA YA MSTARI YA WATOTO WOTE WENYE MIAKA 0-5
	BAADA YA KUORODHESHA								
	MAJINA NA UHUSIANO NA JINSI								
	YA KILA MMOJA, ULIZA MASWALI					KAMA HAJUI			
	2A-2C ILI KUJIHAKIKISHIA					UMRI ANDIK			
	KWAMBA UMEORODHESHA					A "999"			
	WATU WOTE KWA UKAMILIFU								
						KAMA NI			
						MIAKA 95			
						AU ZAIDI			
		ANGALIA				ANDIKA			
		MAGERESHO				"95"			

		HAPO CHINI										
			M	F	N	H	N	H	UMRI			
01			1	2	1	2	1	2		0 1	0 1	01
02										0 2	0 2	02
03										0 3	0 3	03
04										0 4	0 4	04
05										0 5	0 5	05
06										0 6	0 6	06
07										0 7	0 7	07
08										0 8	0 8	08
09										0 9	0 9	09
10										1 0	1 0	10
2A)	Ili kujihakikishia kuwa nimeorodhesha watu wote, je kuna watu wengine kama vile watoto wadogo au wachanga ambao hatujawaorodhesha?		ND		☐ →		MUORO- DHESHE		HP ☐			
2B)	Je, kuna watu wengine wowote ambao sio wanafamilia, kama vile watumishi wa nyumbani au marafiki ambao kwa kawaida wanaishi hapa na hatujawaorodhesha?		ND		☐ →		MUORO-		HP			

			DHESHE	
2C)	Je, kuna wageni au mtu mwingine yeyote aliyelala hapa usiku wa kuamkia leo, ambaye hakuorodheshwa?	ND	MUORO-DHESHE	HP

MAGERESHO YA SWALI LA 3, UHUSIANO NA MKUU WA KAYA

01 = MKUU WA KAYA	04 = MKWE/MKAMWANA	08 = KAKA AU DADA	12 = HAKUNA UHUSIANO
02 = MKE /MUME	05 = MJUKUU	09 = MKE MWENZA	13 = SHEMEJI
03 = MTOTO WA KIUME/KIKE	06 = BABA/MAMA MZAZI	10 = NDUGU WENGINE	98 = HAJUI
	07 = BABA/MAMA MKWE	11 = MTOTO WA KUFIKIA	

TAARIFA KUHUSU MKUU WA KAYA

NO.	MASWALI NA MCHUJO	MAGERESHO			NENDA
11	Je, nini Kiwango cha juu cha elimu cha mkuu wa kaya?	Hajawahi kuhudhuria shule	.	1	
		Hakumaliza elimu ya msingi	.	2	
		Elimu ya msingi	.	3	
		Mafunzo baada ya msingi	.	4	

		Hakumaliza elimu ya Sekondari .	5
		Sekondari (O- Level) .	6
		Sekondari (A - Level)	
		Mafunzo baada ya Sekondari	7
		Chuo/Chuo Kikuu .	8
		Hajui .	9
12	Je, ni nini hali ya ndoa ya sasa ya mkuu wa kaya?		
		Ameoa/olewa au wanaishi pamoja .	1
		Wameachana/wametengana .	2
		Mjane/Mgane .	3
		Hajawahi kuoa/kuolewa na Hajawahi kuishi na	
		mwanamke/mme .	4
		Hajui .	5
13	Je, ni nini shughuli kuu ya kiuchumi ya mkuu wa kaya?	Kilimo/ Ufugaji .	1
		Uvuvi .	2
		Madini .	3
		Utalii .	4
		Ameajiriwa .	5
		Biashara .	6
		Anafanya kazi za nyumbani (bila kulipwa) .	7
		Hana kazi ….	8
		Hajui .	9

<u>TAARIFA ZA KAYA</u>

NO.	MASWALI NA MCHUJO	MAGERESHO		NENDA
101	Je, ni nini chanzo kikuu cha maji ya kunywa yanayotumiwa na kaya hii?	**MAJI YA BOMBA**		
		NDANI YA NYUMBA .	1 1	

								KATIKA ENEO LA NYUMBA							.							12									
								YA JIRANI							.							13									
								YA JUMUIYA								.						14									
								MAJI YA KISIMA KIREFU								.						21									
								KISIMA CHA KUCHIMBA																								
								KISIMA KILICHOJENGEWA							.							31									
								KISIMA KISICHOJENGEWA							.							32									
								MAJI KUTOKA KWENYE CHEM CHEM																								
								CHEM CHEM ILIYOJENGEWA							.							41									
								CHEM CHEM ISIYOJENGEWA								.						42									
								MAJI YA MVUA			.											51									
								GARI YA MAJI (TANKER TRUCK)			.											61									
								MKOKOTENI WENYE TENKI DOGO							.							71									
								MAJI YANAYOTIRIRIKA (MTO/ZIWA/																								
								DIMBWI/KIJITO/MFEREJI/MIFEREJI																								
								YA KUMWAGILIA								.						81									
								MAJI YA CHUPA			.											91									
								CHANZO KINGINE														96									

	(TAJA)	
102 Ni aina gani ya choo ambacho kwa kawaida hutumiwa na wanakaya wako?	**CHOO CHA KUVUTA KWENDA**	
	BOMBA KUU LA MAJI TAKA	11
	TANGI LA MAJI MACHAFU	12
KAMA HAIWEZEKANI KUTAMBUA OMBA RUHUSA KUANGALIA CHOO.	KWENYE SHIMO	13
	SEHEMU NYINGINE	14
	CHOO CHA KUVUTA, HAJUI SEHEMU YANAPOENDA	15
	CHOO CHA SHIMO	
	CHA KISASA (VIP)	21
	CHENYE SAKAFU (KINACHOOSHEKA)	22
	CHA KAWAIDA/SAKAFU (KISICHOOSHEKA)	23
	KISICHOFUNIKWA/ WAZI	24
	MBOLEA CHOO (COMPOSTING TOILET)	31
	CHOO CHA NDOO	41
	CHOO CHA KUNING'INIA (HANGING TOILET)	51
	HAKUNA CHOO/PORINI/MSITUNI/ZIWANI/BAHARINI	61
	NYINGINE	96
	(TAJA)	

103	Je, kaya yako inachangia choo na kaya nyingine?	NDIYO .	1	
		HAPANA .	2	105
104	Ukijumuisha kaya yako, Je, ni kaya ngapi zinachangia choo hiki?	IDADI YA KAYA	0	
		KAMA NI CHINI YA 10 .		
		KAYA 10 AU ZAIDI .	95	
		HAJUI .	98	
105	Je, ni nini chanzo kikuu cha nishati itumiwayo na kaya yako kwa kuangazia?	UMEME .	01	
		NISHATI YA JUA (SOLAR) .	02	
		GESI .	03	
		MAFUTA YA TAA (CHEMLI/KANDILI) .	04	
		MAFUTA YA TAA (KARABAI) .	05	
		MAFUTA YA TAA (KIBATARI)	06	
		TOCHI .	07	
		MSHUMAA .	08	
		KUNI .	09	
		NYINGINE	96	
		(TAJA)		

NO.	MASWALI NA MCHUJO	MAGERESHO		CODE	NENDA
106	Je, ni nini chanzo kikuu cha nishati itumiwayo na kaya yako kwa kupikia?	UMEME	.	01	
		GESI YA MTUNGINI	.	02	
		BIOGAS	.	03	
		MAFUTA YA TAA	.	04	
		MAKAA YA MAWE	.	05	
		MKAA	.	06	
		KUNI		07	
		MABAKI YA MIMEA	….	08	
		KINYESI CHA WANYAMA		09	
		HAKUNA CHAKULA KINACHOPIKWA KWENYE KAYA	.	95	
		NYINGINE		96	
		(TAJA)			
107	Je, kaya yako inatumia vyumba vingapi kwa kulala?	IDADI YA VYUMBA	…………………..		

SECTION C: OBSERVATION CHECKLIST ON HOUSE QUALITY AND CONSTRUCTION			
NO.	MASWALI NA MCHUJO	MAGERESHO	NENDA
108			

	FLOOR (SAKAFU): VIFAA VILIVYOTUMIKA KUSAKAFIA ANDIKA UNACHOKIONA	Udongo/Mchanga .	1
		Kinyesi cha Wanyama .	2
		Mbao/Mabanzi/Mianzi/Minazi	3
		Saruji (Cement) .	4
		Marumaru/Terazo/Vigae .	5
		Zulia/Kapeti .	6
		Nyingine	7
		(Taja)	
109	CEILING (DARI): VIFAA VILIVYOTUMIKA KUWEKA DARI ANDIKA UNACHOKIONA	Hakuna dari .	1
		Board/wood .	2
		Wood (TNG)	3
		Gypsum .	4
		Zege/Saruji (Cement) .	5
		Dari ya Asili (Mfano, Majani, Udongo n.k)	6
		Zulia/Kapeti .	7
		Nyingine	8
		(Taja)	
110	WALLS (VIAMBAZA/KUTA) VIFAA VILIVYOTUMIKA KATIKA KUTA ZA NJE ANDIKA UNACHOKIONA.		
		Mawe na Udongo .	1
		Mawe na Simenti/Chokaa .	2
		Zege/Simenti .	3
		Matofali ya Udongo yasiyochomwa	4
		Matofali ya Udongo ya kuchoma .	5
		Matofali ya Simenti	6
		Bati .	7
		Mbao	8
		Maboksi (Card board)	8
		Nyasi/Majani .	9
		Fito/Michikichi/Magogo/Mianzi/Makuti	10
		Mianzi/Miti na Udongo .	11

		Nyingine	12
		(Taja)	
111	ROOF (PAA LA NYUMBA): VIFAA VILIVYOTUMIKA KUWEKA PAA LA NYUMBA ANDIKA UNACHOKIONA	Vigae	1
		Zege/Simenti	2
		Bati	3
		Asbestos	4
		Makuti ya mnazi	5
		Mianzi	6
		Udongo	7
		Nyasi	8
		Makaratasi ya plastiki/ Madebe	9
		Nyingine	10
		(Taja)	
112	ANGALIA SEHEMU YA PAA INAPOKUTANA NA UKUTA	SEHEMU YOTE IMEFUNGWA	01
		SEHEMU YOTE HAIJAFUNGWA	02
	ANDIKA UNACHOKIONA	SEHEMU FULANI IMEFUNGWA	03
		NYINGINE	4
		(TAJA)	
113	ANGALIA VIFAA VILIVYOTUMIKA KUTENGENEZA	VIOO	A
	MADIRISHA YA NJE	MIFUKO	B
		BATI	C
		WAVU/ PAZIA	D
	ANDIKA UNACHOKIONA	MBAO	E
		NYINGINE	X
		(TAJA)	

114	ANGALIA MADIRISHA YA NJE	MADIRISHA YOTE YAMEDHIBITIWA .	1	
		MADIRISHA YOTE HAYAJADHIBITIWA .	2	→ 127
	ANDIKA UNACHOKIONA	BAADHI YA MADIRISHA YAMEDHIBITIWA .	3	
115	ANGALIA KIFAA KILICHOTUMIKA KUDHIBITI MADIRISHA YA NJE	WAYA/WAVU .	1	
		CHANDARUA KILICHOTUMIKA .	2	
		MIFUKO (Mfano. Plastic/cement) .	3	
	ANDIKA UNACHOKIONA	HAKUNA KIDHIBITI……………………………………	4	
		NYINGINE	5	
		(TAJA)		

VYANDARUA

127	Je, kaya yako ina vyandarua vya kuzuia mbu vinavyoweza kutumika wakati wa kulala?	NDIYO .	1 →						
		HAPANA .	2						
128	Je, kaya yako ina vyandarua vya kuzuia mbu vingapi?								
		IDADI YA VYANDARUA .							
	KAMA NI VYANDARUA 7 AU ZAIDI, ANDIKA '7'.								
			CHAND. #1	CHAND. #2	CHAND. #3	CHAND. #4	CHAND. #5	CHAND. #6	CHAND. #7

129	MUOMBE MHOJIWA AKUONYESHE VYANDARUA VYOTE VYA KAYA			
		KIMEONEKANA	.	1
		HAKIKUONEKANA	.	2
129A	KAMA CHANDARUA KIMEONEKANA, ANDIKA RANGI ZAKE.	BLUU	.	1
		NYEUPE	.	2
		MISTARI YA BLUU NA NYEUPE . . .		3
		NYINGINE __________________		
	KAMA HAKIKUONEKANA, ULIZA:	(TAJA)		
	Chandarua kina rangi gani?			
130	Je, ni miezi mingapi imepita tangu kaya yako ilipopata chandarua hiki?	MIEZI ILIYOPITA		
		ZAIDI YA MIEZI 36 ILIYOPITA	.	95
		HANA UHAKIKA	.	98
131	ANGALIA AINA ZA VYANDARUA KAMA AINA HAIFAHAMIKI NA HUWEZI KUKIONA CHANDARUA,	**VYANDARUA VYENYE DAWA YA KUDUMU (LLIN)**		
		PERMANENT	.	11

No.	Question	Response		Code
	MWONYESHE MHOJIWA PICHA ZA AINA ZA VYANDARUA.	OLYSET	.	12
		NETPROTECT	.	13
		DURANET	.	14
		NYINGINE/HAJUI AINA		
		/HAJUI AINA	.	15
		CONVENTIONAL		
		POLYESTER NET	.	17
		AINA NYINGINE	.	18
		HAJUI AINA	.	19
134	Je, ulipata chandarua hiki kupitia kampeni ya serikali ya kugawa vyandarua kwa kaya, wakati wa huduma ya kliniki ya mama mjamzito au wakati ulipompeleka mtoto kupata chanjo au kupitia mpango wa kugawa vyandarua shuleni?	NDIYO, KAMPENI YA KUGAWA		
		VYANDARUA	.	1
		NDIYO, KATIKA HUDUMA YA		
		MAMA MJAMZITO (ANC)	.	2
		NDIYO, NILIPOENDA KUPATA		
		CHANJO	.	3
		NDIYO, MPANGO WA KUGAWA		
		VYANDARUA SHULENI (SNP)	. .	4

			(NENDA 136)
		HAPANA .	5
135	Ni wapi ulikipata chandarua hiki?	KITUO CHA AFYA CHA	
		SERIKALI .	01
		KITUO CHA AFYA CHA	
		BINAFSI .	02
		DUKA LA DAWA (PHARM)	03
		DUKA LA DAWA MUHIMU (ADDO)	04
		DUKA / SOKONI .	05
		MFANYAKAZI WA AFYA	
		YA JAMII (CHW)	06
		MASHIRIKA YA KIDINI .	07
		SHULENI .	08
		NYINGINE .	96
		HAJUI .	98
136	Je, kuna mtu yoyote aliyelala kwenye chandarua hiki usiku wa kuamkia leo?	NDIYO .	1
		HAPANA. ←	2

									(NENDA 137A)											
						HANA UHAKIKA	.				8									
	137			Ni nani alilala ndani ya chandarua hiki usiku wa kuamkia leo?		NAMBA YA MSTARI														
						JINA														
				ANDIKA JINA NA NAMBA YA MSTARI KUTOKA KWENYE ORODHA.		NAMBA YA MSTARI														
						JINA														
						NAMBA YA MSTARI									;					
						JINA														
						NAMBA YA MSTARI														
						JINA														
						NAMBA YA MSTARI														
						JINA														
						NAMBA YA MSTARI														
						JINA														
													NEXT -> Q129	NEXT -> Q129	NEXT -> Q129	NEXT -> Q129	NEXT -> Q129	NEXT -> Q129	NEXT -> Q129	
													NO MORE -> Q139	NO MORE -> Q139	NO MORE -> Q139	NO MORE -> Q139	NO MORE -> Q139	NO MORE -> Q139	NO MORE -> Q139	

137A	Kwa nini?	HAKUNA MBU		A			
		HAKUNA MALARIA SASA	. . . . . .	B			
		JOTO SANA	.	C			
		HAPENDI HARUFU	. . . . . .	D			
		INAMBANA					
	RECORD ALL MENTIONED	/ANAOGOPA	.	E			
		CHANDARUA KIMECHAKAA/					
		KIMECHANIKA	.	F			
		KICHAFU	.	G			
		HAPAKUWA NA CHANDARUA					
		USIKU WA JANA		H			
		ANAYEKITUMIA HAKULALA					
		HAPA USIKU WA JANA		I			
		CHANDARUA KIDOGO		J			
		KUTUNZA CHANDARUA KWA					
		MATUMIZI YA BAADAYE		K			
		HAKIUI/HAKIFUKUZI TENA					
		MBU	. . . . . .	L			
		NYINGINE		X			
		(TAJA)					
		HAJUI	. . . .	Z			
138		RUDI SWALI LA 129 KWA CHANDARUA KINGINE; AU, KAMA HAKUNA KINGINE, NENDA SEHEMU INAYOFUATA.			RUDI SWALI LA 129 KWA CHANDARUA KINGINE; AU, KAMA HAKUNA	RUDI SWALI LA 129 KWA CHANDARUA KINGINE; AU,	RUDI SWALI LA 129 KWA CHANDARUA KINGINE; AU,

KINGINE, NENDA SEHEMU INAYOFUATA.	KAMA HAKUNA KINGINE, NENDA SEHEMU INAYOFUATA.	KAMA HAKUNA KINGINE, NENDA SEHEMU INAYOFUATA.

UELEWA KUHUSU MALARIA

NO.	MASWALI NA MCHUJO	MAGERESHO		NENDA
139	Kwa maoni yako, ni nini tatizo kubwa la kiafya katika jamii hii?	UKIMWI/ VIRUSI VYA UKIMWI .	01	
		KIFUA KIKUU .	02	
		MALARIA .	03	
		UTAPIAMLO .	04	
		KISUKARI .	05	
		KANSA .	06	
		MAFUA .	07	
		AJALI ZA BARABARANI .	08	
		KUHARA .	09	
		UGONJWA WA MOYO .	10	
		NYINGINE	96	
		(TAJA)		
		HAJUI	98	

14 0	Je, unaweza kuniambia dalili za malaria kwa mtoto mdogo?	HOMA	.	A	
		KUJISIKIA BARIDI	.	B	
		VIPEL VYA BARIDI	.	C	
		KUTOKWA JASHO	.	D	
	ZUNGUSHI A ZOTE ANAZOKU TAJIA.	KICHWA KUUMA	.	E	
		MAUMIVU YA MWILI		F	
		KUKOSA HAMU YA KULA	.	G	
		KUTAPIKA	.	H	
		KUHARA	.	I	
		MWILI KUKOSA NGUVU	.	J	
		KUKOHOA	.	K	
		NYINGINE		X	
		(TA JA)			
		HAJUI CHOCHOTE		Z	
14 1	Je, kuna njia za kujikinga na malaria?	NDIYO	.	1	
		HAPANA	.	2	→ SEHE MU D
14 2	Je, ni njia gani za kuepuka kupata malaria?	KULALA KATIKA CHANDARUA CHENYE DAWA	.	A	
		KULALA KATIKA CHANDARUA	.	B	

																							KUTUMIA DAWA YA KUPULIZA/KUNYUNYIZIA	.				C					
																							KUNYUNYIZIA DAWA YA UKOKO (IRS)				.	D					
				ZUNGUSHIA NJIA ZOTE ANAZOZITAJA																			KUFUNGA MILANGO/MADIRISHA			.		E					
																							KUTUMIA DAWA ZA KUPAKA ZA KUFUKUZA WADUDU	.				F					
																							KUWEKA MAZINGIRA SAFI		.								
																							NA KUKATA NYASI	.				G					
																							ONDOA MAJI YALIYOTUAMA		.			H					
																							UTARATIBU WA KUPEWA DAWA ZA KUJIKINGA NA										
																							MALARIA WAKATI WA UJAUZITO (IPTp)	.				I					
																							KUWEKA NYAVU ZA MBU DIRISHANI NA										
																							MILANGONI	.				J					
																							NYINGINE					X					
																											(TAJA)								
																							HAJUI CHOCHOTE					Z					
	143			Ni njia zipi zinazotumiwa na kaya yako kwa ajili ya kudhibiti mbu na																			Kulala katika Chandarua				.	A					
				malaria?																			IRS (Ukoko)				.	B					
																							Larviciding (Viuatilifu)				.	C					

																									Prophylaxis (Kunywa dawa																	
																													za malaria)				.				D					
						ZUNGUSHIA NJIA ZOTE ANAZOZITAJA																			Kuweka mazingira safi								.				E					
																									Dawa ya kuchoma /kupuliza/kupaka												F					
																									Nyingine												X					
																													(Taja)													
																										Hakuna																
																									Hajui				.								Z					

Table 2-5. Tool 5: Quality Assurance mRDT Results Form

Quality Assurance mRDT Results

Checked by: _____ Date _____ School identifier: _____

1. Per each school:
   a. Select randomly 20% of the mRDT cassette and check with the result filled into Tool 2

No.	Absolute frequency of			Remarks
	Rechecked mRDTs	Concordance	Disconcordance	

Annex 3. Protocol for Malaria Testing and Quality Assurance and Control

Preparations

Before leaving to go to the site where malaria rapid diagnostic testing (mRDT) will take place, the tester should make sure that he/she has the following items:

- Enough mRDT kits
- Waste disposal containers (sharp box, infectious waste container and non-infectious waste container)
- Laboratory coat/apron
- Clean examination gloves
- 0.1% sodium hypochlorite solution or commercial JIK
- Malaria RDT register
- Malaria RDT standard operating procedures (SOPs)
- Malaria RDT job aide
- Ball pen/markers
- Wall clock
- HemoCue and cuvettes
- Filter papers

Testing site

Upon arrival at the site, the tester should seek a room where the testing activity will take place. The room should be prepared to be a temporary testing site and should have a minimum of the following:

- Enough space
- Clean
- Well lit
- 1 flat table that will accommodate the registers, HemoCue, microcuvettes and mRDT devices
- 2 chairs
- An improvised washing place (at least a bucket with tap)

Testing procedure

The tester should organise the testing set up so that the registration of children takes place in the testing room by the tester before the child is pricked. Children **should not** be tested before they are registered.

SOPs should be clearly displayed and strictly adhered to, and job aides should be handy on the table all the time during testing for quick reference

The tester should read the insert/leaflet in the test kit and particularly pay attention to the **waiting time** and the **number of buffers drops** to be added.

Recording of results

Malaria RDT test results should be recorded on the device, school children form and mRDT register. Record results as POSITIVE **(POS)** or NEGATIVE **(NEG)** on the school children form. INVALID **(INV)** results should **NOT** be recorded on the school children form.

Invalid results should be recorded on the test device and mRDT register, and the test **MUST** be repeated.

If there are three consecutive invalid results from the same kit, the kit should be closed, reported to the supervisor and replaced by another kit.

Record results of the test on mRDT register on the result column by ticking on appropriate columns corresponding with appearance of lines on the test window and fill the interpretation column accordingly.

Malaria RDT Quality Assurance and Quality Control (mRDT QAQC)

To ensure quality testing and reliable test results, the tester should strive to achieve the following minimum performance standards:

Physical inspection: The tester should check the kit and its components for physical damage, water or chemical spill and expiry date. Compare the lot number of the device with that of buffer and check if accessories of the kit are all present (**device, buffer, alcohol swab, prickers, blood transfer device**) any discrepancy should be reported to the site supervisor and a decision whether to use the kit or not should be made according to the extent of the discrepancy.

Labelling of the device: All devices should be clearly labelled to show; identification of the child (name and number), date of the test and start and end time

Blood volume: The correct amount of blood should be used and applied on the correct well on the device. The tester should use the blood transfer device that came with the kit and use the correct technique to apply blood on the device. The tester should make sure that the device has no blood splatter, no red colouration on the reading window at end time and no blood clot on the sample well.

Any device with one or all of the three mentioned above is of a poor quality and the results are not reliable.

Buffer: The buffer used should not necessarily be of the same lot/batch number as that indicated on the device.

The tester should use the correct number of drops on the correct buffer well on the device so that at the end of the test there is no blood clot on the sample well, reading window as well as red colouration, invalid result or back flow.

Devices with the above-mentioned conditions are of low quality and their results are not reliable.

Timing: The waiting time should be strictly adhered to. Test results should not be read before 15 minutes have elapsed. Negative results should be reported after the waiting time specified by the manufacturer has passed.

Dried Blood Spot (DBS)

DBS is collected for molecular analysis. This time it is collected for the purpose of determining whether there are *Plasmodium falciparum* species with histidine-rich protein 2 (HRP2) gene deletion or not. This is of paramount importance; the collector should strictly

adhere to the SOP for DBS. Remember to use powder-free gloves; if you have to use powdered gloves, then they have to be washed. The prepared DBS should be well dried and kept away from dust.

Haemoglobin measurement

During the survey, haemoglobin will be measured amongst some selected pupils by using HemoCue haemoglobinometer. Testers should strictly adhere to the SOP for haemoglobin estimation and maintenance of the HemoCue machine.

Note: The three procedures are performed from the same finger prick. Because of its sensitivity to contamination, DBS should be collected first, followed by haemoglobin measurement and last is the mRDT. This testing sequence should be strictly followed.

Safety precautions:

Personal protection*:* Laboratory coat/apron should be worn during procedure. Clean examination gloves should be worn during the procedure. They should be changed when they are soiled (5–10 children).

Waste disposal: There should be 3 clearly labelled waste containers; sharp box, infectious waste container and non-infectious waste container. All prickers (blood lancets) and blood transfer devices should be put into a sharp box immediately they are used. DO NOT put them on the table at any time. Used gloves and alcohol swabs should be discarded into the infectious containers. Device envelopes and desiccants should be put into non-infectious container. When the waste containers are full, they should be transported to a nearby health facility where they should be disposed of according to Infection Prevention and Control (IPC) guidelines. DO NOT dispose mRDT wastes on the school premises.

Used mRDT devices: Used mRDT devices should not be discarded and disposed of after the test. They should be kept in a box and stored at the district hospital by the tester for subsequent references and monthly test checking by mRDT QAQC supervisors. Such devices should be kept for a minimum of one month before they are disposed of.

Roles and responsibilities

Regional Laboratory Technologist

The Regional Laboratory Technologist (RLT) is the overseer of all testing activity in the region; he/she is therefore responsible amongst other things for:

- Orienting all testers selected to participate in the survey from the respective region
- Ensuring that testing materials and equipment are available at the testing sites on time
- Carrying out supportive supervision to all testing sites to ascertain that testing is done by adhering to SOPs, thus quality is ensured
- Assisting testers to solve problems whenever they occur
- Performing mRDT QAQC to retained used mRDT devices and compiling mRDT rechecking form
- Submitting all mRDT rechecking forms to the National Supervisor at the end of exercise

Testers (Laboratory Technicians)

Testers are a key to the success of this survey as far as parasitological and anaemia survey is concerned. They are also key to the success of determining prevalence of HRP2 gene

deletion in the country. Testers were expected to conduct themselves with integrity and adhere to the code of conduct of laboratory technologists. At the testing site they are responsible for

- Preparing the testing site to suit the testing activity (arranging tables and chairs, flow of pupils etc.) taking into consideration the safety of pupils, staff and themselves.
- Carrying out mRDT and hemoglobin measurement.
- Collecting DBS and packing them according to the SOP.
- Filling out forms and maintaining registers.
- Referring pupils with mRDT-positive to the supervisor to facilitate treatment.
- Submitting all forms and registers to the RLT/supervisor.
- Ensuring all waste generated during testing were safely collected and transported to the nearby health facility for disposal.

Annex 4. Malaria RDT Standard Operating Procedure (SOP)

DIAGNOSIS OF MALARIA USING RAPID DIAGNOSTIC TEST (RDT)			
Purpose	**This procedure provides instructions for diagnosing malaria using RDTs**		
Materials	**Reagents**	**Supplies**	**Equipment**
	• Buffer	• Capillary tube/pipette/loop • Lancet • Alcohol prep pad • Gloves • Felt pen/marker pen	• RDT device • Clock/timer • Sharps containers • Infectious waste containers • Non-infectious waste containers
Sample	Fresh whole blood		
Special safety precautions	All specimens should be considered as potentially infectious: • Wear gloves during mRDT procedure • Handle sharp instruments carefully • Dispose all used deposable materials according to safety and waste management procedures • Use new mRDT package and lancet for each patient		
Quality control	Make sure that the control line is reactive before interpretation of the results		

Procedure: Follow the activities in the table below to

Step	Action		
1	Follow every step in the SOP		
2	Prepare all the materials before performing mRDT test		
3	Explain to the patient that you are going to test for malaria using mRDT		
4	Open mRDT kit and check: • If the envelope is intact • Expiry date on the envelope and buffer • If the lot number on the kit matches with the buffer number • For the presence of capillary tube or pipette, alcohol pad and lancet		
5	Open the RDT envelop carefully and check for the integrity of the cassette and desiccant. **If loop system check for the presence and integrity of the loop.**		
6	Write patient's unique identifier (dual identification) on the surface of the device		
7	Put on/wear gloves		
8	Clean the patient's finger with the alcohol pad/swab and leave it to dry. **The finger must be dry before pricking.**		
9	Prick the patient's finger to get the drop of blood		
10	Collect the blood		
	If	**Then**	
	Loop	Use the tip of the loop to collect the required amount of blood according to manufacturer's instruction	
	Pipette	Use the pipette to collect the required amount of blood according to manufacturer's instruction	
	Capillary tube	Use the tip of capillary tube to touch the blood and wait until it reaches the recommended level	
11	Immediately touch the RDT well/hole with the instrument to drop the blood		
12	Immediately put the recommended drops of buffer to the appropriate well/hole. "**Don't use the buffer from different kits or lots number**"		
13	Immediately record the time and read the results fifteen (15) minutes for a negative test after adding buffer. Report a positive test as soon as the control line is visible, the devise can detect a positive test within a few minutes. **Do not report a negative result before fifteen (15) minutes have elapsed or after 20 minutes**		
14	Interpret the results		
	If		**Then**

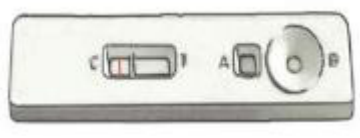
	Control band is not reactive and test band reactive	**Invalid results – Repeat the test**
	Control band is not reactive and test band not reactive	**Invalid results – Repeat the test**
	Control band is reactive	Valid results – Continue with interpretation of the result
	Control band and test band reactive	Positive test
	Control band reactive and test band not reactive	Negative results
15	Record results on the cassette, investigation form and on the laboratory register	
16	Dispose of all infectious waste properly	

Annex 5. Job Aide on How to Do the Rapid Test for Malaria

A. Prepare needed materials

Materials needed before starting malaria RDT

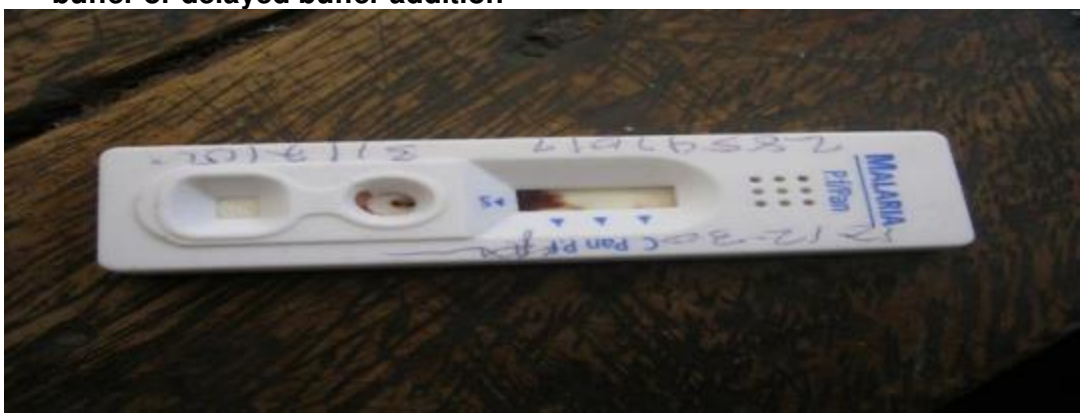
B. Perform the test

1 	2 	3 
4 	5 	6 
7 	8 	9 
10 	11 	12 
13 	14 	

Procedure for conducting malaria RDT

3. **Blood deposited on the sides of sample well (blood splatter)**

4. **Blood clotted on sample well as well as reading window due to either insufficient buffer or delayed buffer addition**



5. **Red colouration on the reading window resulting from adding too much blood**

Annex 6. Handover Form (*Fomu ya Makabidhiano*)

JAMHURI YA MUUNGANO YA TANZANIA

WIZARA YA AFYA, MAENDELEO YA JAMII, JINSIA, WAZEE NA WATOTO

MPANGO WA TAIFA WA KUDHIBITI MALARIA

MAKABIDHIANO YA REGISTER YA VIPIMO VYA MALARIA NA FORM YA UTAMBULISHO WA SHULE KATIKA NGAZI YA HALMASHAURI/MKOA

Mratibu wa Malaria Halmashauri ya Jiji/Mji/Wilaya/Manispaa…….. nimekabidhi fomu ya utambulisho wa shule na register ya vipimo vya malaria yenye jumla ya watoto ……... kutoka shule ya/za (andika school IDs na onesha idadi katika mabano kwa kila shule) ……. kwa mratibu wa malaria mkoa/msimamizi wa utafiti kutoka wizara ya afya. Ikiwa idadi ya shule /wanafunzi ni pungufu toa sababu hapa……...

Jina la Mratibu Halmashauri _____ Sahihi _____ Tarehe _____

Jina la Mratibu Halmashauri _____

Jina la Mratibu Mkoa _____ Sahihi _____ Tarehe _____

Annex 7. Field Work Process

Composition of the field teams

The field teams included a National Supervisor, Regional Malaria Focal Person (RMFP), Regional Laboratory Technologist (RLT), District Malaria Focal Person (DMFP), District Nutrition Officer (DNuO), District School Health Programme Coordinator and two laboratory technicians who were involved in this survey. In addition, in each surveyed school, two teachers were included on the field team (one of whom was responsible for health issues at the school).

Facilitators and supervisors

National Facilitators

National Facilitators were from participating institutions, namely the National Malaria Control Program (NMCP); National Institute for Medical Research (NIMR); Ifakara Health Institute (IHI); National Bureau of Statistics (NBS); Tanzania Food and Nutrition Centre (TFNC); Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC); and University of Dar es Salaam (UDSM).

National Supervisors

National Supervisors were from participating institutions, including the NMCP, NIMR, IHI, Muhimbili University of Health and Allied Sciences (MUHAS), NBS, TFNC, MoHCDGEC, UDSM, and the President's Office–Regional Administration and Local Government (PO-RALG). National Supervisors were selected based on their professional backgrounds and expertise. They were responsible for overseeing day-to-day activities and coordinating the council teams for each region.

Regional Supervisors

Each regional team comprised an RMFP and RLT from their respective regions. They were responsible for overseeing and performing daily quality checks during field visits and acted as a bridge between the national and council teams. In addition, RLTs were responsible for conducting training of laboratory technicians from councils in their respective regions in collaboration with National Supervisors.

Data collectors

The data collection team consisted of a DMFP, DNuO, District School Health Programme Coordinator, two laboratory technicians, drivers and two teachers at a respective school.

District Malaria Focal Person

The DMFP was the overall Council Team Leader responsible for coordinating all logistics, organising the survey at council level, collecting data from pupils and households, providing recommended treatment for pupils who tested mRDT-positive and giving referral to the nearby health facility to pupils who needed more medical attention. Furthermore, they were responsible for providing the daily survey reports to the regional team.

District School Health Programme Coordinator

The District School Health Programme Coordinator role was to assist the Council Team Leader to coordinate activities at all the sampled schools in their respective council and conduct sensitisation meetings to the school committee on the School Malaria Parasitaemia and Nutrition Survey (SMPNS).

DNuO/focal person

The DNuO was responsible for assisting the Council Team Leader to coordinate activities at all the sampled schools in their respective council and overseeing that nutritional measurements were obtained as per study protocol.

Laboratory technician

Laboratory technicians were responsible for blood sample collections from pupils for malaria testing, interpretation and recording of the results, determination of haemoglobin levels and record keeping in the register, preparation of dried blood spots (DBSs), storage of used mRDT cassettes for verification, and ensuring appropriate disposal of mRDT waste.

School teachers

The major roles of school teachers in the selected school were to facilitate the preparation of the school committee's meeting, review and update pupils' register according to class and gender, and select pupils to be interviewed.

Training content

The training covered orientation on the study protocol, fieldwork procedures, review and pre-testing of the survey tools, interviewing techniques, sampling, anthropometric assessments, logistics management, reporting, quality assurance checks, data handling and management and report writing.

Training methods

Different training methods were used, as listed below.

- Presentations from facilitators using prepared materials
- Discussion of the presentations, survey tools, roles and responsibilities of each participant
- Role play of survey tools by participants in small groups to get familiar with the sequence of the questions
- Practical on how to estimate haemoglobin level, DBS preparation and malaria diagnosis using RDT
- Pre-test of survey tools using software application installed in electronic tablet

Orientation on the malaria diagnosis, haemoglobin estimation and DBS preparation

RLTs were oriented on the diagnosis of malaria infection using RDT, estimate haemoglobin levels and preparation of DBS filter paper using the study standard operating procedures (SOPs). At the time of field training, the RLTs prepared filter papers to be used for DBS collection in their respective regions.

At the regional level, the RLTs organised a two-day orientation for laboratory technicians on procedures for obtaining respondents' voluntary consent for haemoglobin estimation, malaria diagnosis, DBS preparation and quality control issues.

Data collection tools

Structured questionnaires were used as a guide to interview and collect data from all selected pupils and households. Questionnaires were in both paper and electronic format. The questionnaires were initially prepared in English, translated to Swahili, and then programmed for the electronic tablet.

Four different questionnaires were designed to capture survey data (Annexes 1, 2, 3 and 4):

- **Tool 1:** School identification form
- **Tool 2:** Designated mRDT, Hb and DBS register and mRDT Quality Assurance Form
- **Tool 3:** Pupil's questionnaire
- **Tool 4:** Household questionnaire

Tools 3 and 4 were programmed in the software called Census and Surveys Processing System (CSPro), and data were collected through mobile application installed in electronic tablets. In addition, hard copies of mRDT Quality Assurance Form and Data Completeness Checklist were used for data quality and accountability.

Tool 1: School identification form

This tool was designed to provide a council-level summary. Each row contained information on the name of the school surveyed, school ID, contact number of head teacher, name of the nearest health facility and distance to the health facility (reported in kilometres or minutes), number of pupils tested, number of pupils tested positive per school based on the designated mRDT register and number of pupils whose haemoglobin was estimated and found to be less than 8g/dl.

Tool 2: Designated mRDT, Hb and DBS register and mRDT Quality Assurance Form

The tool collected information on each pupil's identification (e.g., name, identification number and school class), mRDT test and result, mRDT lot number and expiry date, haemoglobin level and sample collection for DBS. Moreover, the quality assurance was done by comparing mRDT test results on the used cassettes/device with the respective results recorded in the Tool 2 for concordance or discordance using the mRDT Quality Assurance Form.

Tool 3: The pupil's questionnaire

Information collected on the pupil's questionnaire included pupil's identification (e.g., name, pupil ID, sex, age, school name and class); anthropometric measure (temperature, height and weight); household information (household size, number of individuals who slept in the household the night before the survey, designated caretaker); bed net information (number of bed nets at home, general bed net use, bed net use the previous night, number of people sleeping under the same bed net); history of illness in the last two weeks before the survey (school absenteeism due to sickness, fever, medical care seeking behaviour, malaria diagnosis and received malaria treatment); health on the day of the survey (mRDT test result, treatment, drug names used for malaria treatment); knowledge on malaria treatment and prevention, source of information for malaria diagnosis, treatment and prevention and food consumption behaviour; and frequency and duration of physical activity.

Tool 4: The household questionnaire

The household questionnaire collected information on household identification and ownership, an observation checklist on house quality and construction, household access to and use of bed nets, knowledge of malaria (signs, symptoms, prevention and control measures) and household food consumption behaviour.

Survey equipment and supplies

Tablets

Samsung tablets (Galaxy Tab A SM-T585) with pre-installed questionnaires of Tool 3 and Tool 4 using CSPro software version 7.2 were used to collect data for study. The information

obtained were transmitted on a daily basis to the server located at the headquarters (NMCP – Dodoma).

Weighing scales

Pupils were weighed using the electronic seca® uniscale (seca Gmbh and Co.kg 22061, Hamburg, Germany, with precision of 100 gm). Each pupil's weight was measured in kilograms. Pupils were measured lightly dressed without shoes.

Height measuring boards

Pupils' height (cm) was measured using SHORR® two-pieces height boards (Shorr productions, Maryland USA, with a precision of 0.1cm). Pupils were measured with no shoes on.

HemoCue machine and microcuvettes

HemoCue machine 201® and associated microcuvettes were used to determine haemoglobin levels in gm/dl.

Thermometers

Digital thermometers were used to measure axillary body temperature of all selected pupils. The measurement was reported in degrees centigrade.

mRDTs

SD Bioline® malaria antigen Pf/pan mRDTs Standard Diagnostics Inc. of Korea were used to test pupils' blood for presence of malaria infection. In the field, the RDTs were transported in a cooler box to avoid exposure to high temperatures. Prior to using the mRDT devices, desiccant in the mRDTs envelope were inspected for colour changes, and those found to have colour change were not used. Performance of the test was based on the manufacturer's instructions. In addition, laboratory technicians used job aides to perform and interpret the test correctly.

Filter papers

Whatman® filter paper no. 3 Merck KGA Darmstadt, Germany was used to prepare 10mm diameter DBS for molecular analysis. After collecting the pupil's blood on the filter papers, each unique paper had the pupil's identification number written on it, dried and individually packaged in a plastic zip lock bag with a desiccant. These DBSs are stored in a conducive environment until further analysis.

Antimalarial medicines

All pupils with positive mRDT results were treated on site with artemether-lumefantrine (ALu) as co-formulated tablet of 20mg of artemether and 120mg of lumefantrine according to the National Guidelines for Malaria Diagnosis and Treatment (106). The first dose, and on certain occasions the second dose, was administered on sight at the time the mRDT was interpreted as being positive for malaria infection. Pupils were instructed on how to take the remaining doses. The same instructions were given to respective teachers for easy follow up on the required pupils.

Other Supplies

Latex examination gloves were used by the laboratory technicians when performing the laboratory tests (mRDT, hemoglobin and DBS). A new pair of gloves was used for each pupil. This was in line with the MoHCDGEC Infection Prevention and Control (IPC) guidelines (107,108).

Packets of biscuits and bottled juice were locally purchased, sufficient for all participating pupils. They were essential to maintain the energy levels of pupils who were to spend long periods being interviewed, tested and having their anthropometric measurements taken. This aided in curbing selected pupils from absconding due to hunger.

Laboratory processing of DBS

The collected filter papers of DBSs are currently stored under conducive environment and will further be analysed to determine the parasite density, parasite allelic frequency and genetic diversity parasite migration, undetectable/sub-patent parasitaemia and gametocytaemia, histidine-rich protein 2 gene deletion, molecular markers of antimalarial drug resistance and population-level sickling test. Material transfer agreement will be sought in case analysis will be done elsewhere.

Annex 8. The 2019 SMNS Regional Profiles

Figure 8-1. The 2019 SMNS Regional Profile–Geita

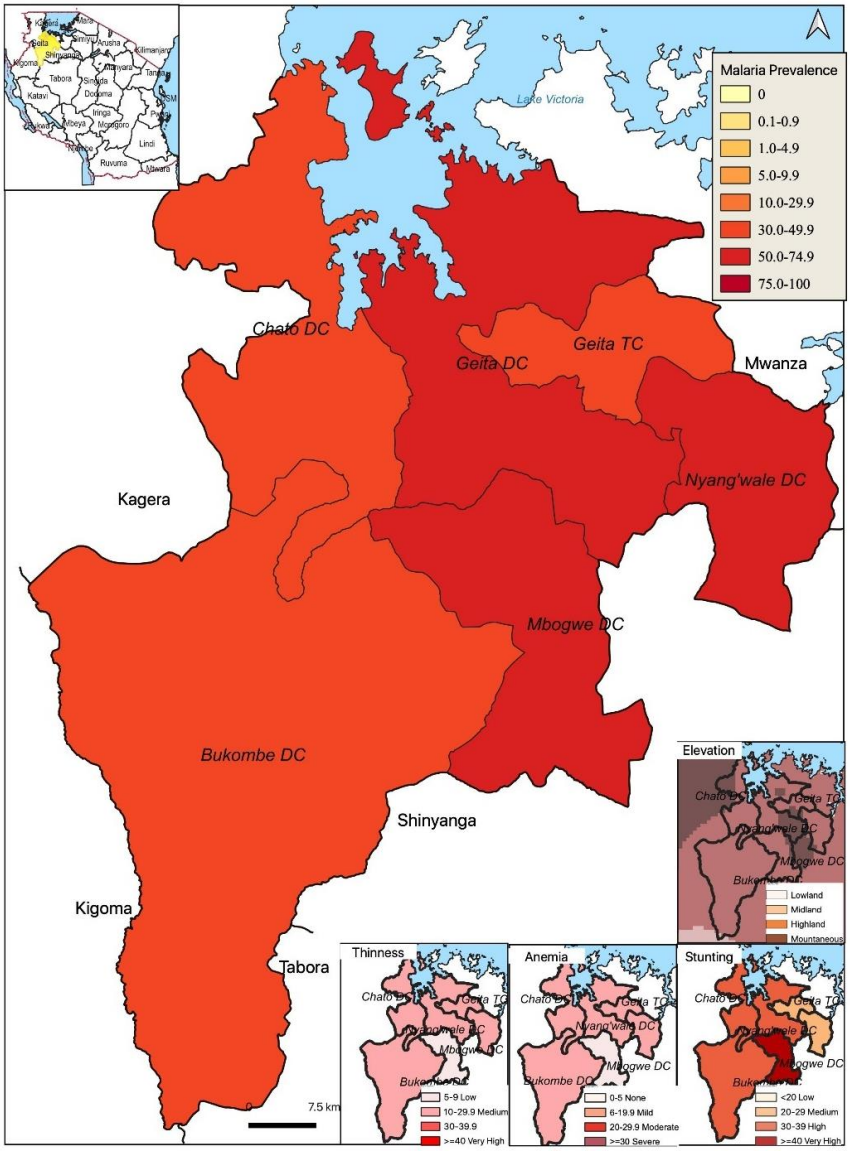


Figure 8-2. The 2019 SMNS Regional Profile–Njombe

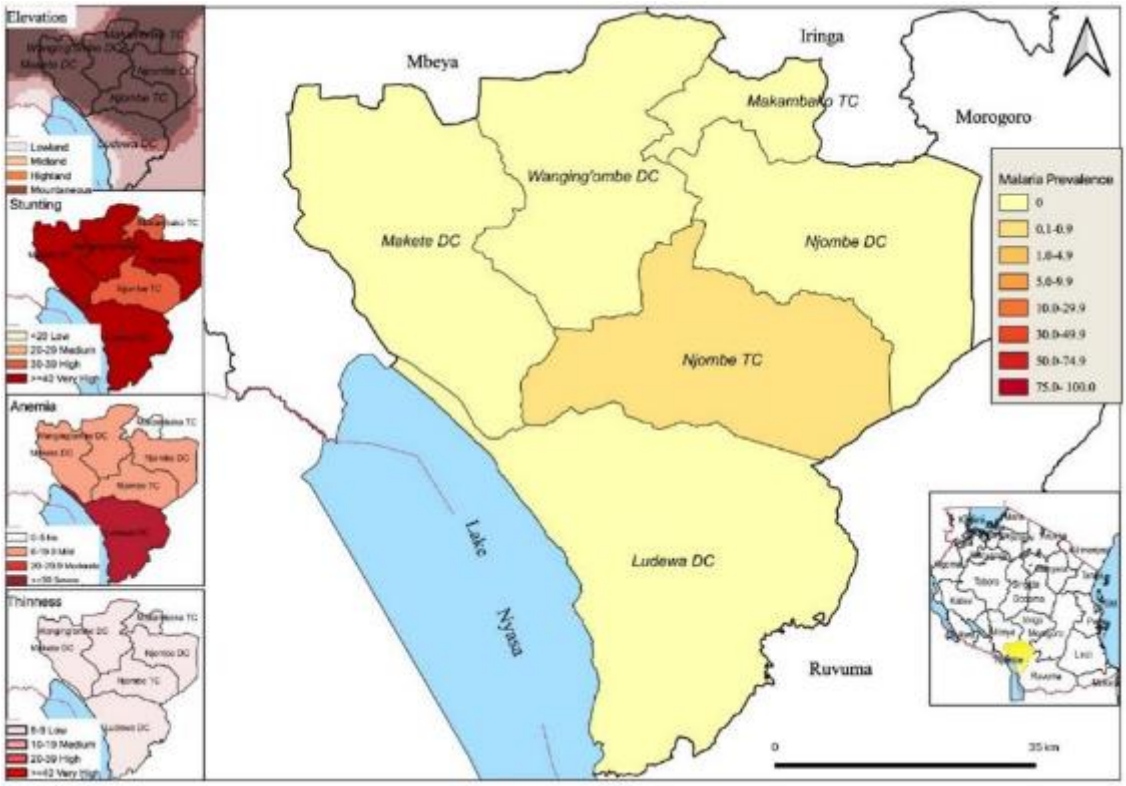


Figure 8-3. The 2019 SMNS Regional Profile–Manyara

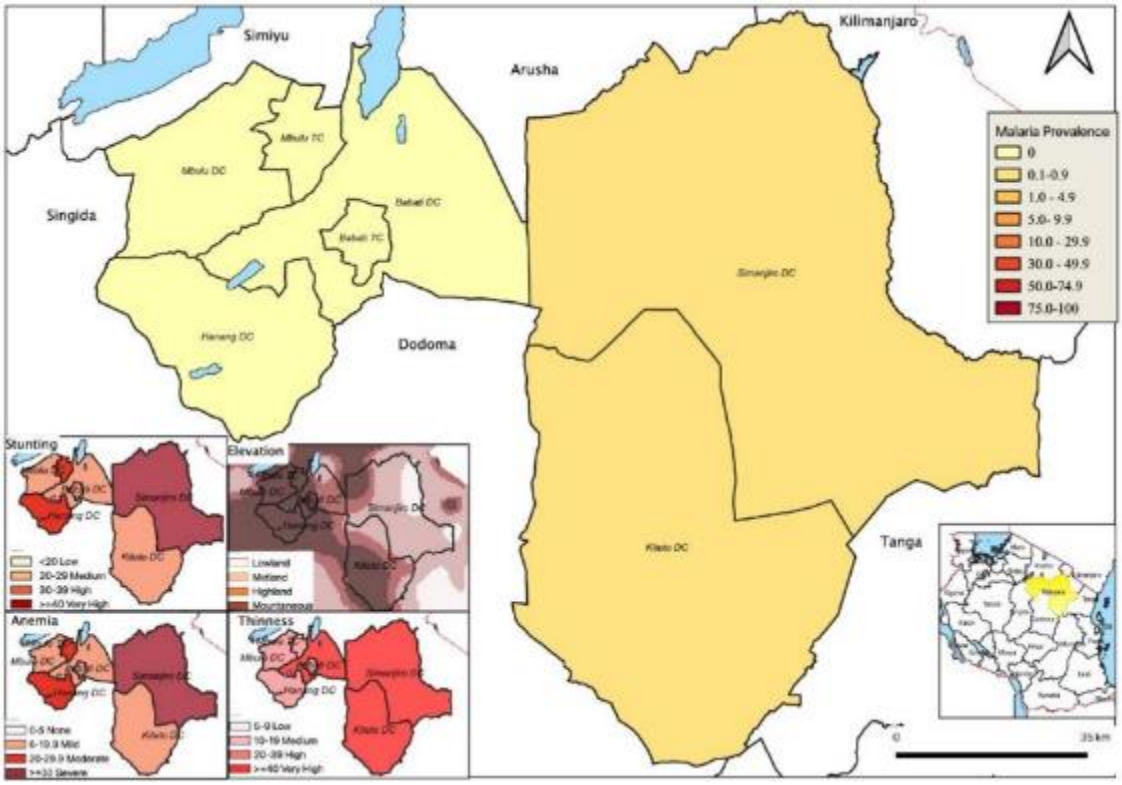


Figure 8-4. The 2019 SMNS Regional Profile–Mara

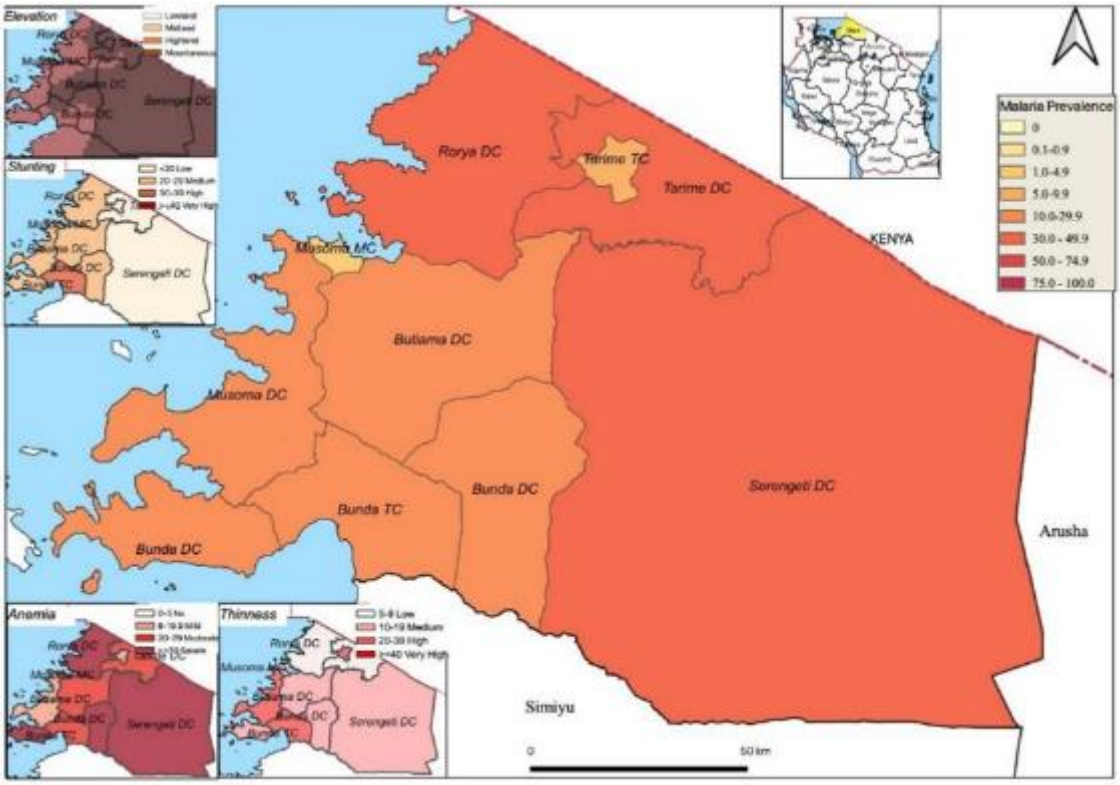


Figure 8-5. The 2019 SMNS Regional Profile–Mwanza

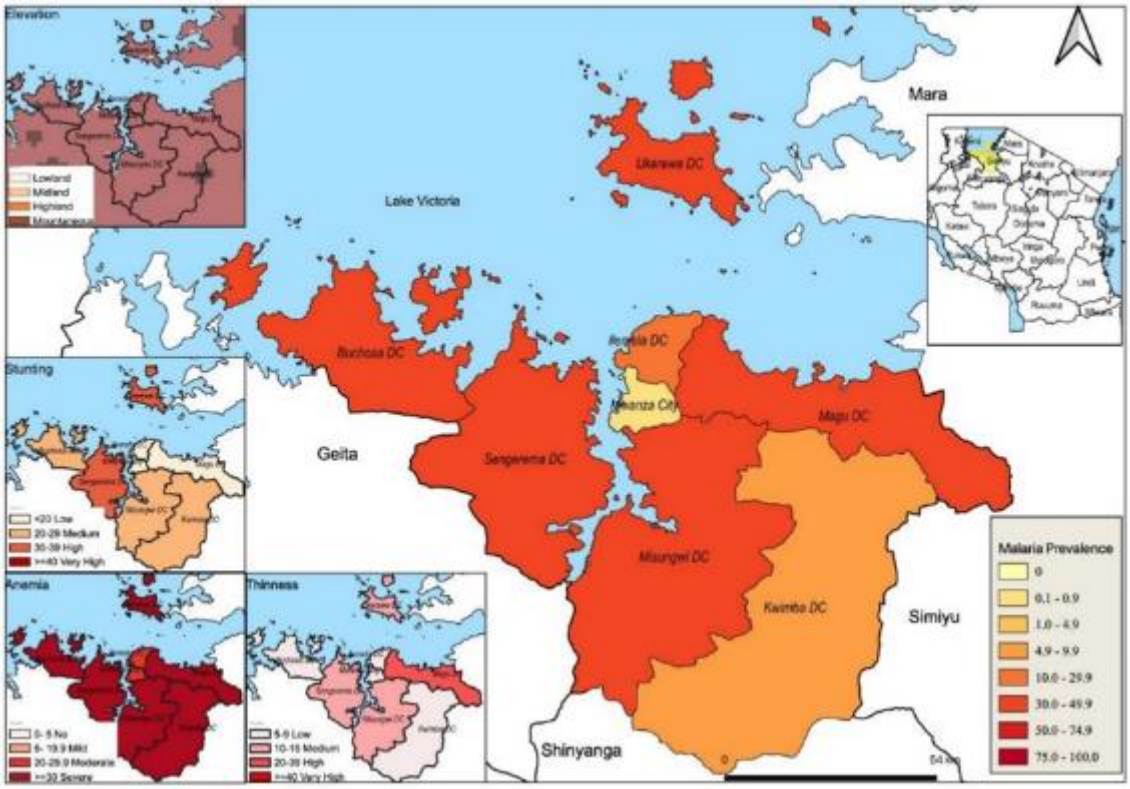


Figure 8-6. The 2019 SMNS Regional Profile Figure–Simiyu

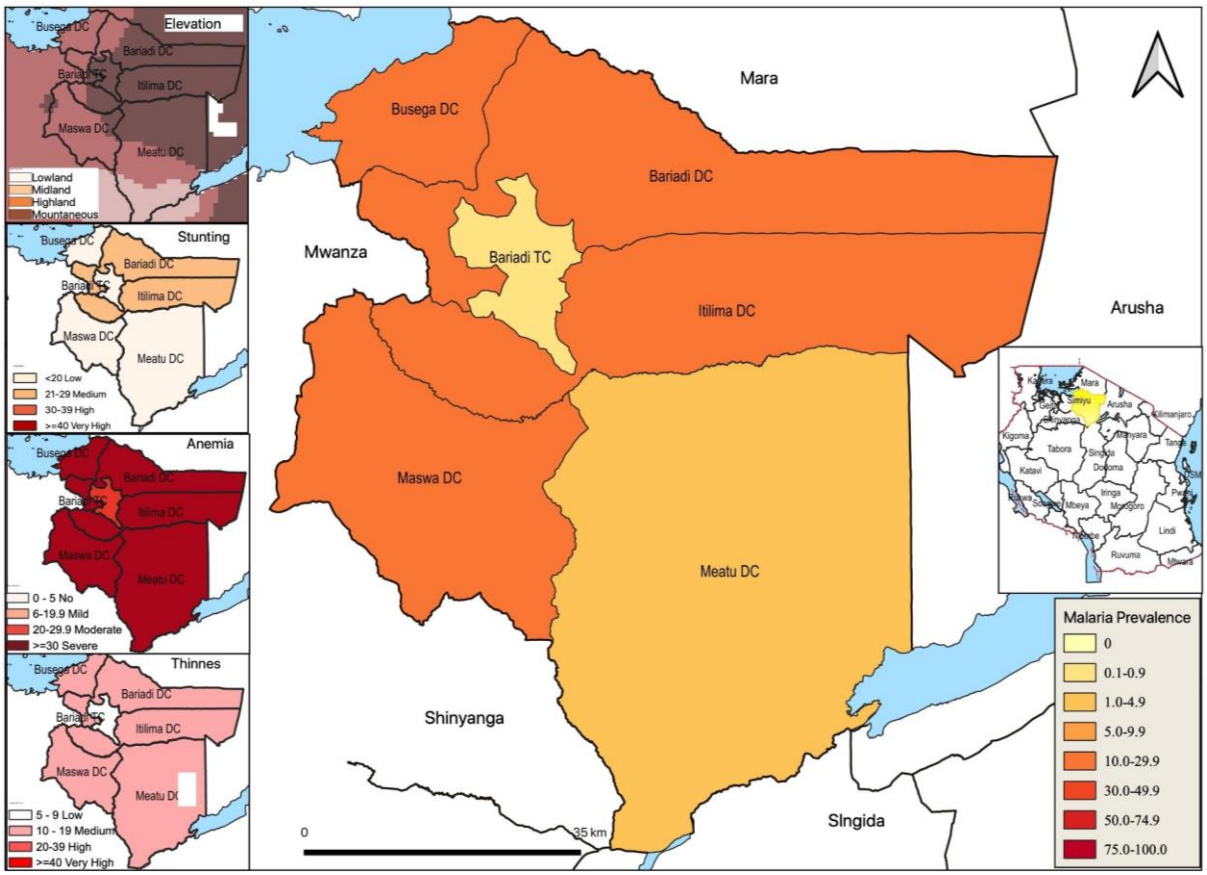


Figure 8-7. The 2019 SMNS Regional Profile Figure–Arusha

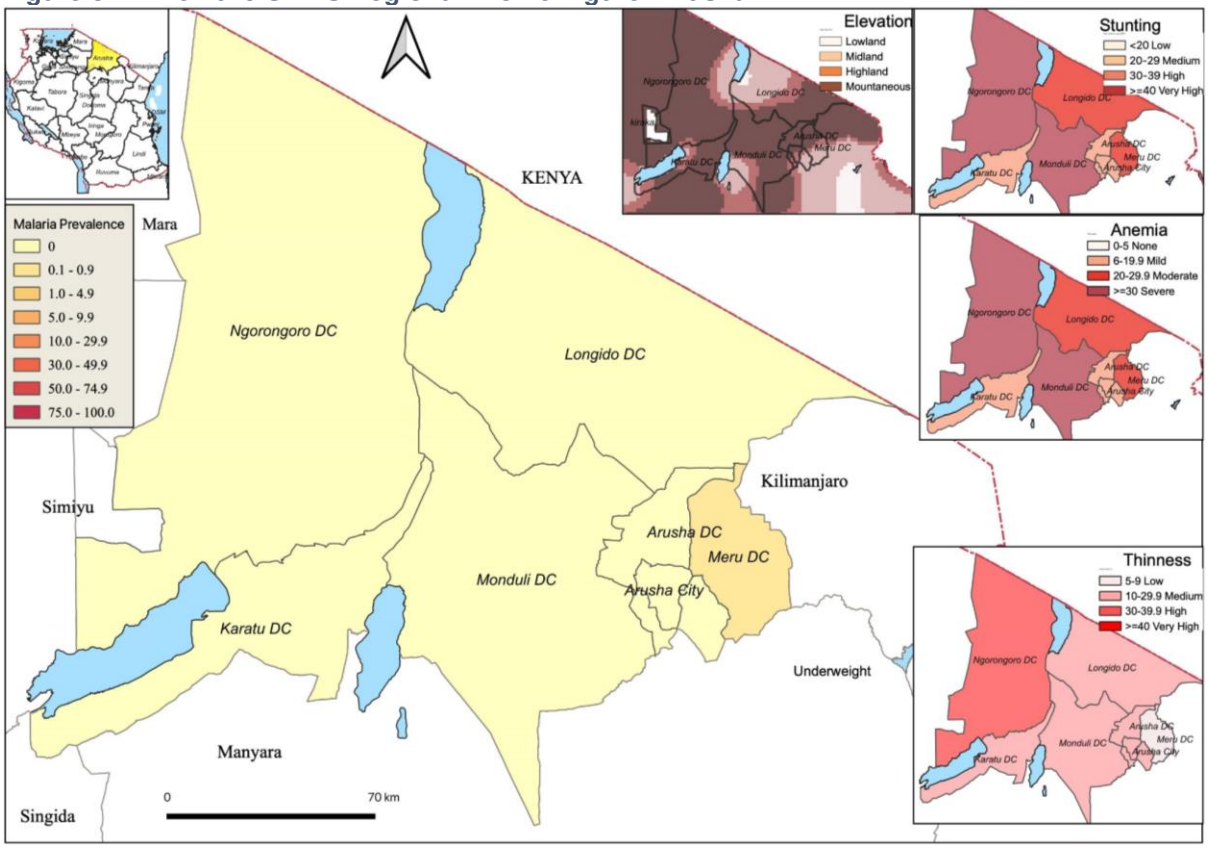


Figure 8-8. The 2019 SMNS Regional Profile–Mbeya

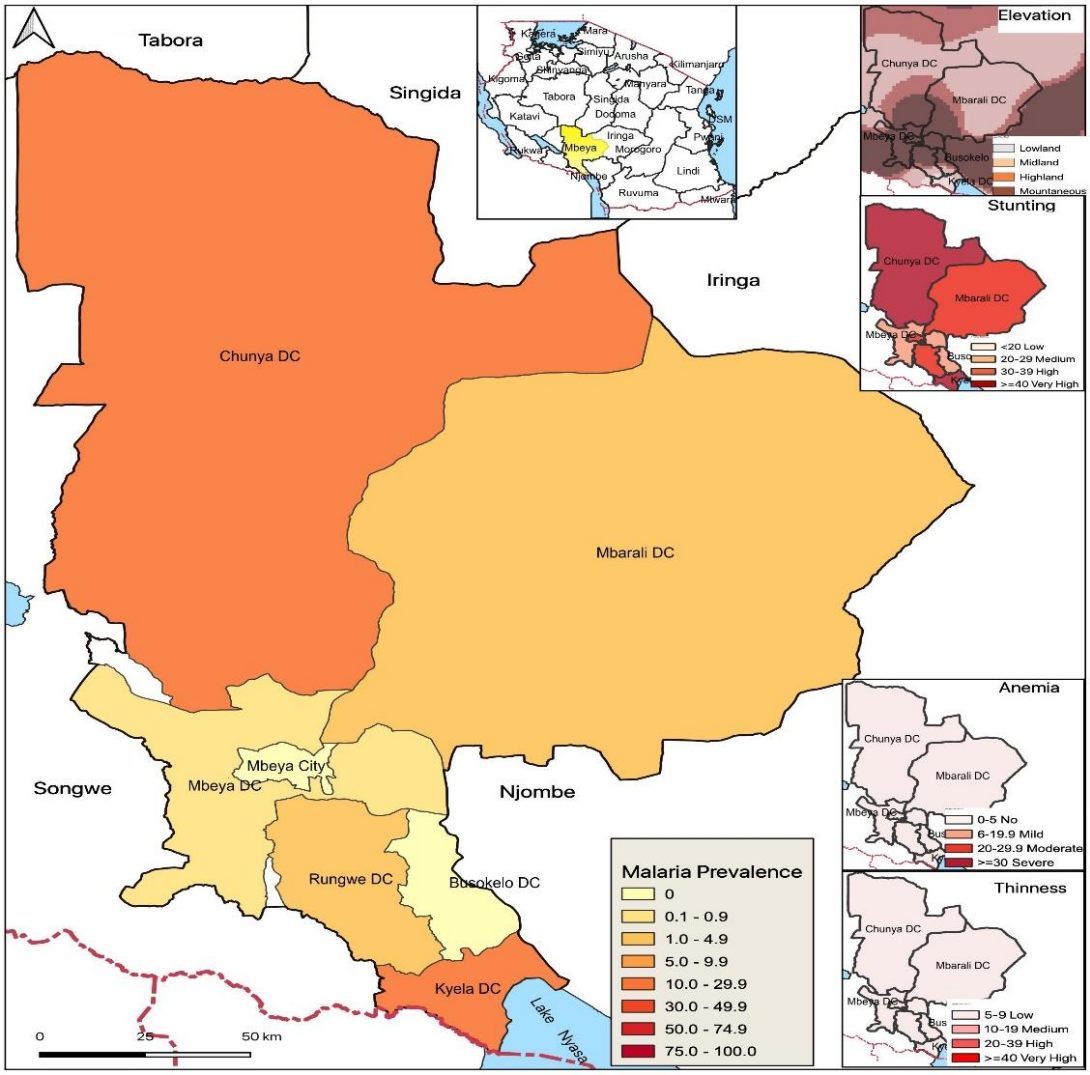


Figure 8-9. The 2019 SMNS Regional Profile–Dar es Salaam

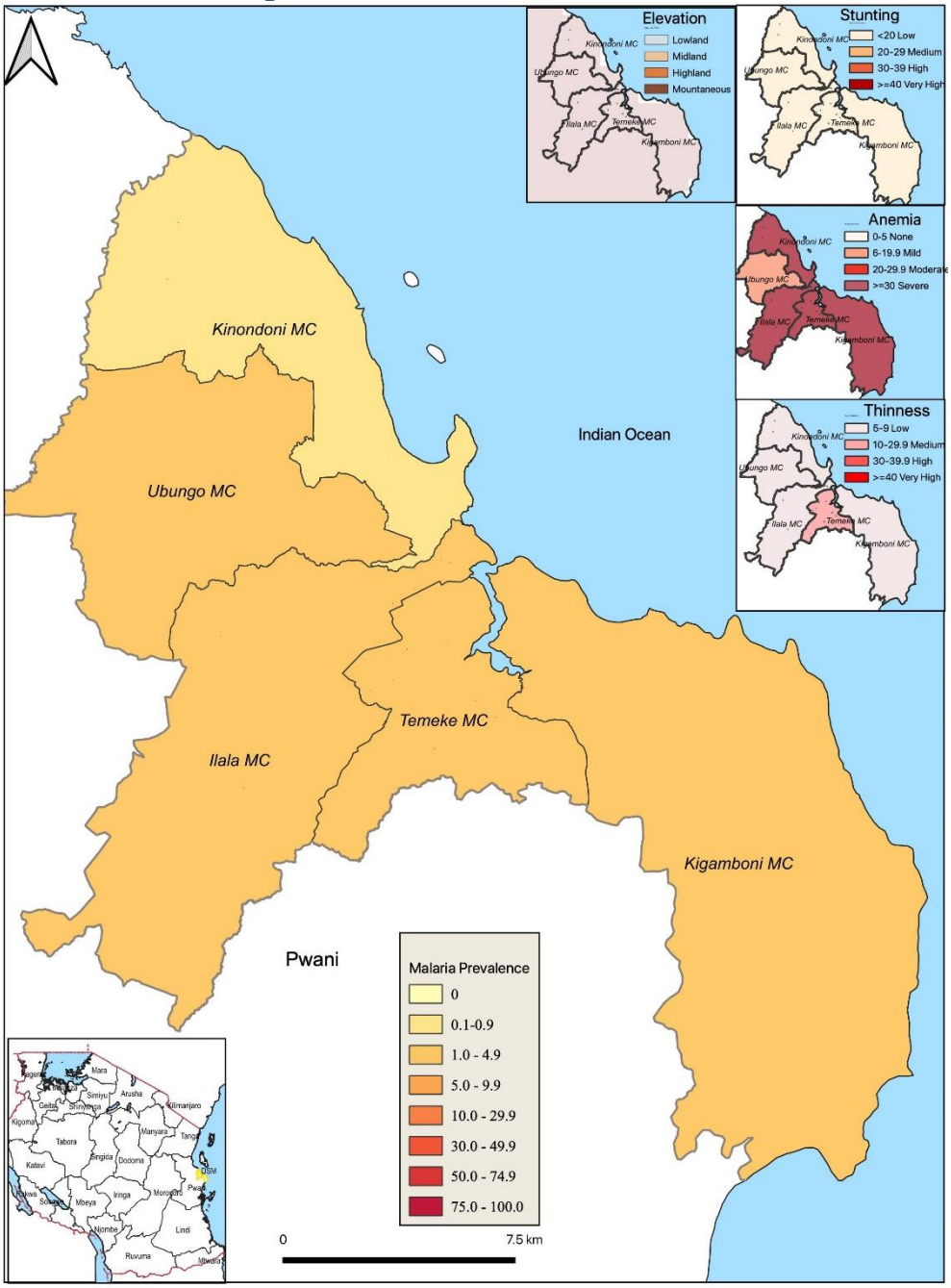


Figure 8-10. The 2019 SMNS Regional Profile–Dodoma

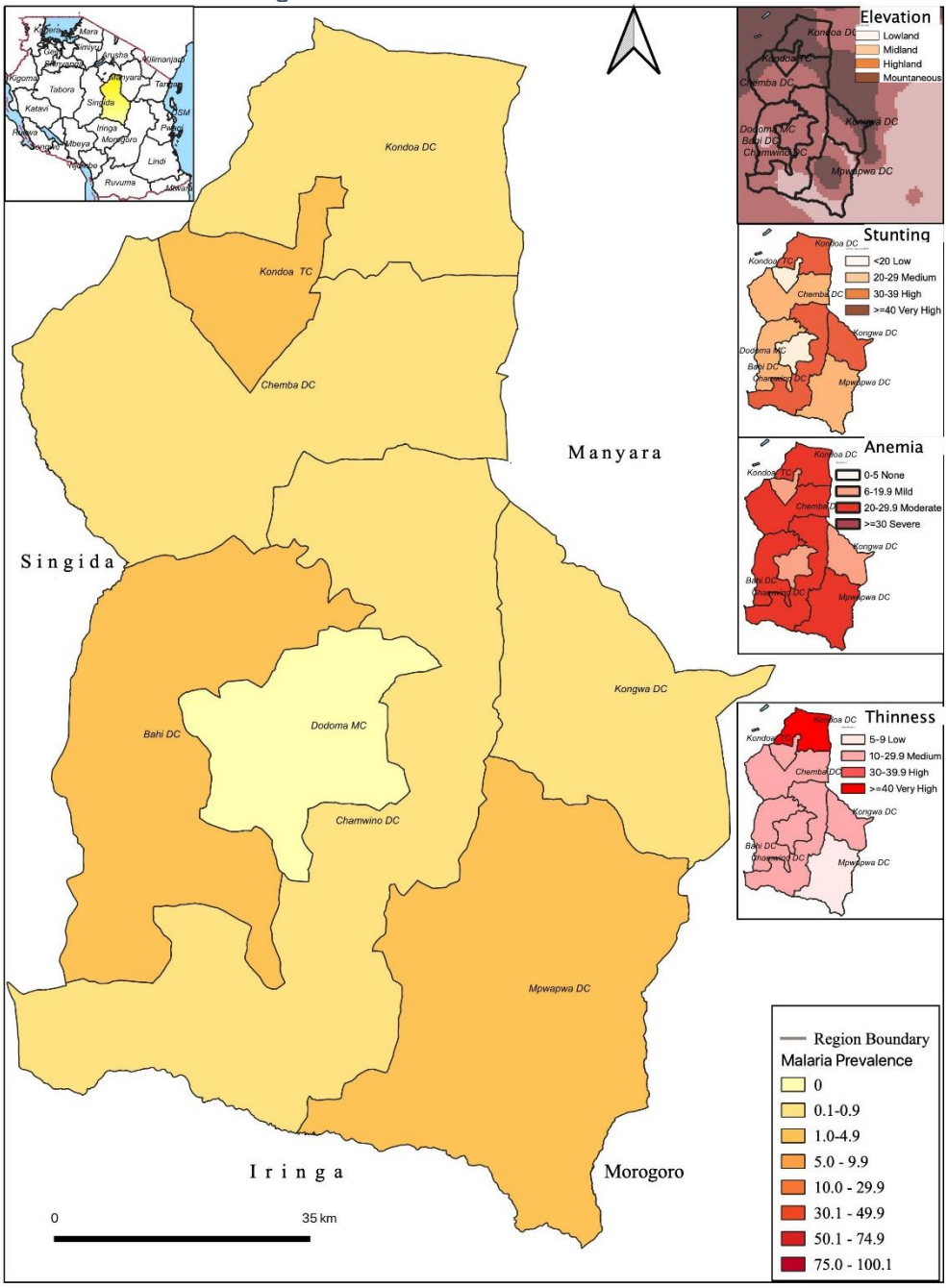


Figure 8-11. The 2019 SMNS Regional Profile–Iringa

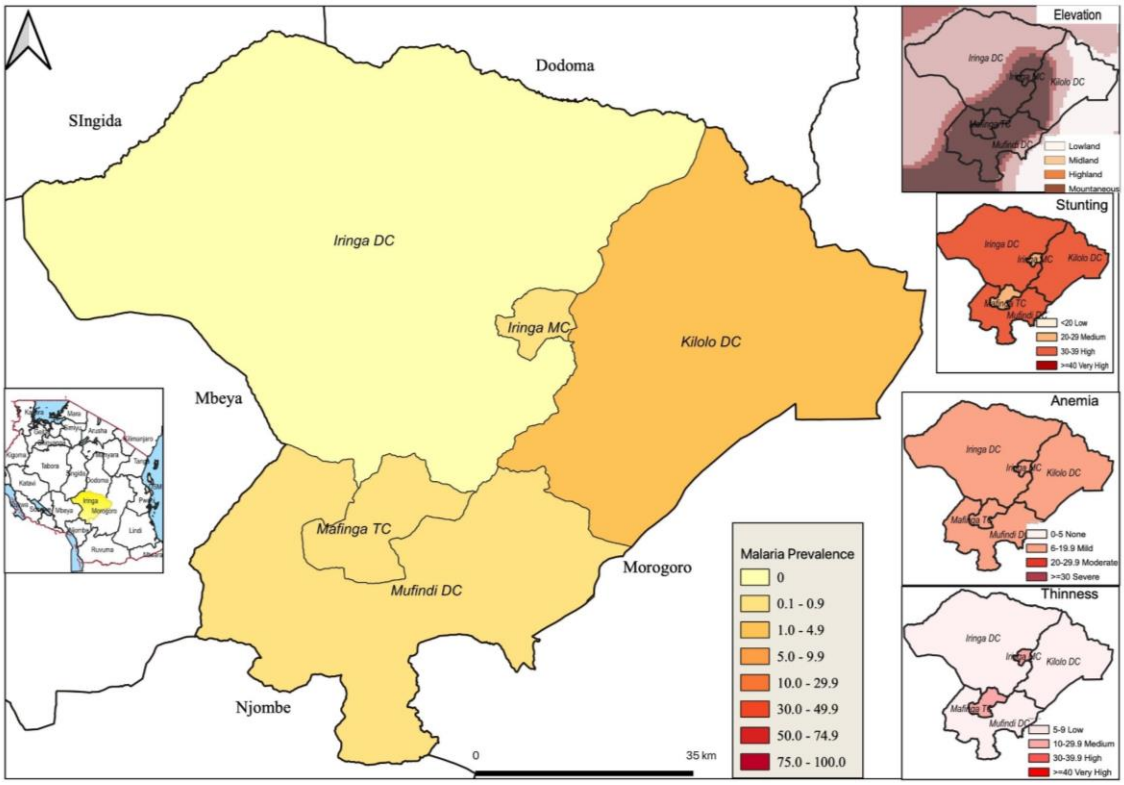


Figure 8-12. The 2019 SMNS Regional Profile–Lindi

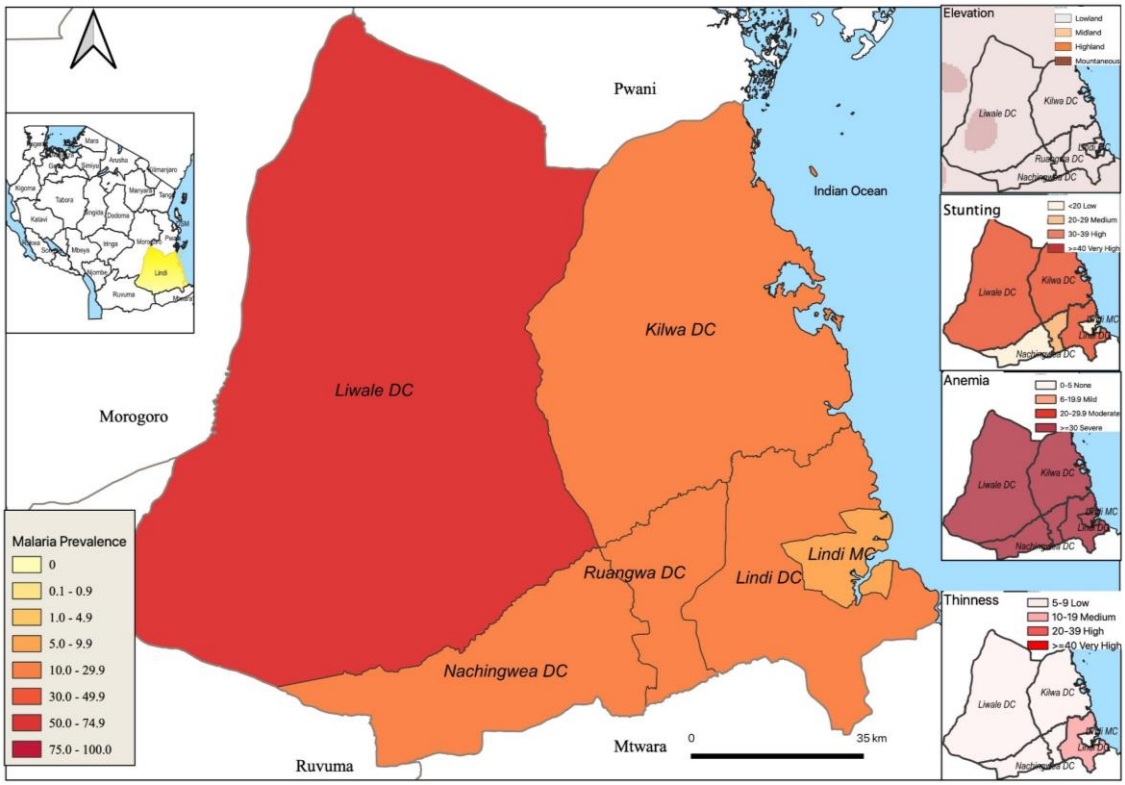


Figure 8-13. The 2019 SMNS Regional Profile–Kagera

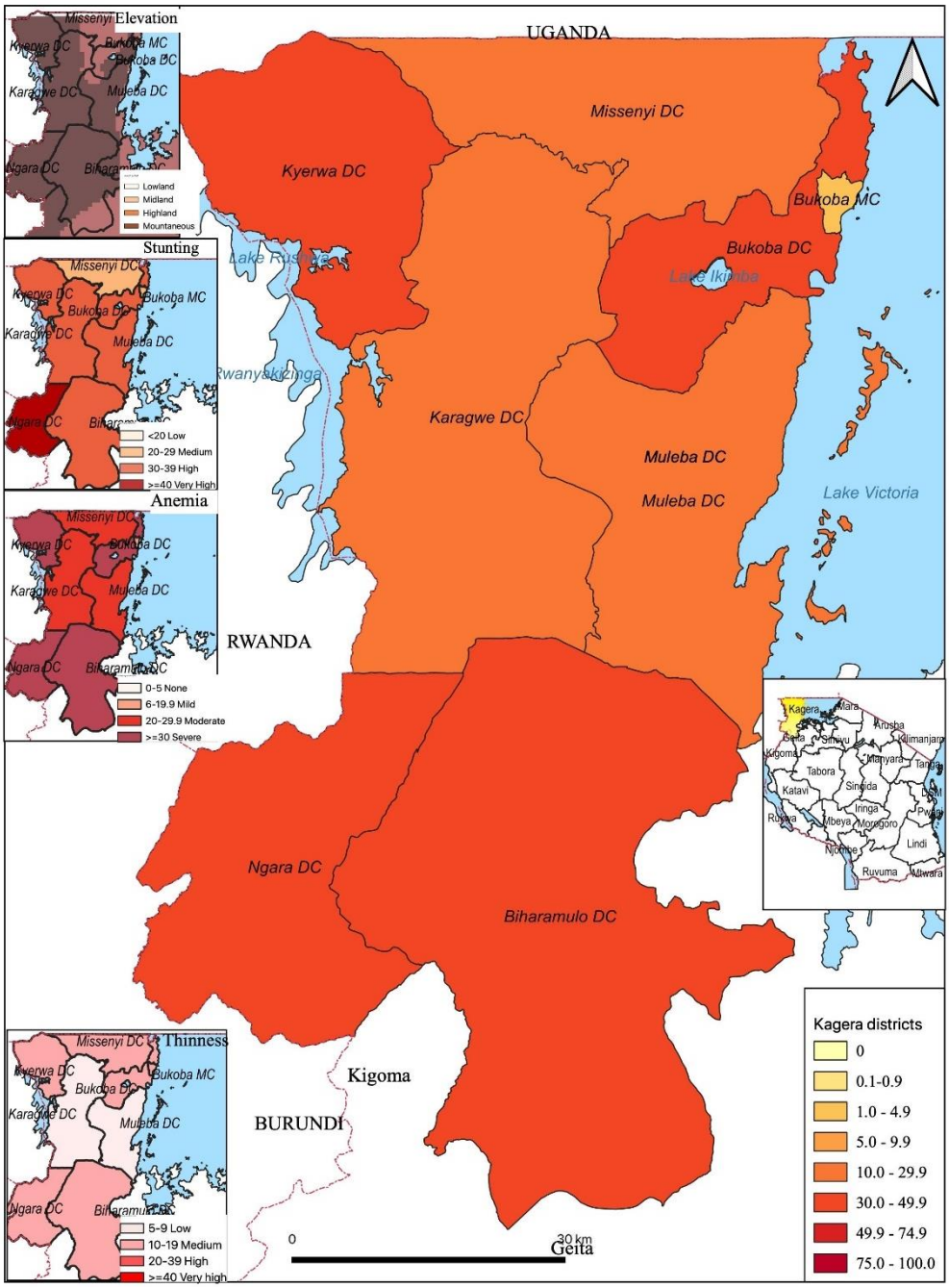


Figure 8-14. The 2019 SMNS Regional Profile–Morogoro

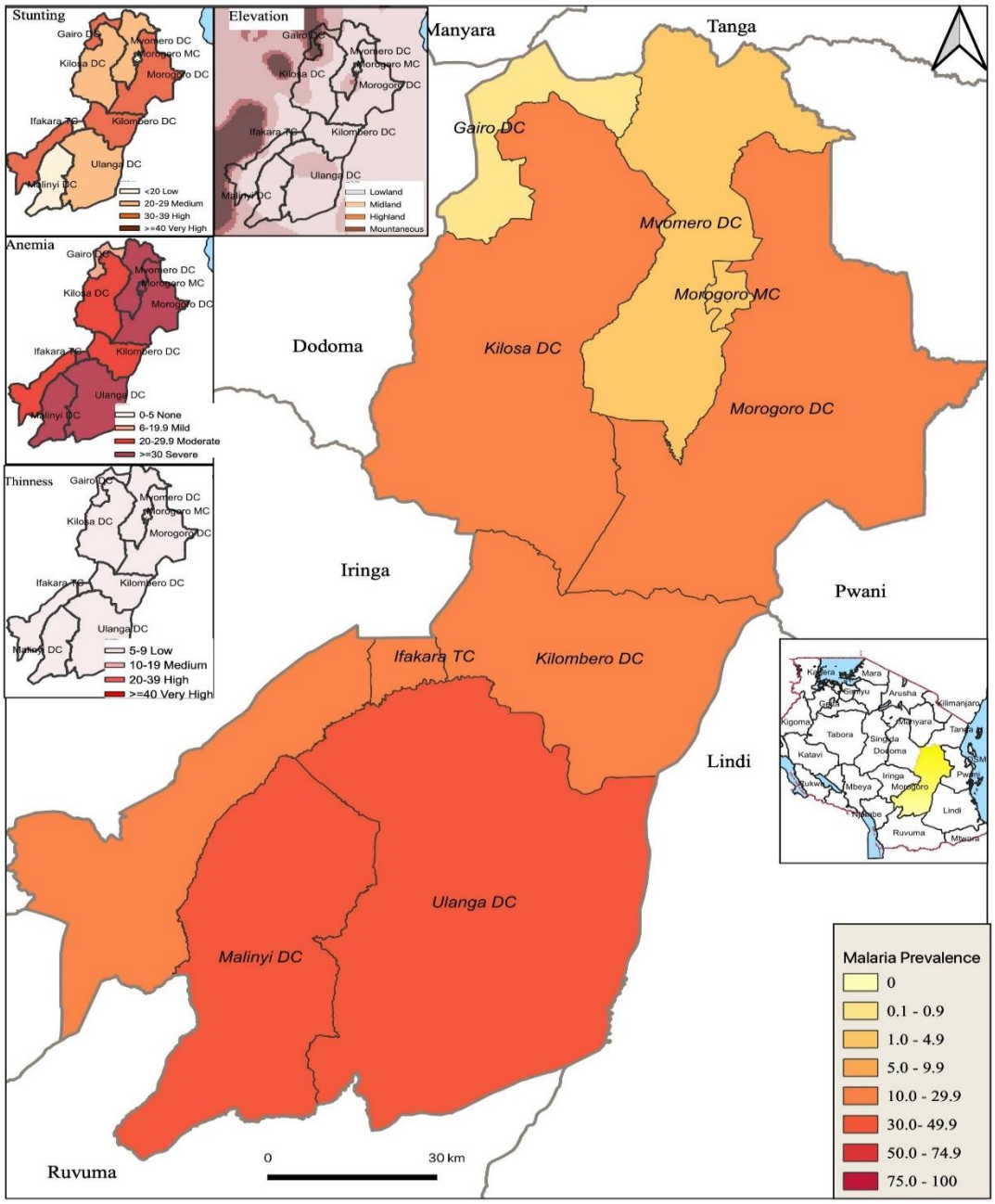


Figure 8-15. The 2019 SMNS Regional Profile–Mtwara

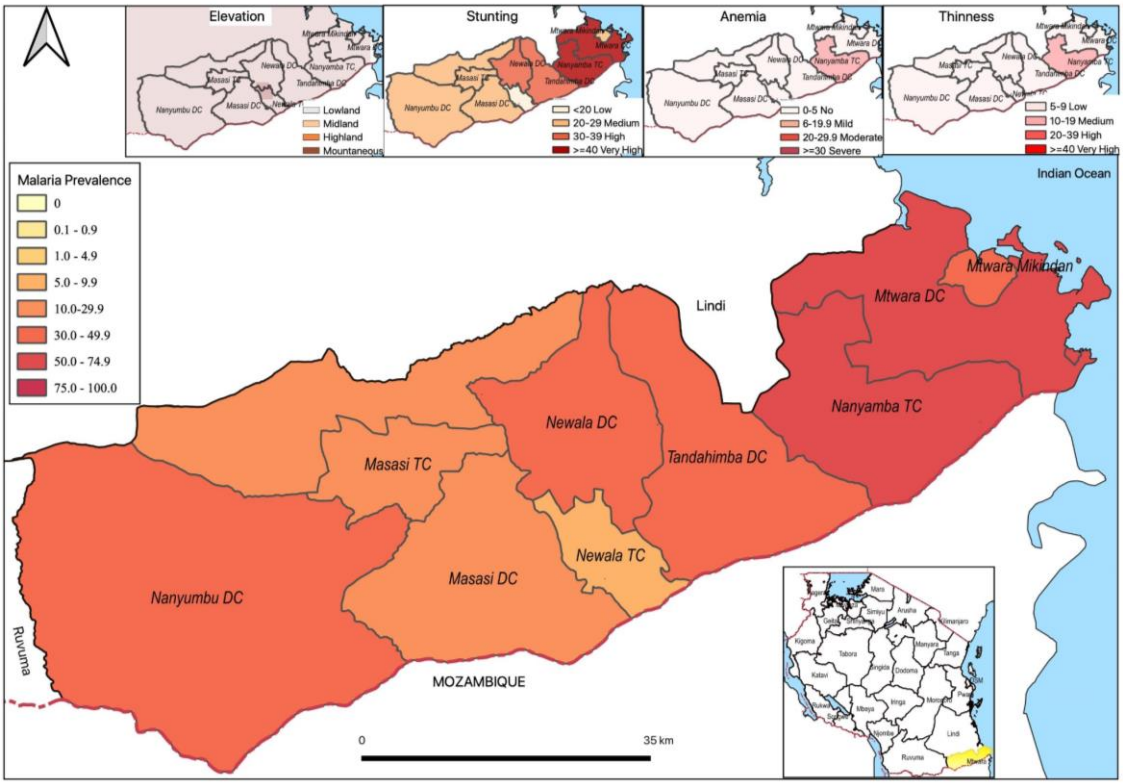


Figure 8-16. The 2019 SMNS Regional Profile–Rukwa

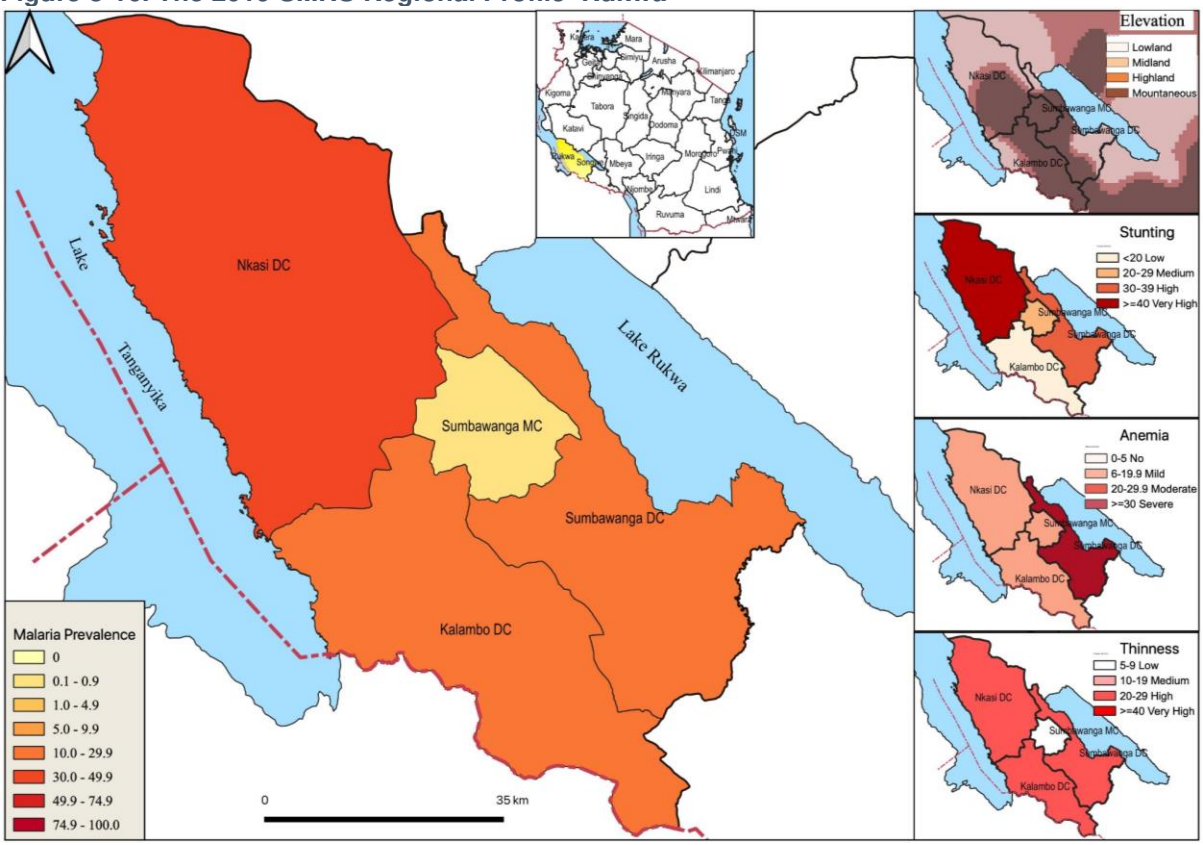


Figure 8-17. The 2019 SMNS Regional Profile–Pwani

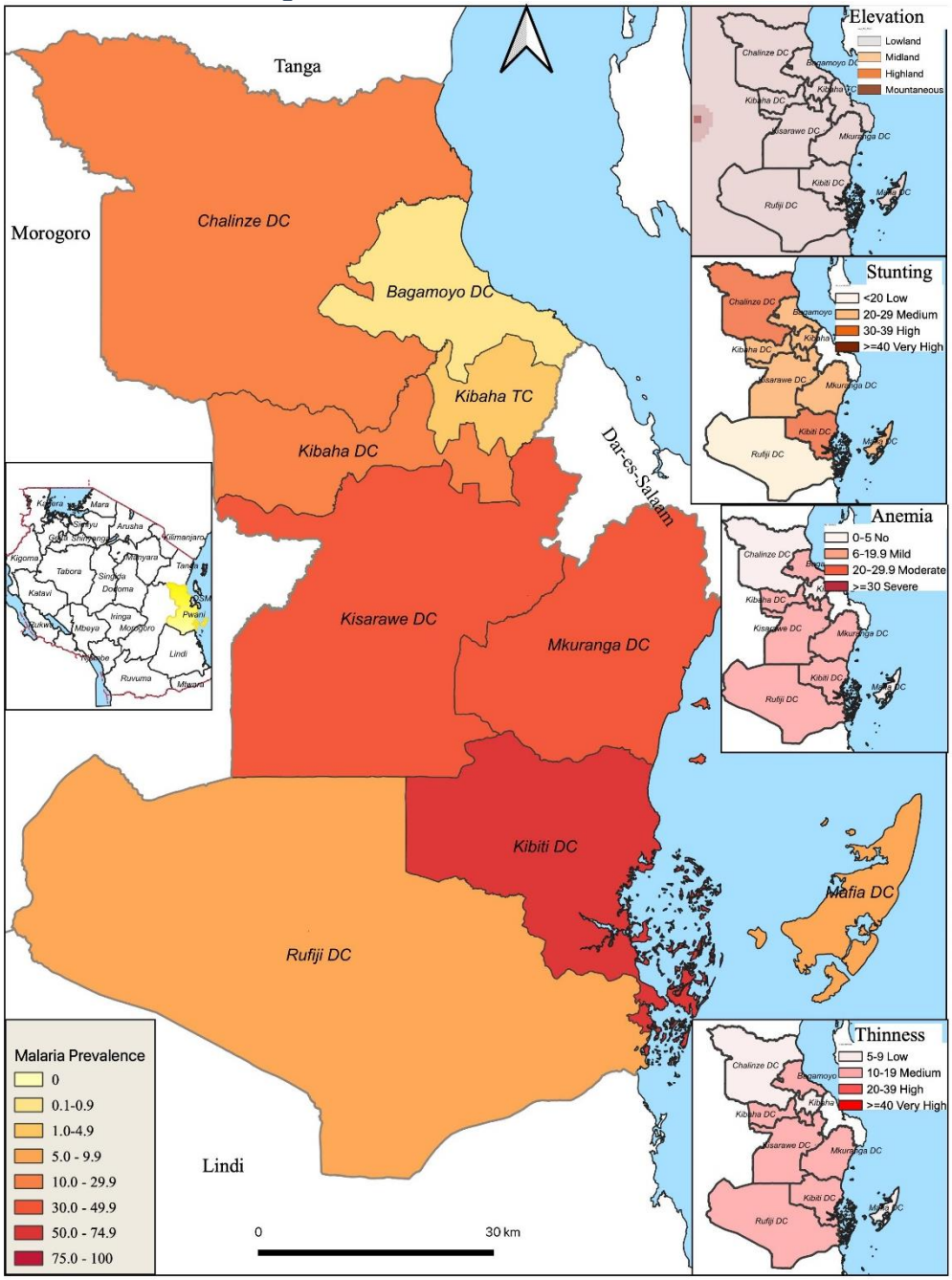


Figure 8-18. The 2019 SMNS Regional Profile–Ruvuma

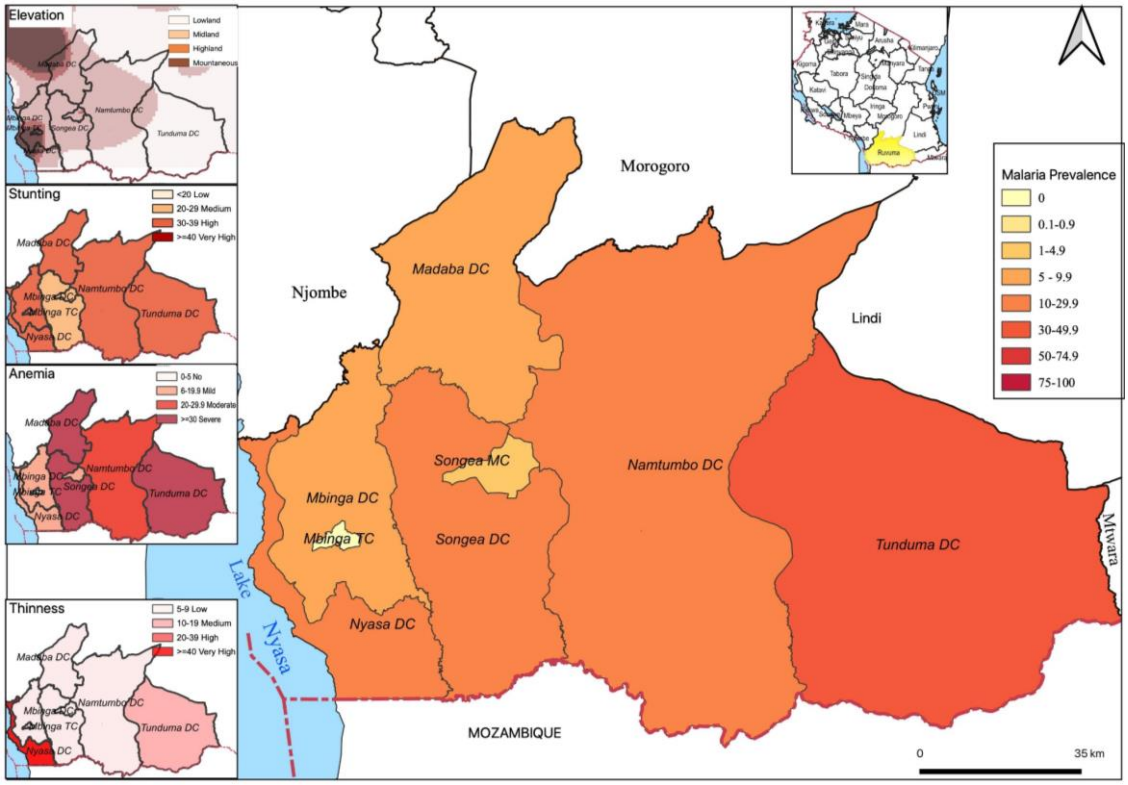


Figure 8-19. The 2019 SMNS Regional Profile–Tabora

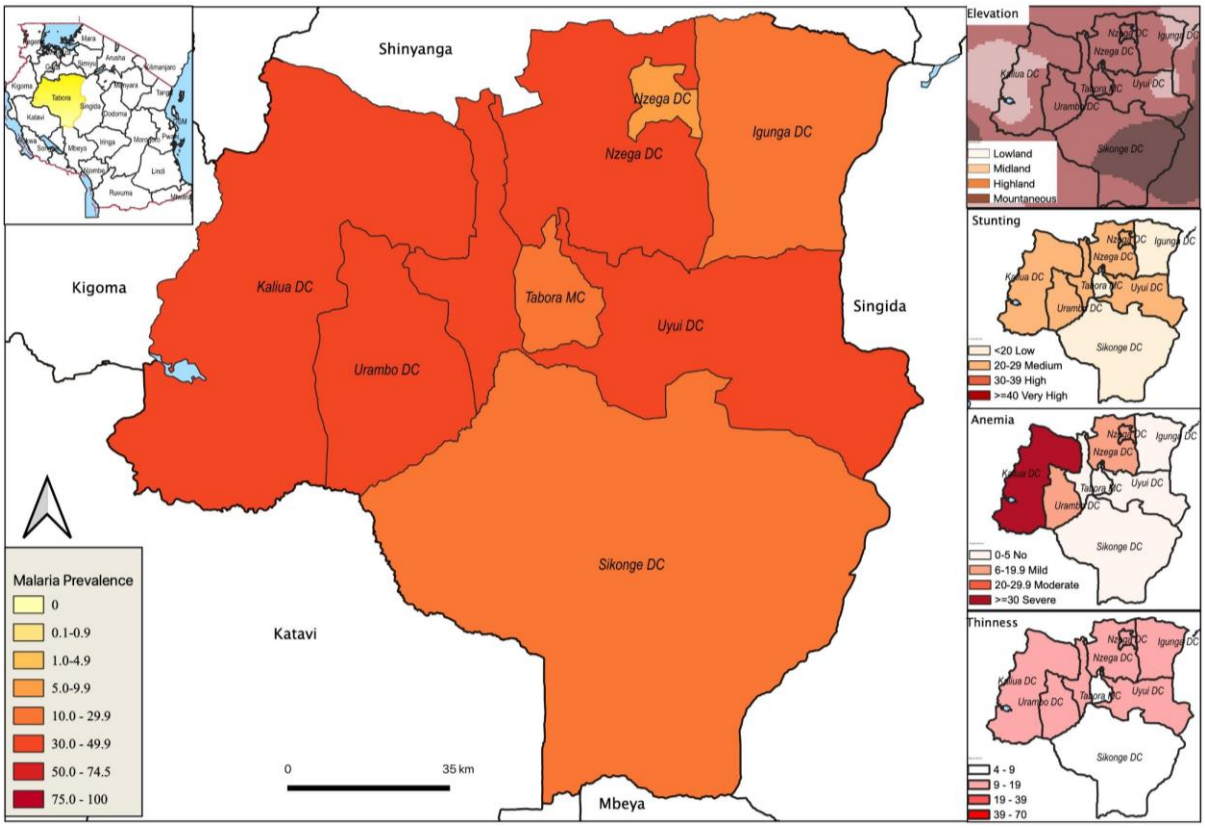


Figure 8-20. The 2019 SMNS Regional Profile–Tanga

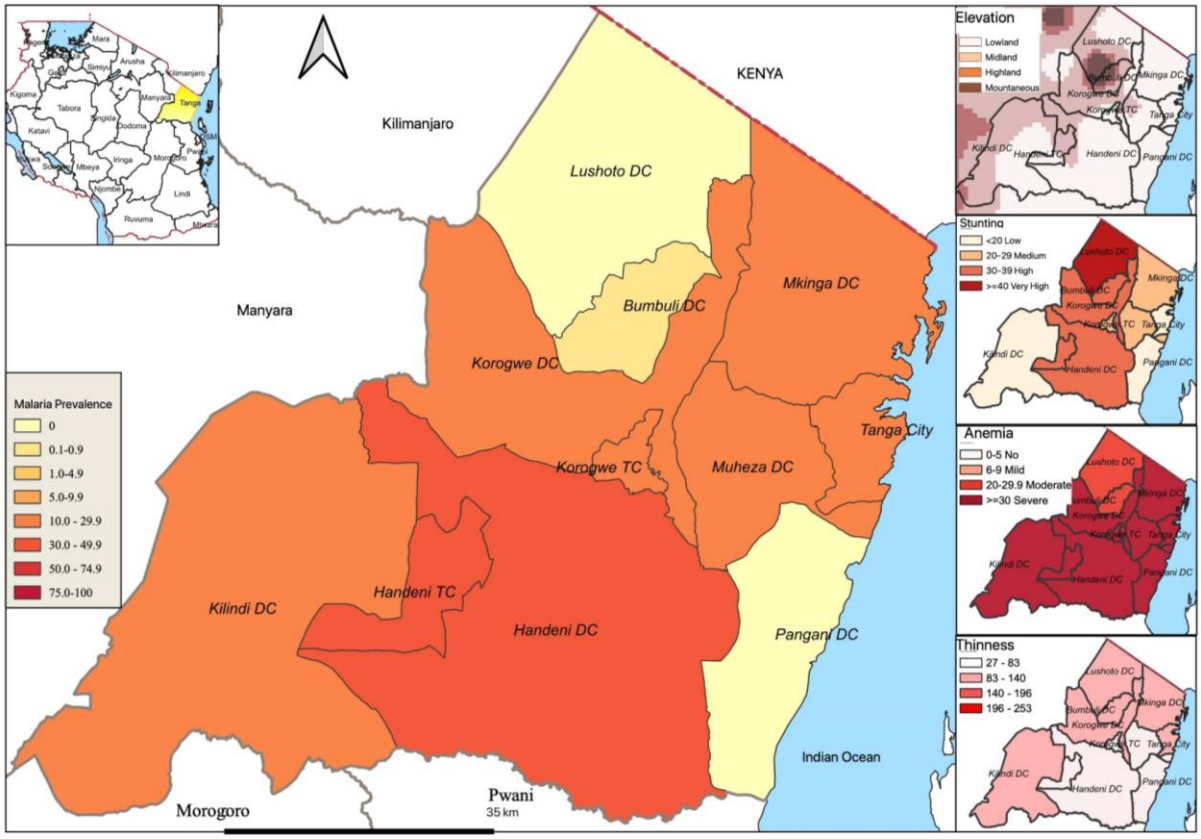


Figure 8-21. The 2019 SMNS Regional Profile–Kilimanjaro

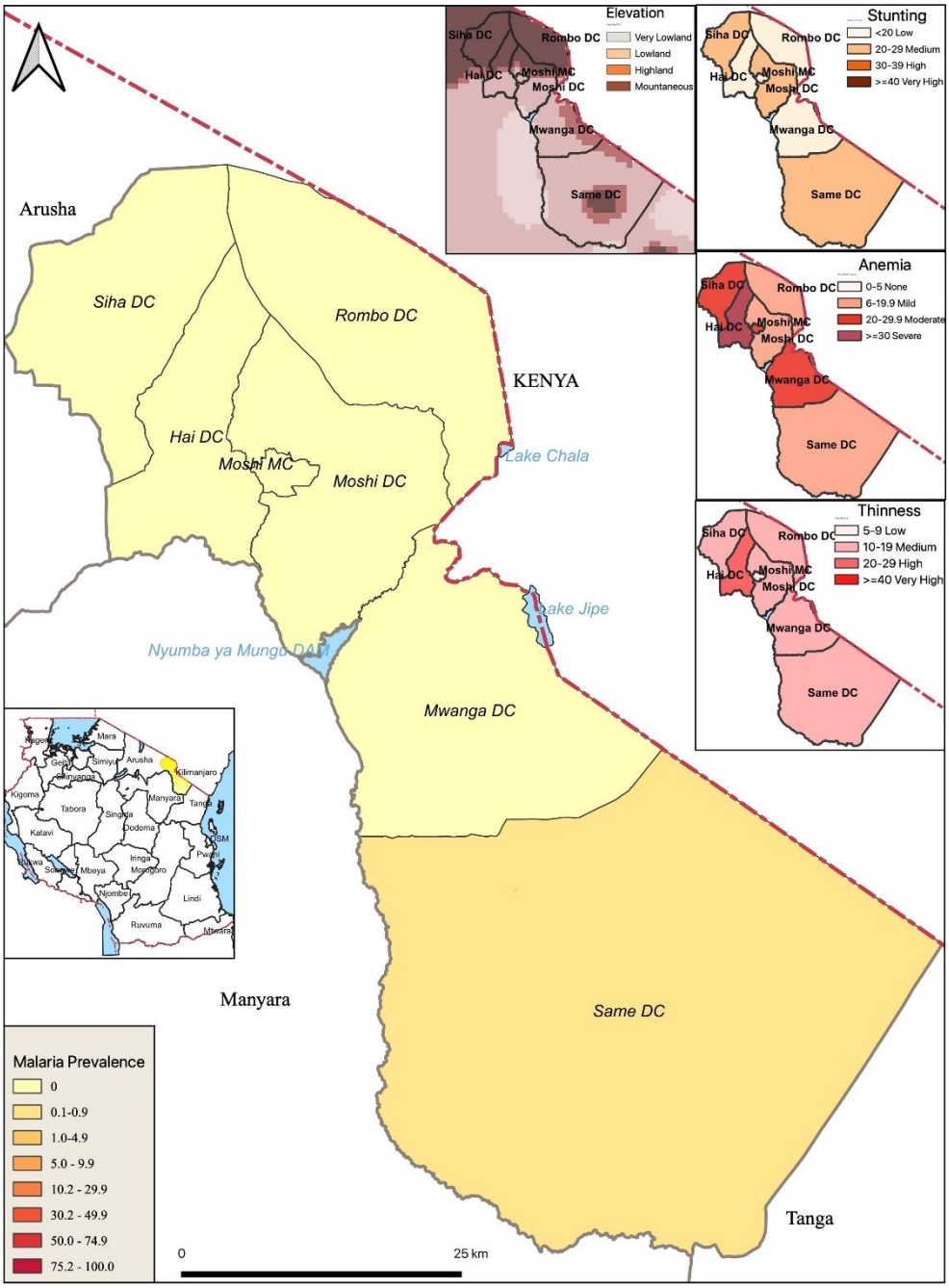


Figure 8-22. The 2019 SMNS Regional Profile–Songwe

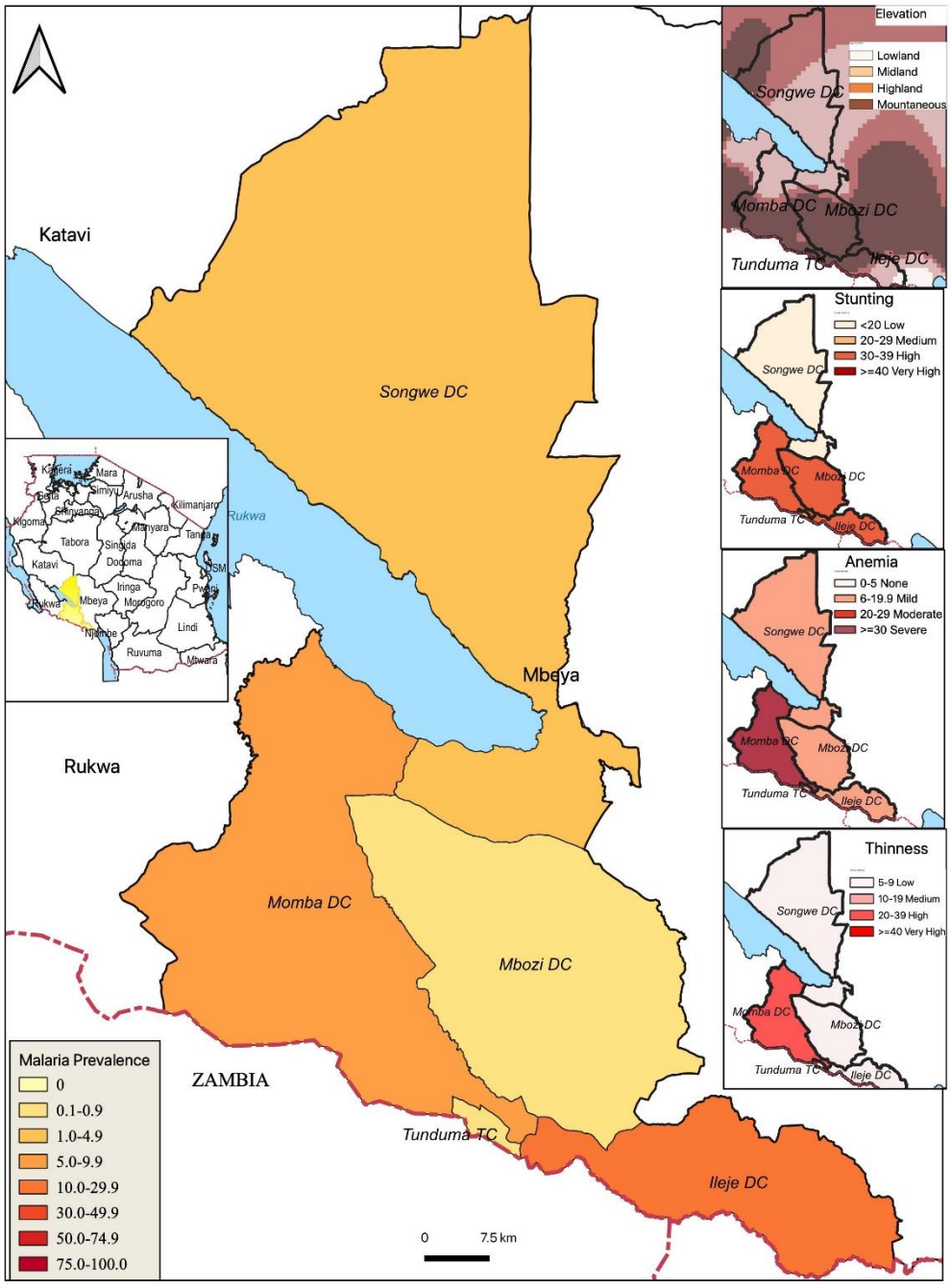


Figure 8-23. The 2019 SMNS Regional Profile–Shinyanga

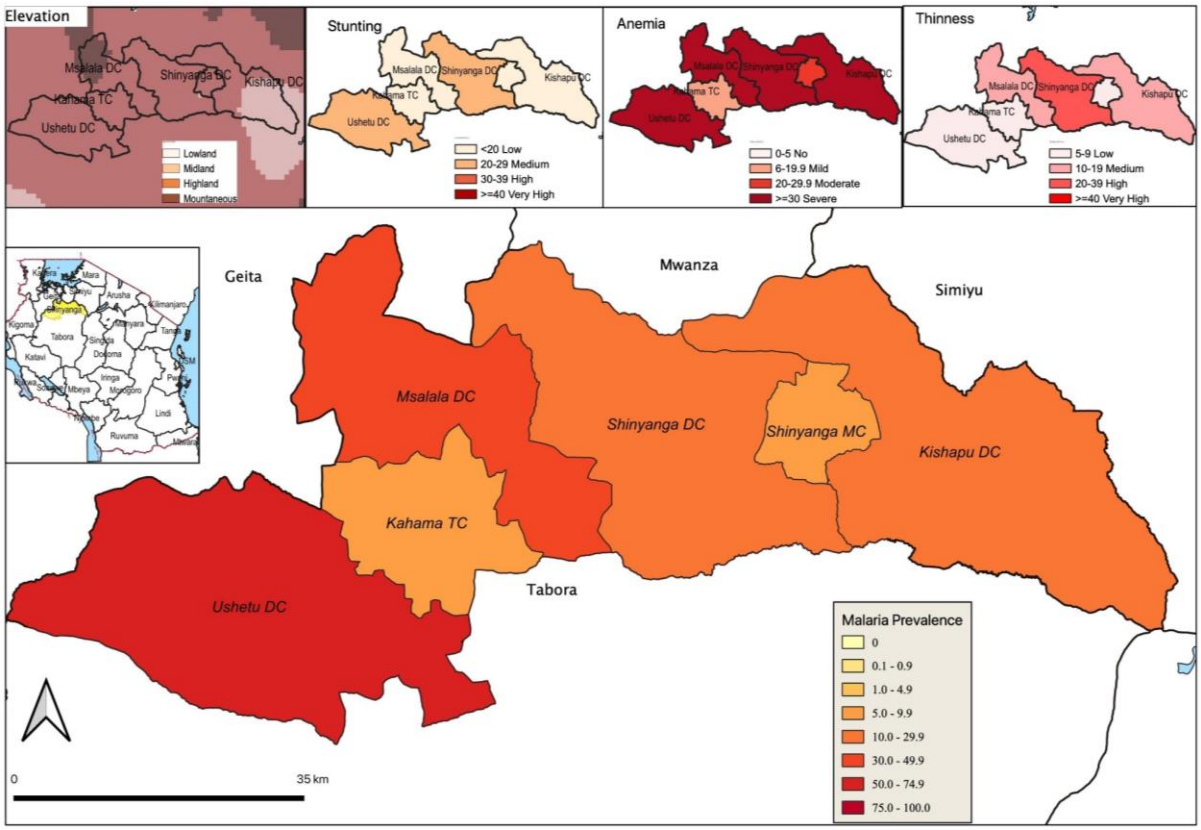


Figure 8-24. The 2019 SMNS Regional Profile–Katavi

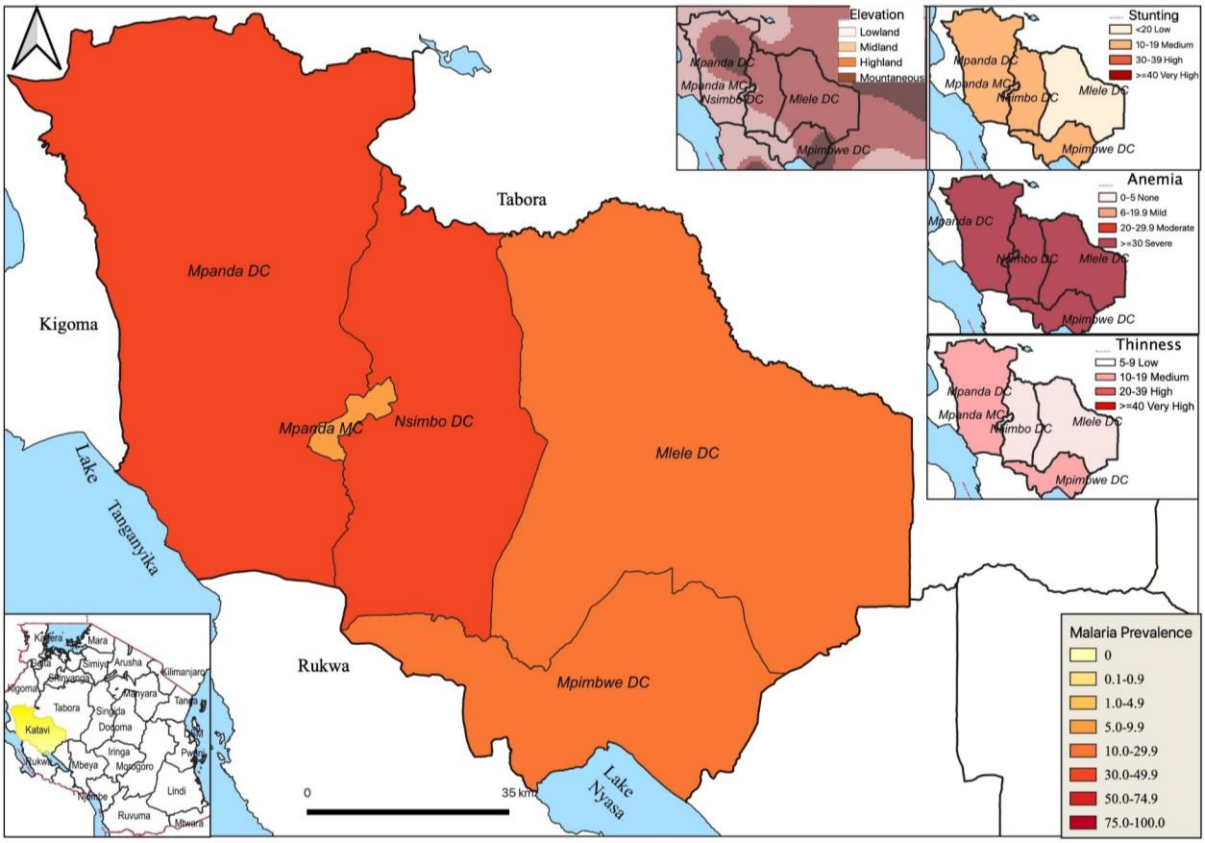


Figure 8-25. The 2019 SMNS Regional Profile–Kigoma

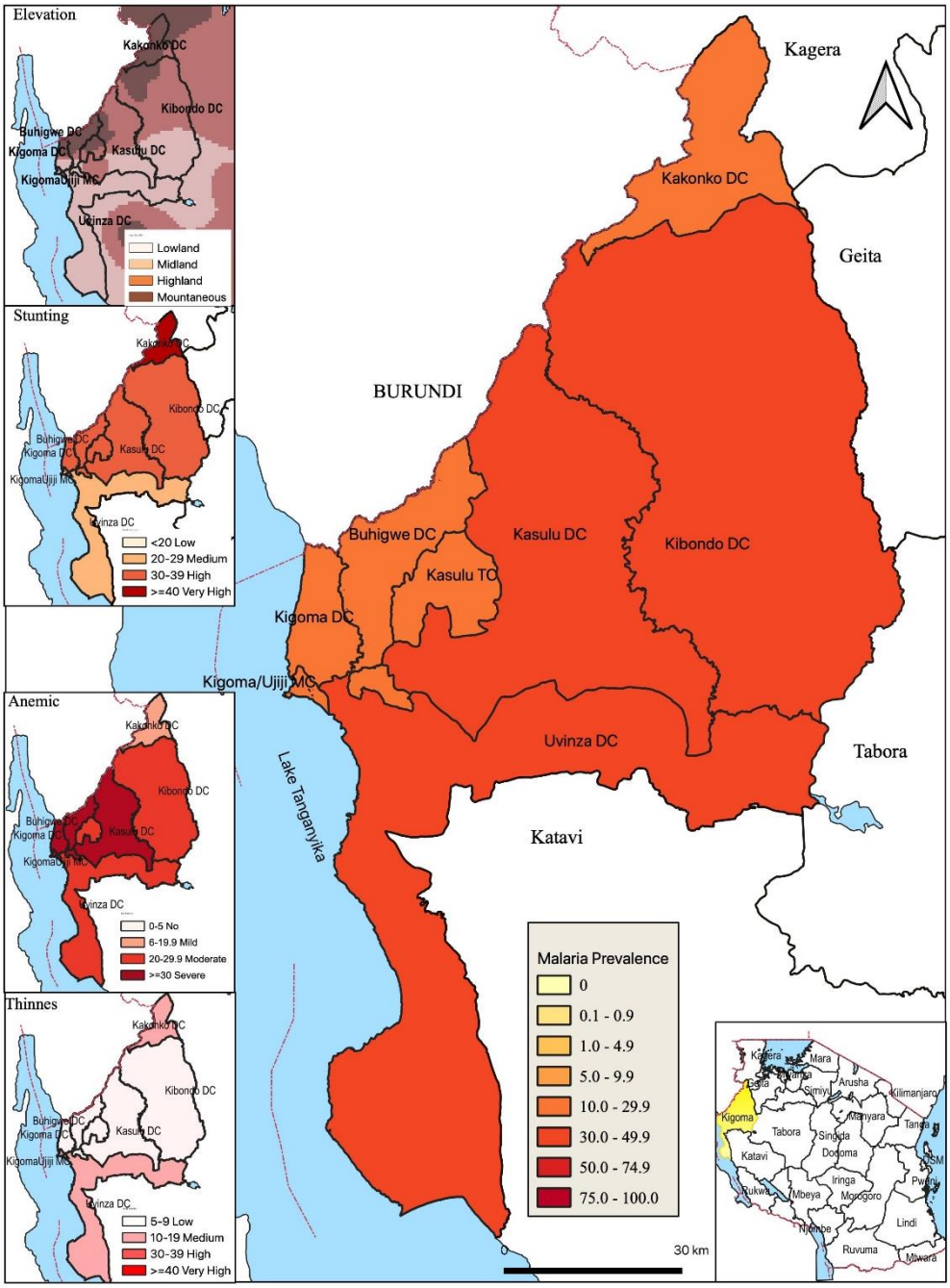
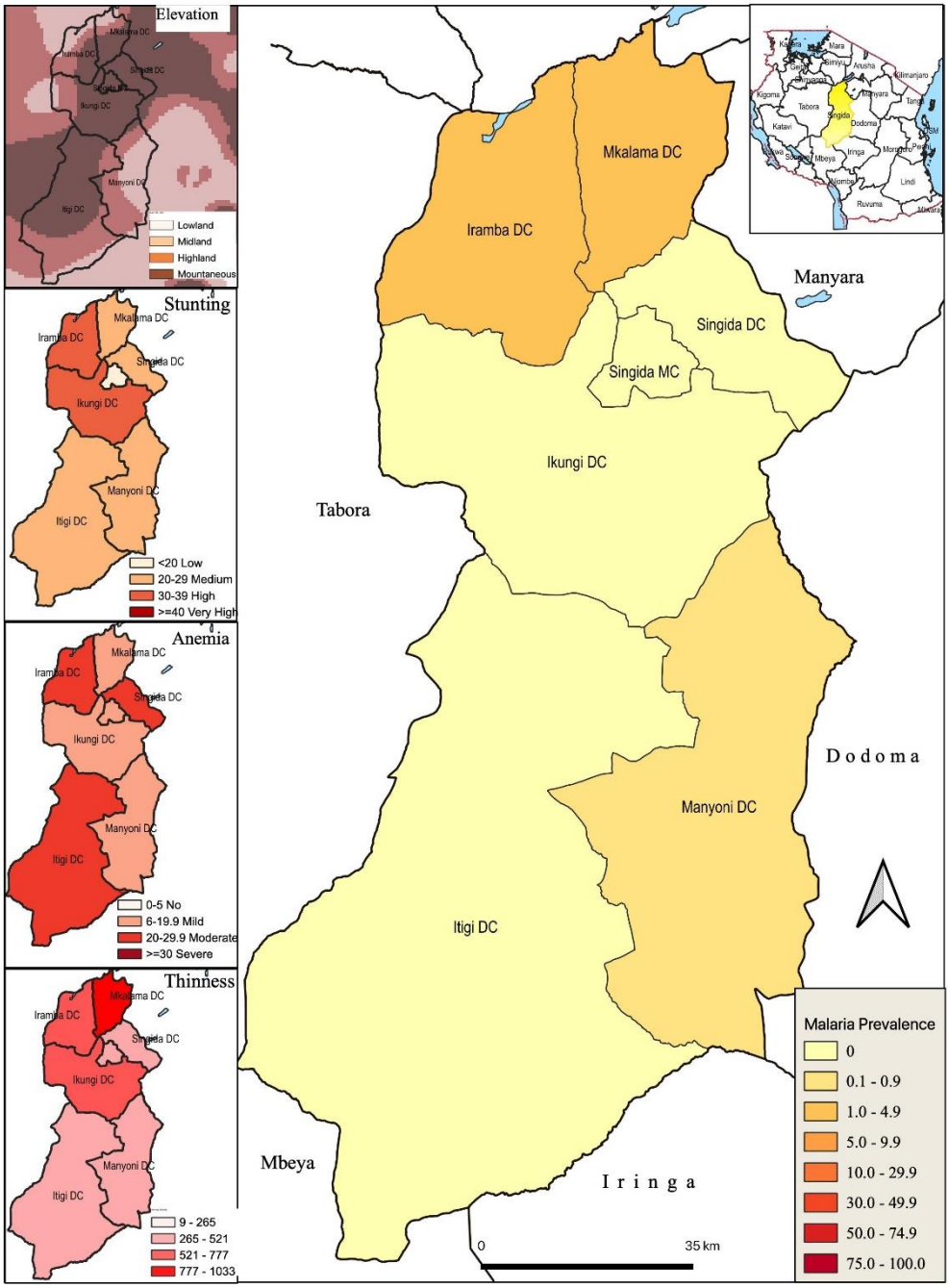


Figure 8-26. The 2019 SMNS Regional Profile–Singida



Annex 9. Data Management

Introduction

Soon after data collection for the School Malaria and Nutrition Survey (SMNS), the National Malaria Control Program (NMCP) organized a working session for three weeks to process and clean the data. This activity also involved sorting of dried blood spots (DBSs). The event took place in Dodoma at the Regional Referral Hospital venues. The SMNS facilitators identified a team of Data Entry Clerks who were selected based on their professional backgrounds, particularly as graduates in statistics, information technology, and teaching.

This activity involved sorting data, entering data, importing data from the server, reviewing data, checking for consistencies, determining duplicates, merging data sets and conducting data cleaning.

Data Processing

Data sorting

This involved review and organization of DBS, Quality Assurance Forms, and data collection tools according to their respective regions and councils.

Orientation of Data Entry Clerks in Dodoma Referral Regional Hospital Conference Facility

Data entry

A template for data entry in Epi-data software version 3.1 was prepared in a restriction manner to prevent erroneous values and typing errors. Identified Data Entry Clerks were oriented on the template, overview of the survey, nature of the data, data collection tools used, variables collected, and code used. Confidentiality of the results were emphasized. The data entry exercise was monitored and guided by Data Entry Supervisors for the entire three weeks. Data Entry Clerks were given an opportunity to ask questions/express concerns for clarification, and emphasis was given to ensure the template and questionnaires were understood and clear.

Teams were advised to conduct regular self-checks for their own performance, continuously "save" their work, and ask if something was unclear or any ambiguity was experienced.

Issues observed during the data entry exercise were identified and documented as shown in **Table 9-1**.

Table 9-1. Data entry challenges and how they were solved

Variable Name	Challenges	Explanation/What Was Done
School name	In some regions, school names were incorrectly written (e.g., written as a ward name or written in a short form).	The master sheet of school names was used to counter-check the correct names of the schools.
School identification (ID)	Some school IDs were incorrectly written (e.g., the first initial letter written was the council instead of the region, some used "msimbo wa shule" [school ID] provided by the government rather than the one provided by the project).	The correct ID was written in correct form by counterchecking with the respective region and council name. For schools that used "msimbo wa shule," the same numbers were maintained.
Pupil ID	The same pupil's ID was repeated to more than one pupil in Tool 2.	Verification was done using Tool 3 that was submitted through the tablets in electronic format.

Variable Name	Challenges	Explanation/What Was Done
	Some IDs were incorrectly written (e.g., wrong format).	Verification was done using Tool 3 that was submitted through the tablets and master sheet of school names.
Date of testing	In some pages of Tool 2 in the same school, date of testing was written in the first page only.	The same date that was written on the first page was reflected as the same in the rest of the tool.
	Some schools specifically did not indicate date of testing.	The missing date was copied from Tool 3 that was submitted through the tablets.
Pupil name	Some pupils' name could not be read properly in Tool 2.	Verification was done using Tool 3 that was submitted through the tablets.
Malaria test	Interpretation of malaria test results was not recorded in the provided columns for some pupils in Tool 2.	Cross checking with the Control, P.f and Pan columns were used to write the interpretation of the result.

Data merging

Both data submitted through mobile application and the ones entered by Data Entry Clerks were exported to Stata software version 14 and then merged for quality checks and analysis.

Data quality check

Data quality checks were carried out by supervisors to assess the quality of entered data and any inconsistency issues. This was achieved by selecting 20% of entered data from each Data Entry Clerk/survey team from each council through a random approach. This approach was done for each council and school. Sampled data for quality checks were compared with the ones in the paper forms.

Data cleaning and DBS sorting, organizing, and repacking

Data cleaning

Data were screened for duplicates, completeness, misspelling, and invalid or inconsistent values. Suspicious values were inspected and compared with paper forms or raw data in the server that were submitted electronically. In addition, teams formulated variables for different sections of the data set focusing on the variable names, format, labels, etc. Further, the teams created codes, including the one for non-response to ensure the data set was ready for analysis.

Some of the challenges encountered during data cleaning and how they were addressed are summarized in **Table 9-2** and **Table 9-3.**

Table 9-2. Overall data cleaning and coding challenges and solutions

No.	Challenge	Variable/Tool	Solution
1	Typos of a school name across Tools 2 and 3	School name Tool 2 and Tool 3	Re-naming was performed according to the original name as agreed earlier with council teams to ensure the same name for both Tool 2 and Tool 3. This was done in line with respective region name, council name, ward name, school IDs, and pupil name.
2	Nonconforming school IDs format (e.g., school registration number as school IDs [MB/Mm/01 vs. EM 3997])	School IDs Tool 3	Stata command was prepared to replace the wrong IDs with the IDs previously prepared for the survey. Special attention and speculation were done to ensure same pupil was given the right ID.

No.	Challenge	Variable/Tool	Solution
3	Missing school name in the data set	School name Tool 3	Solved by comparing the similarities of other variables from Tool 2 and Tool 3.
4	Extra number of pupils in some schools attributed by incorrect recording of some pupils' data that were entered during testing	School name, pupils' name Tool 3	Identifying the test records, comparing pupils' names and IDs, and dropping non-paired.
5	Missing variable labels	Variables in Tool 2 and Tool 3	Re-labeled variables.
6	Ungrouped multiple response questions	Tool 3	Grouped multiple response variables ready for analysis.
7	Misplaced pupils' records from one school to another	Tools 2 and 3	Checking pupils' names and region, council, ward, or school ID.
8	Non-uniform school IDs data collected from the field	Tool 1 and geo-locations database	Linked school data (Tool 1) with geo-location data from field using school IDs.
9	Multiple entries of same respondent by different entrants using Epi-data	Tool 2	In this case, for data entered in the same format for all variables, the case was termed as duplicate.
10	Categorization of sugar sweetened beverages	Some variables could not be coded due to the missing data in that group category	The group was excluded during coding.

Table 9-3. Summary of schools with discrepancy in Tools 2 and 3

Region	Council	School Name	Tool 2 Data Set	Tool 3 Data Set	Hard Copies for Reference
Dodoma		Mbori	Missing	Available	Verified in the hard copies
Kigoma		Nyarugusu	Missing	Available	NA
Iringa		Ivambinungwi	Available	Missing	NA
		Lupalama B	91 Cases	124 Cases	NA
Kagera	Muleba	Muleba	122 Cases	136 Cases	NA
Kilimanjaro		Kavambughu	90 Cases	106 Cases	NA
		Yamba	Missing	Available	Hardcopies for Tool 2 are missing

DBS sorting, organizing, and repacking

The laboratory team worked on collected filter papers from the 26 regions of Mainland Tanzania. A total of 67,097 samples were sorted and arranged in serial order. In addition, a series of tasks were carried out, including identification of missing numbers and duplicates, verification of total DBSs expected according to Tool 2, separation of DBSs with respect to positive and negative malaria test results, and DBS labeling and repacking. Four councils from two regions out of all 26 regions and 184 councils had incomplete DBS samples.

The name of the councils and their respective number of schools missing (in parentheses) were Chunya (2), Mbeya DC (3), Kiteto (6), Mbulu DC (1), Sumbawanga DC (2), Misenyi (1) **(Table 9-4).**

Sorting, organizing, and repacking of obtained DBSs

Table 9-4. DBS organization and repacking

No.	Region	School	Total Samples	Status	Reason
1	Arusha	32	3,422	Done	NA
2	Mtwara	19	1,401	Done	NA
3	Katavi	10	818	Done	NA
4	Iringa	15	1,551	Done	NA
5	Tabora	31	3,162	Done	NA
6	Njombe	13	1,173	Done	NA
7	Ruvuma	22	1,866	Done	NA
8	Lindi	12	1,109	Done	NA
9	Mara	26	2,573	Done	NA
10	Dodoma	31	2,977	Done	NA
11	Mwanza	37	3,912	Done	NA
12	Geita	21	2,128	Done	NA
13	Shinyanga	19	1,991	Done	NA
14	Morogoro	31	3,334	Done	NA
15	Tanga	25	2,439	Done	NA
16	Songwe	17	1,823	Done	NA
17	Singida	17	1,715	Done	NA

No.	Region	School	Total Samples	Status	Reason
18	Kigoma	44	4,611	Done	NA
19	Pwani	17	1,395	Done	NA
20	Dar es Salaam	72	8,554	Done	NA
21	Kilimanjaro	32	3,498	Done	NA
22	Simiyu	19	2,022	Done	NA
23	Rukwa	17	1,517	Incomplete	Sumbawanga DC (2 schools' samples) are missing
24	Mbeya	18	1,716	Incomplete	Chunya DC (2 schools' sample) and Mbeya DC (3 schools' sample) are missing
25	Kagera	32	3,286	Incomplete	Misenyi DC (1 school's samples) is missing
26	Manyara	21	2,573	Incomplete	Kiteto DC (6 schools' samples) and Mbulu DC (1 school's samples) are missing
	Total	**650**	**67,097**	**—**	**—**

Challenges encountered during DBS sorting and organization

Some of the challenges encountered during DBS sorting and organization and how they were addressed are summarized in **Table 9-5**.

Table 9-5. Challenges encountered during DBS sorting and organization

No.	Challenges	Solutions
DBS collection	DBS collected in some councils/regions were incorrectly labeled compared to the standard IDs that were written in Tool 2. • Some councils did not submit DBSs in time/at all • Some DBSs were incorrectly packed: several DBS with different IDs were packed in the same envelope thus posing high risk of contamination and difficult to identify which DBS matched with which ID. • Some DBS samples collected from different councils were kept in the same envelope. • Some DBSs were not labeled with time and date of collection. • Some DBS samples had duplicated IDs while other IDs were missing. • Some DBS samples had ambiguous ID (e.g., writing pupils' registration number instead of project-generated IDs). • Inadequate blood spots in DBS samples. • Some DBSs had decayed due to fungus growth that may be a result of packing before completely drying. • Some DBS IDs could not be read properly due to poor handwriting. • Discrepancy between numbers of pupils registered in Tool 2 and the actual total number of DBS collected. • Some DBS samples were lacking descant that might facilitate fungal growth.	IDs were counter-checked and corrected in line with the ID master sheet. • Communicated with the District Malaria Focal Person (DMFP) to retrieve the missing DBS samples; the majority of the missing were submitted. • The DBS teams sorted and repacked the DBS samples in separate ziplock bags with descants. In addition, multiple DBS samples that were packed in the same ziplock bags were identified as a precaution in case of extraordinary laboratory results. • The teams sorted the mixed DBS samples and packed them according to the correct councils in a separate boxes per region. • These samples were reassessed, labeled, and repacked within their respective councils. • Duplicate DBS samples that were in series were differentiated using their time difference allocated in the DBS. If they appeared to be different in time, one of the DBS was assigned the next nearest missing number. • A list of pupils with ambiguous IDs were sent to respective schools for identification by assigning their names for easy tracing of their IDs in the project database.

No.	Challenges	Solutions
	• Some DBS samples had poor quality (dirt, dust). • Poor quality ziplock bags and filter paper used.	• This was included along with other samples, although a precaution is needed during laboratory analysis. • DBS samples identified with fungus were sorted and packed in a separate package as they cannot be used for laboratory analysis. • This was addressed through team members' consultation to verify the IDs. • All the missing DBS IDs number were identified and recorded. • Additional descant was added in all samples to prevent fungal growth. • These samples were packed and labelled separately. • All samples were included in the database. However, a mark to indicate observed defect was made to guide laboratory analysis.

Samples of DBS that were incorrectly labelled/incorrectly packed

Issues observed during DBS sorting, organizing, and repacking and precautions taken prior to analysis

General issues observed

1. **Observation:** The team observed that the samples were not in order and samples from different regions were mixed up in the same box.
2. **Implication:** The mix-up of several samples happened at the project headquarters where all the samples were delivered.
3. **Recommendation:** The team recommends the program to have a specific team in place to receive and store the samples in a conducive environment before data management is done.
4. **Observation:** Some samples were dirty (covered in dust) and of poor quality.

Poor packing of DBS filter papers

DBS made with a finger-filter paper using direct contact, not a free-falling drop

Implication: Sample preparation was done in a dirty environment, possibly outdoors or in open spaces during work in the field. Some samples were even eaten by flies.

Recommendation: The field team needs to be advised to prepare DBS in a closed environment, such as a classroom, which will minimize the chances of dust, sand, and flies to come in contact with the sample. This will reduce the chance of compromising the laboratory analysis of the sample. In addition, supervisors should make sure they closely monitor all activities carried out in the field including conducive site for sample collection.

Observation: The DBS samples were made from different types of filter paper.

Implication: The materials provided by the project for making DBS were provided in terms of sheets, hence, it is assumed that field team ran out of materials after dividing for each pupil. This may explain why they opted to use other types of filter paper for DBSs. Other filter paper types may not persevere in laboratory analysis, such as DNA extraction process.

Incorrectly labelled DBS samples

Recommendation: The study Principal Investigator (PI) and Co-PIs should ensure adequate and uniform materials/consumables are procured and disseminated timely, to maintain the quality of the sample.

Observation: Many IDs on the DBS samples were written incorrectly and did not conform to the survey-generated IDs.

Implication: The field teams used the familiar acronyms for regions or councils that were not provided by the survey. Similarly, field teams used pupils' registration numbers and school identity numbers to generate pupil IDs. The survey/study supervisors did not emphasize the importance of using survey/study-generated IDs while in the field.

Recommendations: The National Facilitators should continue to emphasize the use of the survey/study-generated IDs during the orientation seminars. In addition, the national and regional supervisors should bear in mind that one their main roles is to conduct quality assurance of the fieldwork processes. This include performing quality assurance (QA) checks for each school to ensure that the IDs used are correct. These national and regional QA results should be submitted to the national-level database.

Specific issues

The team observed the following issues, which were seen in some specific regions or councils.

- Some DBS samples used incorrect IDs that did not match with the IDs in Tool 2. Similarly, some schools swapped IDs and/or sample sizes from those provided by the survey/study.

Implication: The field teams did not realize the importance of using survey IDs and failed to provide information to the supervision team in case of swapping school IDs or sample sizes.

Recommendation: The supervision team should monitor and emphasis on the importance of using the survey IDs and QA regularly during the field surveys to ensure correct IDs are used and that the DBS labelling matches the Tool 2 IDs.

- Some DBS samples were packed without desiccants or drying agents which might allow fungal growth and in turn, compromise quality.

Implication: All the samples from at least two regions (Singida and Simiyu) and other councils were not packed with desiccant(s). This implies that the field team did not have adequate materials (i.e., desiccants) to use when packaging the DBS. Furthermore, this indicates that there was no communication between the teams, National and Regional Supervisors, and the PIs, as evidenced by the lack of important materials not reported as an issue that required immediate attention. Also, it seems field teams were not aware that some desiccants could be obtained from the mRDTs packages.

Recommendation: The project should procure all items needed for the survey adequately and distribute them timely for field use. Similarly, supervision should be strengthened and all issues observed on QA during the field surveys should be reported to the national level for immediate actions.

Decayed DBS samples in comparison to a fresh sample (center bottom)

- Some DBS samples (at most 50 samples) had decayed and were separated from the rest of the samples since they could be used for further laboratory analysis.

Implication: Although all the samples were packed with a drying agent, the decayed ones were most probably due to being stored in plastic ziplock bags before they were completely dry. This implies that the work of placing DBS filter papers in bags was done by not only the laboratory technicians but also by other members of the team who could not identify a completely dry sample from a wet sample. Furthermore, it might be that some samples were collected late in the evening and hence needed a longer time to air dry in comparison to those samples collected in the morning or afternoon; thus, the team did not wait for them to dry completely.

Recommendation: We advise that fieldwork exercise should be done early enough (during the start of school hours) to have enough time to obtain and air-dry samples before they pack and leave the school premises. In addition, the packing of DBS should be done by the laboratory technician in all circumstances to reduce unprofessional errors.

- Some DBS samples were prepared using an inadequate volume of blood in DBS.

Inadequate amount of blood used to prepare DBS

NB: a 50UL drop of blood would cover at least a circle of 1cm in diameter.

Implication: The laboratory technicians were overloaded by the blood collection/testing activities (Hb [random], mRDT and DBS onto filter paper) per pupil. The technicians were supposed to be fast and efficient to prepare for mRDT and Hb readings and preparing DBS. Some technicians fell behind and prepared the DBS later when the prick was almost dried; hence, very little blood was used to prepare the DBS onto the filter paper.

Recommendation: The project should consider reducing the number of blood test activities by separating HB measurements and mRDT/DBS samples into a two-phase survey to reduce overloading the laboratory technicians. The project should opt to use spring pickers, which guarantee the right amount of the pricking and adequate volume of blood. The blood could further be placed in EDTA coated micro-cuvettes 300UL, which could further be used adequately for all blood related activities.

Multiple DBS samples stored in a single bag in contact with one another

- Some DBS samples were packed together in the same bag (i.e., multiple samples came into contact with each other due to poor packing).

Implication: Either the laboratory technicians did not get adequate training from their respective RLTs or the work (mostly packing) was done by other non-laboratory technicians without knowledge of the basic principles of handling of human blood samples.

Recommendation: The District Laboratory Technicians (DLTs) should be involved and receive the same training as the RLTs from the national level to reduce incompetence and discrepancies caused by trickle-down of information.

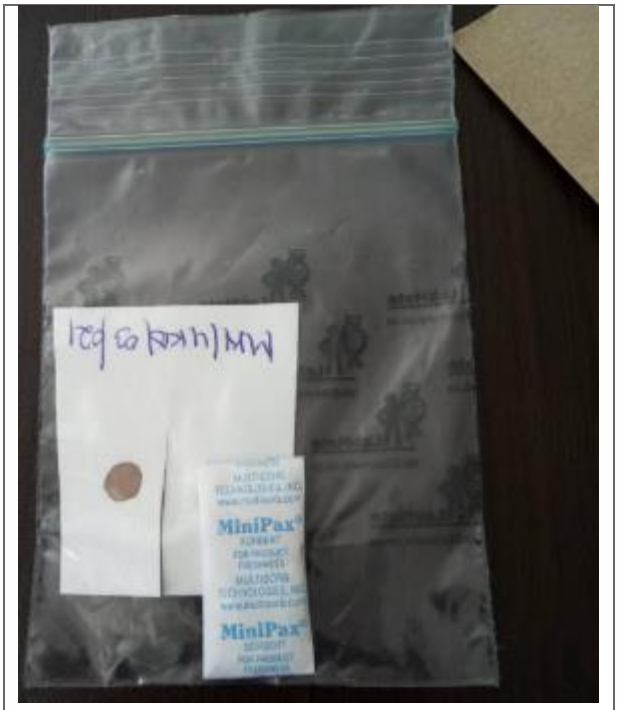
- Some DBS sample IDs were written with poor handwriting.

Recommendation: The laboratory technicians should be coached on the importance of clear and good handwriting on the filter paper to increase readability for use in the preceding laboratory analyses.

- No time or date was written in some DBS filter papers.

Implication: The laboratory technicians were not aware of the importance of recording the time and date on the filter paper. This may be due to inadequate training prior to the field surveys, which was conducted at regional level.

Recommendation: Strengthen the QA team.



DBS sample without time or date recorded

General recommendations

1. The SMNS project should put in place a standard operating procedures (SOPs)/ protocol for DBS activities within the survey. The SOPs will address all issues related to procurement of adequate and recommendable materials for DBS filter paper preparation, handling, and storage.
2. The QA should be strengthened and include checking for mRDT quality and the quality of DBS filter papers. In addition, the QA information should be synced in the national database for immediate mitigation of any pressing issues discovered during the QA.
3. The project should design a mechanism of commitment for all trained laboratory technicians to take part in person in the field surveys. The study PI(s)/ and National Facilitators should be given a mandate to request for all RLT/DLTs who were trained at the national level to take part, in-person, during the survey. Personal replacement/assignment or swapping of trained staff with untrained staff should be highly discouraged to avoid inconsistencies caused by people who go to the field without being trained.

Precautions prior analysis

Due to the issues observed during the DBS sample management, the following precautions should be taken prior to laboratory analysis:

- Since more than one type of filter paper was used in preparing DBS, the method of DNA extraction chosen should be able to accommodate both types of filter papers. Attention should be given to other samples whose DBS seem to be prepared using ordinary paper.
- Due to the small amount of blood on some DBS, performing laboratory analysis should be prioritized in order of importance so that all the important analyses are done using the limited DNA obtained from the inadequate DBS.
- Due to human error, some IDs are duplicated, missing, skipped, or unlabeled.

Annex 10. Investigators for the 2019 School Malaria and Nutrition Survey

Table 10-1. Investigation team

Principal Investigator	Investigating Team
Frank Chacky	Ally Mohamed
	Samweli Lazaro
	Pendael Machafuko
	Witness Mchwampaka
	Susan Rumisha
	Prosper Chaki
	Samafilan Ainan
	Grace Moshi
	Saul Epimack

Table 10-2. Data collection team

Dar es Salaam	Mwanza	Simiyu
National Supervisor	**National Supervisor**	**National Supervisor**
Joyce Mariadu	Honorata Chagula	Stephano G. Cosmas
Justin Omollo	Sophia Lugome	Benedictor Peter
Grace Moshi	Regional Supervisors	Regional Supervisors
Ester Kabula	Saula Beichumila	Mugune Maeka
Mwendwa Mwemesi	Juma Shigella	Charles Mahongo
Regional Supervisors	Sophia Lugome	Council Team
Ford Chisogela	Council Team	Petro C. Simon
Costantine Mnzava	Daniel Sulusi	Martha M. Mbelwa
Council Team	Benedictor Peter	Fatuma Kombo
David Manyama	Paul Biyaga	Mashaka Isack Ndulu
Martha N. Shilla	Emma Kalolo	Bakari D. Marco
Bertha Mwakabage	Pili Malimi	Abel Gyunda
Gloriana Msengi	Joyce Kasimbazi	Musa Amos
Ally Adinani	Dismas S. Dotto	Oswin Mlelwa
Flora Mgimba	Lucy S. Samike	Mihayo Majele
Martha J. Kussaga	Josephine Kasese	Godfrey D. Lyonga
Abdullah Hemed	Samwel Omahe	Zuwena A. Malley
Janet Mnzawa	Prisca V. Mukama	Emmanuel C. Mbwilo
Goodluck Mselle	Joyce Method	Juliana Limbu
Florence N. Kalasira	Rachel Stephen Ntogwisangu	Happiness Kubona
Beatrice Joseph	Mary Hossea Mollo	Magno M. Lasway
Mectilda V. Rukoijo	Abdulrahman Tanzilu Mgonja	James J. Mvanga
James E. Msami	Evarist Mganga	Raphael Gabriel Mtaho
Charles Richard	Pauline Machango	George Momboja Henry
Joyce Msese	Redemptor Kibiti	Andrea Silas
Dorcas Amos	Sundi Kabuli	Charles Mtwale
Majid Mfaume	Magreth Nyanyusa David	Said Hussein Juma
Asma Amir	Belina Gwabo Seleman	Mariam Thomas Nyanzobe
Mwinyimvua Mwinyimvua	Oswald Mpelasoka	Lucia Shaban
Mariam Lusasi	Marina Atupelye	Zeipha Iddy
Mwajuma Mbaga	Bertha Donald	Zita Lucas

Dar es Salaam	Mwanza	Simiyu
Ester Nhang'ano	Sega Kamata	Gideon Jackson
Salum A. Khamis	Zephania Daud	Maua Joseph
Rashid S. Hamad	Stephene Omindo Gerald	Wilfred Irenus
Josephat John	Eliya Alute	John Lemelo
Richard Mnyanyi	Rehema Zacharia	Masoud Mikidadi
Mengi Kizigo	Daud M. Chacha	
Amasa Kahisi	Nelly Gama	
Godfrey Millinga	Martine Machela	
Kindamba Komba	Pudensiana J. Ng'wecji	
Richard Munga	Giliad Kairanya	
Asad Akim	Jeremiah.L. Phiri	
Said Mwamba	Enoss Merick	
George William	Nyangaka J. Machibya	
Ibrahim Said	Eliakimu M. Malima	
	Mussa M. Pagija	
	Monica Tillya	

Kagera	Kilimanjaro	Katavi
National Supervisor	**National Supervisor**	**National Supervisors**
Grace Kanyankole	Lyimo Ghasia	Ona Panga
Emma Kilimali	Mary Kibona	**Regional Supervisors**
RMFP	**RMFP**	Stephano Kahindi
Julian Mugengi	Joyce Mariadu	Joseph Nkana
Audax Mbakileki	Makange	Asnath Mrema
Council Team	**District Team Leaders**	**Council Team**
Ernest Lukumba	Member Name	Herman Kimango
Florence Ifunya	Andrew F. Sangalala	Siame Wambote
Robinson Tigelelwa	Jacob Minja	Flaviana Sumia
Veadsto Yohana	Angela N. Maganda	Fabiola Kauzeni
Andrew Felician	Issa O. Mganga	Donath Mkatimbila
Edward Nditije	Glory M. Silas	Noah Pius
Witness Tibaijuka	Joyce Mbwambo	Mayunga Mabinda
Luhaga Issa	Sara Muhongo	Venance Tesha
Idd Issa	Musa Mruma	Baraka Charles
Idd Mrisho	Johnson Mndeme	Priscus Temba
Nkwimba Limbe	Rozalia Mmbaga	Ntambi Mikoba
Zainath Hassan	Shadrack Mziray	Tunsume Mwafumbila
Marius Byalugulu	Erca Lymo	Raphael Kibona
Prosper Jumbe	Conjeta Kessy	Janiva Evarist
Renatha Israel	Iddi Mgando	Halie Zakaria
Pontian Katabarwa	Rahel Mkandya	James Massaga
Gisela Richard	Aghata maariki	Kelvin Msambili
Redempter Clemence	Albina Cretus	Peter Said
Salvatory Ignas	Theresia Pascal	Dorine Malekela
Mzamiru Juma	Salome Aubrey	Alex Ruhwago
Deodart Ngaiza	Philberta Rogata	Speratus Karumuna
Sagamambi Mjinja	Frank Luchagura	Esther Mbaya
		Andendekisye Mbwile

Dar es Salaam	Mwanza	Simiyu
John Misalaba	Mathias Luzabiko	Charles Mweli
Devotha Mtesigwa	Eva Kweka	Rechaell Moses
Desdery Karugaba	Victor Siliwa	
Goreth Zilyahuramu	Jonas Kira	
Merryness Alphonce	Laurence Mboya	
Nora Nyakunga	Nay Mollel	
Francis Bartholomeo	Faraja Ramadhani	
Adolf Fulgence	Happiness Ndashau	
Boniphace Kayegeji	Beatrice Mvungi	
Napendaeli Philemon	Silvania Kullaya	
Lilian Katundu	Manka Mboya	
Elizabeth Yusuph	Alberta Makule	
Derick Rwiza	Hadija Kitumpa	
Dkt.Madina Kibiriti	Samson Likombe	
Mugisha Rubagola	Hafidhi Hamis	
Elian Yoweri		
Norbert Nicholaus		
Emmanuel Renatus		

Mbeya	Iringa	Morogoro
National Supervisors	**National Supervisor**	**National Supervisors**
Issa Garimo	Valeria Millinga	Ona Panga
Haika Sarah Lekey	Regional Supervisors	Stephan Motambi
Regional Supervisors	Tatu Mbotoni	Regional Supervisors
Mashaka Juma	Frank Mgoba	Stephano Kahindi
Council Team	**Council Team**	Joseph Nkana
Amani Hassani	Peter Mwenda	**Council Team**
Frank Anderson	Pius Myonga	Lidya Likoga
Prisca Mwamanga	Peter Daffa	Edward Sule
Grace Njole	Mrisho Mnana	Masumbuko Chaula
Robert Ndiu	Nimrod Chengula	Yassini Kisuda
Nathan Mwakyusa	Mario Mwelesa	Sara Ngata
Ephraim Mwandunga	Anamaria Ndigoje	Simplicia Andrew Mjokonde
Erasmo Mgimba	Muda Kidau	Nionzima Stanley Bwenge
Halima Kameta	Victoria Kapinga	Rose Awetty
John Mnkeni	Theopist Qintine	Bahati Ally Mbogo
Neema Msambazi	Eileen Matalu	Mary Maganga
Martha Chacha	Juma Mkolea	Neema Kusesa
Emmanuel Dalika	James Mfuse	Irene Magembe
Yonah Msyani	Kokubelwa Mlelwa	Ferister Ngaga.
Zubeda Mahenge	Bruno Ndunguru	Msafir Luanda
Marry Chambo	Anjelo Mbugi	Julither Samwel
Jastine Obed	Kirugara Matutu	Evance Mlaponi
Devotha Nombo	Nickson Chonya	Latifa Kalikawe
Athman Juma	Daniel Mgoho	Witness Kimoleta
Christina Kawinda	Nestory Magashi	Francis Lutte
Mohamed Sichane	Nuru Andrew	Davis Jerome
Rehema Hiluka	Charist Ndambo	Meleji L. Mollel

Dar es Salaam	Mwanza	Simiyu
Henry Swalle	Vicent Madelemo	Priska Malekela
Aman Mwakipesile	Nixon Mbungu	Ester John Awet
Fredrick Malunde	Efron Msuva	Damson Mwachipa
Elly Jackob		Geofrey Liwemba
Anna Sanga		
Mary Luoga		
Rebeca Heperwa		
Deus Limandola		
Esther Mgaya		

Tabora	Arusha	Rukwa
National Supervisor	**National Supervisor**	**National Supervisor**
Daniel Mzee	Felista Mwingira	Joseph Lekule
Napendael Philemon	Pai Elliah	Dismas Shao
Regional Supervisors	**Regional Supervisors**	Benson Sanga
Nassoro I. Kaponta	Sixta Komba	**Regional Supervisors**
Bonaventura Makingi	Selina Hongo	Ally M. Rubeba
Council Team	Council Team	Martin Haule
Anizia Msita	Dorice Massawe	Council Team
Marry Mallya	Rose Mauya	Agnes Tamba
Chiku Mihiko	Sarah Walles	Noah Eliya
Jackson Paul	Yona Senzota	Jesca Lwiza
Hassan Kapamba	Adelaida Garra	Gerementina Kaishozi
Mohamed Maalim	Aziz Ally	Edwin Esra
Lilian Ndyamkama	Mary Koillah	Elina Yesaya
Charles Ndungile	Theresia Tarimo	Emmanuel Ilomo
John Ernest	Aziza Said Sigera	Amenye Reuben
Rotilda Msekwa	Grace Noel Massawe	Gradness Wella
	Milembe Dotto	Agnes Komba
Agnes Fungama	Apoline Msoma	Shaban Athuman
Felix Mangala	Pamela Materu	Zenobi Nandi.
Athuman Juma	Adelina Kahija	Graceana Kilenga
Gambalala Mageni	Paskalina Levi Sanga	Jesca Mwihava
Hamisi Omary	Eda Zaya	Sr. Felister Lulanika
Job Gahanga	Adelide John Garra	Sophia Nyangwe
Epharazia Kiweha	Reginald Ngoli	Jilala Nanda
Flavian Mark	Seronira Mark	Chrispin Franscico
Harun A. Mnuo	Shaban Hamis Shaban	Neema Shaban
Ashir Shea	Anna Nanyanje	Mary Mtawa
Devotha Mselle	Asia Ijumaa	
Felisiana Mwigaya	Elizabeth Mgombelo	
Vitus Ntega	Emmanuel Munna	
Bernard Masanja	Yusta Casius	
Mary Fungo	Aziza Iziga	
Juma A. Juma	Dickson Muhagama	
Johari O. Hamis	Samson Sagday	
Joel M. John	Mary James Siay	
Zawadi Mbasa	Fatihiya Abdallah	

Dar es Salaam	Mwanza	Simiyu
Elisha Maige Winifrida John Byama Nyilwohi Fransisco Kibiki Reveliana Pastory Andulile Francis Hiyobo Simba Lovenear Welelo Bilali Abdul Subira Hussein Jesse Joram	Batanisha Sukume Namjodo Grace Mlelwa Juliana Wangwi Prosper Kibira Stella Nyambo Sigmanta Saronga	

Singida	Lindi	Manyara
National Supervisor Joyce Assey Peter Kaswahili Regional Supervisors Habibu Said Mwinory Sekunda Kimaro **Council Team** Selina L. Magesa Dora A. Simon Albert V. Clement Eliasifiwe Yunami Happiness Nyaluke Sarah Nkumbi Neema Swai Sarah N. Mkumbo Aisha S. Masanja Ibrahimu M. Msengi Martha Kinyau Monica Sarwat Grace Kiunsi Asia O. Sumwa Omari R. Hassan Monica Paulo Fredrick Gaisha Elizabeth Ajem Regan J. Temba Magreth Msigwa Francis Mwasanga Eliwandisha Kinyau Musa Mpimbili Asha S. Mnaguzi Leah N. Tibihenda Philip Kitundu Prisca Masenga Agnes L John	**National Supervisor** Egria Mallongo Saul Epimack Regional Supervisors Alex Khamis Julius Mwansimba **Council Team** Elizabeth Kakusa Sophia R. Chinjala Nancy Mwailupe Mfariji Mchilas Asha Seti Fredrick Myulla Shaibu H. Ulochi Sadiki Katima Tafawa Bakari Rita Max Borgia E. Magoya Lucy A. Mahua Tabu Katengesya Flora Mwami Gaston Chilumba Bosco Chilongola Anna Lulandala Gella Mwenda Ernest Mushi Tamimu Adam Seifu Moyo Rehema Mkalola Veronika Barua Peter Shija Selemani Juma Magreth Chinguwile Lawama Mtocha	**National Supervisor** David Edward Lenga Mabula Masunga Regional Supervisors Elingikaniawo Kombe **Council Team** Archimedes Mpemba Beatrice Lutanjuka Monica A. Chibululu Vicent Mugeta Edward Limbalu Nicodemus Shauri Samwel Madangi Loema Awtu Idrisa Abdi Ayoub George Mary Alphonce Mary Ombay Catherine Mighey Zakia Malomba Namsifu Godson John J. Kaaya Esther Mkumbi Bernadetha Tembo Ramlati A. Dumba Raymond P. Mushi Somoe Bakari Rukia A. Mteremko Said M. Kaminya Enos Kuzenza Fadhili A. Silim Leopold N. Francis Martha Nambunga Mabula Masunga Migatha Elingikaniawo Kombe

Dar es Salaam	Mwanza	Simiyu
Amasha Msele Happiness V. Jingu Erondola Henry Ng'wandu Masaga Antonia Renatus Mwanaid M. Ramadhan Rehema G. Kabata	Tegemeo Kingo Felix Milanzi Grace Mmuni	Patson Nyomoka Catherine Palanjo

Songwe	Kigoma	Njombe
National Supervisor Jackline Mboya Regional Supervisors Rose Alfred Ally Mwampashi **Council Team** Edward Kyejo Gerald Sadala Goshen Tweve Faustine Bachuba Grace Malugu Edward Kambi Jackson Ramadhani Charles Nkalasa Simon Aron Mkaya Saidi Petro Matwiga Luca Kayange Bhoke Ndimila Lagero Sichone Leonce Venance Bernad Mohara Hafsa Pongwa Mohamed Matongo Adelina Mwashambwa Mayanzi Buyaga Frank Malya Anifa Nyaluke	**National Supervisor** Sekunda Kimaro Samson Ndimanga Regional Supervisors Godfrey Smart Hassan Ruanda **Council Team** Simon Mafuru Daniel Tilia Ferisha Mwananzumi Christopher Mbogo Adam Kilimba Kagaga Daga Felician Ferdinand Nowadia Rubaladi George Mlewa Gerson Agripa Jonas Twakamiki Gerald G. Nkona James Ngalabe Jasmen Meru Oscar Ntogoto Abdallah Idd Erick Julias Bujiku Makoye John Batashaka Clement Dominic Veronica Katambi Noel Kasaya Theodora Thomas Kombo Assa Kombo Mkondosye Nyaseme Laurent Bukuru Flora Vedastus Tatizo Tondiye Zacharia Nice Samwel Aisha Hussein Abigal Kasuman Juma Nziajose	**National Supervisor** Oogorah Peter Japhari Magessa Regional Supervisors Valeliana Jacob Makasi China Mbilinyi **Council Team** Oberd Mlenga Jackline Nanauka Monica Mahenge Deodatha Ngailo Isack Ngollo Carlos Nyongole Maliselina Mtitu Festo Salingwa Upendo Nelly Mary Lyabonga Wende Twin'Omujuni Zenobia Aloyce Tabia Ngilangwa Wallace Chungu Nadhir Kahishe Christopher Chongola Titus Mihale Loveness Kambaga Ahimidiwe Mwendamseke Letisia Mlyapatali Samwel Vianga Rachel Magafu Exaveria Mtega Tabitha Lwilla Helger Nziku Kelvin Mfuse Lenis Mtotu Aziza Mtitu Anastasia Luoga Neema Noah

Dar es Salaam	Mwanza	Simiyu
	Cornel Kissinga Makoye Mathias Ruth Kiboye Jaequiline Tungaraza Tumaini J. Muna Agness Malinzi Emanuel Ng'ando Crian Mpindutse	

Geita	Shinyanga	Mtwara
National Supervisor Bagelela Bagana Grace Mosi **Regional Supervisors** Moses Simon Mateso Charles **Council Team** Fransisca Charles Eliwaza Ndau Delphina C. Fidelius Paulo Mugassa Lydia Kilama Esther Pius George Ndukwa Tibendakwingana Charles Fedasto P. Milonga Gabriel Wangese Rosemary A. Akile Tibezuka Mapesa Japhet Masessa Rehema N. Mustapha Obeid O. Mwakyami Musa Lubadanja Radisdlaus Magasu Jenipher Kisusi Tansigar Leonce Jacobo Bandora Charles Pamba Simon Juma Amos Mandago Ester William Dastan Kipengele Silvester Mshadawa Willmina Robert Elieth Mpisi	**National Supervisor** Grace Mosi Esther Joseph Kabula **RMFP** Daniel Mzee Emmanuel Reuben **Council Team** Anthony A. Mwampulo Loyce Nicolao Isaya Mhujilo Verediana Masam Beatrice Mbonea John Duttu Hadija Nasibu Peter Mkungu Thabiti Kibwana Loyce Ndutu Obote Castro Salama Mwenda Selina Paschal Mwanaidi Lukali Rehema Mponda Leoson Katebalila Mwl. Winfrida K. Mukama Avelina France Samson K. Bartholomeo William Malekela Peter Shimba Nganzo Sayi Ntiga Mother Prosper Vicent Ipagala Gloria P. Kazoka Joseph Bihemo Peter Masanyiwa Joseph Sobaja Brian Gilagiza	**National Supervisor** Pili Kimanga Tufingene Malambugi **RMFP** Kevin W. Mnali Edward Ngonyani Council Team Salum Malick Elizabeth Ulanga Mathew Maluchila Anna S. Shekaoneka Florencia Marandu Fedson Magafu Shaban Sultan Flora Stuart Davis M. Kasembe Neema Silas Lilian Mlaponi Neema Msami Selestina Zed Monica Michael Angelina January Vincent Kway Alfred Mapunda Restituta Mgimba Kassim M. Dua Ashura Mbulu Cresensia Mlelwa Evance E. Millanzi Hebron Nkembo Sarah Mwakyoma Salvatory Chinguile Ramlati A. Dumba Joseph Donald Charles Mbele Raymond P. Mushi Somoe Bakari Rukia A. Mteremko

Dar es Salaam	Mwanza	Simiyu
		Said M. Kaminya Novath Shayo Rashid Likoko Enos Kuzenza Fadhili A. Silim Leopold N. Francis Martha Nambunga Yusto John Scolastica David Manzi Saidi Victoria Ngatunga Rehema Mpokwa Festo Ulanga Blandina Lawi
Pwani	**Mara**	**Dodoma**
National Supervisor Bwire Wilson Elizabeth Lyimo **Regional Supervisors** Mhando Muya Anyosisye Mwakiposa Hildegeld Makundi **Council Team** Zena Mtajuka Sofia Kirumbi Sofia Makame Halima Shomari Christina Ndabise Salama Masukuzi Ester Kalale Zainabu Waziri Neema Bernard Asifiwe Kibanda William Mwaga Sofia Mbaga Dorine Mng'ong'o Adeline Rafael Evodi Kuwingwa Ali B. Shaha Salima A. Mohamed Laurencia M. Harry Rehema Gerard Mbunda Betrice Nyigu Ernest Mujuni Roina Deus Daza Moza Sungu Irine Mwasote	**National Supervisor** Rhobi Kinyunko Given Mlowe **Regional Supervisors** Damian Maswola Albinus Chacha **Council Team** Paulin C. Mathis Gerald P. Uisso John V. Ndunguru Tabitha Mugini Mugusi Casta Bayugile Esther Koreni January E. Dalushi Fadhili J. Kanyogoto Mboke Ngereja Mchunga Bahati Charles Kivuruga Christina Rubaka Samweli Sucha Esther P. Kungu Masatu K. Mtaki Monica E. Oliko Taabu Lazaro Rwegasila Karugwa Ernest Gamba Chacha Mnyoro Cosmas Mziba Melinda Chafora Rehema Juma Coltilda Kapeche Christina Simon Emmanuel Nangi	**National Supervisor** Shadrack Kibona Vumilia Lyatuu **Regional Supervisors** Francis Bujiku Mathias Mwendesha **Council Team** Restituta Putile Gama Mwanaidi Ramadhani Kondela Sima Petronilah Ollomy Neema Ntibagwe Fatuma Rashid Anna Maria Kidunda Bernadetha Petro Rose Nkinda Annosysia Ambele Frank Ndunguru Asha Mpendakazi Anna Njau David Ndunguru Faith Temu Gasper Kisenga Theresia Modaha Semeni Eva Juma Godliver Ngatunga Zamoyoni Mtavangu Vendelino Raymond Judith Mwamakula Halima M Salum Edson James Sadam Mrinji

Dar es Salaam	Mwanza	Simiyu
Sefu Bakari Mng'ombe	Marina Atupelye	Ramadhani Wambanguru
Chalo Kalunde	John Makebo	Kanasia Nyela
Mwanaharusi Issa.	Amos Mambile	Francis Maghembe
Emeresiana Kaseka	Robert Chidodo	Emmanuel Kilimba
Gasper Mzeru	Charles Chacha	Dorice Munis
Isabella Kipesile	Esther Togoro	Melkizedeck
Rukia Maumba	Casta Mahembela	Maria Haule
Hussein Rajabu.	Upendo Ndaki	Flora J. Mkanza
Sebastian Mlinda	Milton Obote	Thomas Nombo
Kadri Ally	Emmanuel Kadama	Augustino Seganji
Hamida Mfinanga	Zuberi Musa	Renatus Kadati
Elinas. J. Nnko	Zacharia Tumbo	Renatus Komba
Vumilia Ngandango	Vicent Katehile	Mohamed Mikina
Teddy Bogolele	Jensen Kaijage	John Mtali
Tatu Ugomba	Toto Wanjara	Dafrosa Mboya
Sinawema Nyumba	Michael Babilasi	
Neema Thomas	Ally Makinda	
Mwanahamisi Salehe	Roseline Munche	
Juliana Masanja	Godfrey Shoto	
Nicolaus Silanda	Esther Misana	
Sultani Hamisi Mketo		

Ruvuma	Tanga	
National Supervisor	**National Supervisor**	
Justine Omolo	Habibu Mwinori	
Michael Mboya	Jonathan Budenu	
Regional Supervisors	Pamela Meena	
Kibua Kakolwa	**Regional Supervisors**	
Dodea Mlenda	Olga Mushi	
Council Team	Juma Kayanda	
Neema Gerge	Council Team	
Ayoub Joseph	Joseph Nchimbi	
Leah Mhalule	Sarah Mafundo	
Maxenisius Mahundi	Catherine Shuma	
Adam Shabani	Devotha Njalika	
Gudluck Salimu	Grace D. Mbanga	
Christina Mapunda	Richard Nyiti	
Hanifa Ulanga	Julia Chalo	
Janeth Bandari	Mariam Makwiro	
Kisa Nsajigwa	Lucy J. Chami	
Florentine Kissaka	Sizo Nzogere	
Beda Mgegedu	Muula Magolima	
Humphrey Lupembe	Adelina Ndumbaro	
Martha Kibona	Merina Kijazi	
Joyce Kamanga	Jumanne H. Njiku	
Kalisnes Gwajila	Neema T. Tandiko	
Mary Luoga	Abu Ngoye	
Magreth Ngonyani	Rehema Kwagilwa	

Dar es Salaam	Mwanza	Simiyu
Beatrice Shawa	Shungusho Mbwambo	
Evaristo Ngalowoka	Ernesta Joseph	
John Chihapula	Saida Mahugu	
Majaliwa Mwambete	Rehema Lyimo	
Karister Mgaya	Emmanuela Marthine	
Stella S. Komba	Neema P. Nkini	
Prisca J. Nziku	Rukia S. Magogo	
Rashid Njaidi	Sakina Mustafa	
Philbert Kapinga	Nkombola N. Mkombozi	
James Ndunguru	Gilbert Bureda	
Sunday E. Moyo	Lucina Mtalo	
Stanley Ngonyani	Binuru M. Shekidele	
Agness Mpangala	Selemani Mchauru	
Ezekiel Shauri	Blandina Mhina	
Judith Maua	Fatuma Ussi	
Rainery Ngonyani	Kelvin Shukia	
Edwin Mwambyuse	Happy Nkunda	
Jordan Milinga	Iddy H. Mhinga	
Mariam Magulima	Said Mlandula	
Sr. Chrisma Ngonyani	Abubakary Ikumbilo	
Kumbanje Abilah Kumbanje	Germano Burushi	
Longinus Muhagama	Lazaro Mangara	
	Fulcance Kanyunyu	
	Hadija H. Lihaya	
	Charles Kajembe	
	Maglalena Daffa	
	Eliakimu Nyika	
	Hussen Ngare	
	Rabson Fundi	
	Cosmas.I. Luhwelele	
	Saad M. Omar	

Table 10-3. Data management team: supervisors and data entry clerks

Supervisor	Frank Chacky Susan Rumisha Stanslaus Mafung'a	Pendael Machafuko Samweli Nhiga Munir Mdee	Witness Mchwampaka Samafilan Ainan
Data Entry Clerks and laboratory personnel	Simon Simumba Sebastian Njau Joyce Assey Angela Herman Maguhwa Elineema Zephania Fausta Lutambi Hashim H Hassan Shija Mazuke Theresia Mapunda (laboratory) Boniphace Mwalusamba (laboratory)	Gaspar Mosha Tumani Tondi Elvila Mfuse Nuru Pangani Steven Siwiti Josephine Chacky Nancy Ngausoni Andrea Macha Edagrace Adam (laboratory) Jema T. Msigwa (laboratory)	Grace Mosi Michael Mboya Dismas Shao Rehema Mlay Wiggins Kyatikila Alfred J Mgondah Angela Herman Maguhwa Nasser Milulu Michael Clemence (laboratory) Mohammed H. Ally (laboratory)

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Annex 11. List of the 2019 SMNS Surveyed Schools

Region	Council	Ward	School
Arusha	Arusha CC	Olasiti	Burka estate
Arusha	Arusha CC	Elerai	Elerai
Arusha	Arusha CC	Sinoni	Engosengiu
Arusha	Arusha CC	KiMandolu	KiMandolu
Arusha	Arusha CC	Kati	Meru
Arusha	Arusha CC	Muriet	Nadosoito
Arusha	Arusha CC	Themi	Themi
Arusha	Arusha CC	Unga limited	Unga limited
Arusha	Arusha DC	Mwandet	Imbibia
Arusha	Arusha DC	Ilkiding'a	Kioga
Arusha	Arusha DC	Kisongo	Lesiraa
Arusha	Arusha DC	Nduruma	Mzimuni
Arusha	Arusha DC	Oltoroto	Oltoroto
Arusha	Arusha DC	Oltrument	Oltrument
Arusha	Karatu	Buger	Ayalaliyo
Arusha	Karatu	Daa	Endashangwet
Arusha	Karatu	Mbulumbulu	Kambi ya simba
Arusha	Karatu	Endamaghang	Mikocheni
Arusha	Longido	Engikaret	Engikaret
Arusha	Longido	Kamwanga	Kitendeni
Arusha	Longido	Merugoi	Magadini
Arusha	Meru	Akeri	Akeri
Arusha	Meru	Kikwe	Karangai
Arusha	Meru	Usariver	KiliMani
Arusha	Meru	Mbuguni	Mikungani
Arusha	Meru	Songoro	Ushili
Arusha	Monduli	Monduli juu	Eluwai
Arusha	Monduli	lolkisale	Lolkisale
Arusha	Monduli	Esilalei	Oltukai
Arusha	Ngorongoro	Oldonyosambu	Jema
Arusha	Ngorongoro	Kakesio	Osinoni
Arusha	Ngorongoro	Orgosorok	Sakala
DSM	Ilala	Ilala	AMana
DSM	Ilala	Bonyokwa	Bonyokwa
DSM	Ilala	Buguruni	Buguruni Moto
DSM	Ilala	Buyuni	Buyuni
DSM	Ilala	Kiwalani	Bwawani
DSM	Ilala	KiManga	Darajani
DSM	Ilala	Ukonga	Juhudi
DSM	Ilala	Kipawa	Karakata
DSM	Ilala	Msongola	Kiboga
DSM	Ilala	Majohe	Kichangani
DSM	Ilala	Pugu	Kigogo Fresh
DSM	Ilala	Zingiziwa	Kimwani

Region	Council	Ward	School
DSM	Ilala	Kipunguni	Kipunguni
DSM	Ilala	Kitunda	Kitunda
DSM	Ilala	Kivule	Kivule
DSM	Ilala	Vingunguti	Kombo
DSM	Ilala	Liwiti	Liwiti
DSM	Ilala	Segerea	Maendeleo
DSM	Ilala	Mchikichini	Mchikichini
DSM	Ilala	Ukonga	Mongo la ndege
DSM	Ilala	Mzinga	Mwanagati
DSM	Ilala	Pugu Station	Pugu Station
DSM	Ilala	Tabata	Tabata
DSM	Ilala	Gongolamboto	Ulongoni
DSM	Kigamboni	Kisarawe II	Chekeni mwasonga
DSM	Kigamboni	Kigamboni	Rahaleo
DSM	Kigamboni	Vijibweni	Vijibweni
DSM	Kinondoni	Magomeni	Ally Hassan Mwinyi
DSM	Kinondoni	Bunju	Bunju A
DSM	Kinondoni	Kigogo	GilMan Ruthinda
DSM	Kinondoni	Hananasif	Hananasif
DSM	Kinondoni	Kijitonyama	kijitoManyama kisiwani
DSM	Kinondoni	M'nyamala	Kinondoni
DSM	Kinondoni	Makongo	Londa
DSM	Kinondoni	Mbezi Juu	Mbezi Ndumbwi
DSM	Kinondoni	Mbweni	Mbweni
DSM	Kinondoni	Mikocheni	Mikocheni
DSM	Kinondoni	Mabwepande	MjiMpya
DSM	Kinondoni	Makumbusho	M'nyamala Kisiwani
DSM	Kinondoni	Msasani	Msasani
DSM	Kinondoni	Kunduchi	Mtakuja
DSM	Kinondoni	Wazo	Salasala
DSM	Kinondoni	Tandale	Tandale
DSM	Kinondoni	Kawe	UkwaMani
DSM	Temeke	Buza	Buza
DSM	Temeke	Kilakala	Kigunga B
DSM	Temeke	Mbagala Kuu	Kizuiani
DSM	Temeke	Mianzini	Majimatitu
DSM	Temeke	Mbagala	Mbagala
DSM	Temeke	Chamazi	Mbande
DSM	Temeke	Kijichi	Mtoni Kijichi
DSM	Temeke	Mtoni	Mtoni Sabasaba
DSM	Temeke	Kilunguli	Nzasa
DSM	Temeke	Chang'ombe	Unubini
DSM	Temeke	Sandali	Vetenary
DSM	Temeke	Makangarawe	Yombo dovya
DSM	Ubungo	Mabibo	AMani

Region	Council	Ward	School
DSM	Ubungo	Goba	Goba
DSM	Ubungo	Kimara	Golani
DSM	Ubungo	Kibamba	Kibwegere
DSM	Ubungo	Kimara	Kimara B
DSM	Ubungo	Kimara	Kimara Baruti
DSM	Ubungo	Kwembe	King'azi
DSM	Ubungo	Msigani	Malamba Mawili
DSM	Ubungo	Manzese	Manzese
DSM	Ubungo	Mbezi	Mbezi
DSM	Ubungo	Makurumla	Mianzini
DSM	Ubungo	Mngani	Mngani
DSM	Ubungo	Mbezi	Msakuzi
DSM	Ubungo	Mburahati	Muungano
DSM	Ubungo	Sinza	Sinza
DSM	Ubungo	Ubungo	Ubungo NHC
Dodoma	Bahi	Chipanga	Chipanga "B"
Dodoma	Bahi	Makanda	Chonde
Dodoma	Chamwino	Handali	Handali
Dodoma	Chamwino	Loje	Igunguli
Dodoma	Chamwino	Iringa mvumi	Iringa Mvumi
Dodoma	Chamwino	Manchali	Manchali
Dodoma	Chamwino	Dabalo	Manyemba
Dodoma	Chamwino	Mvumi Misheni	Mvumi
Dodoma	Chemba	Paranga	Cheku
Dodoma	Chemba	Mpendo	Hamia
Dodoma	Dodoma CC	Makole	Chadulu
Dodoma	Dodoma CC	Chamwino	Chamwino
Dodoma	Dodoma CC	Mbalawala	Chihikwi
Dodoma	Dodoma CC	Ihumwa	Ihumwa
Dodoma	Dodoma CC	Ipagala	Ipagala B
Dodoma	Dodoma CC	Iyumbu	Iyumbu
Dodoma	Dodoma CC	Makutupora	Kambarage
Dodoma	Dodoma CC	Kikuyu Kaskazini	Kikuyu
Dodoma	Dodoma CC	Nzuguni	Kitelela
Dodoma	Dodoma CC	Kiwanja cha Ndege	Mlimwa B
Dodoma	Kondoa DC	Kinyasi	Ikengwa
Dodoma	Kondoa DC	Haubi	Kidulo
Dodoma	Kondoa DC	Salanka	Salanka
Dodoma	Kondoa TC	Kolo	Hachwi
Dodoma	Kondoa TC	Suruke	Tungufu
Dodoma	Kongwa	Sejeli	Msunjilile
Dodoma	Kongwa	Iduo	Suguta
Dodoma	Kongwa	Zoissa	Zoissa
Dodoma	Mpwapwa	Chipogoro	Chipogoro
Dodoma	Mpwapwa	Matomondo	Mbori

Region	Council	Ward	School
Dodoma	Mpwapwa	Wangi	Wangi
Geita	Bukombe DC	Iyogelo	Bugando
Geita	Bukombe DC	Uyovu	Kanembwa
Geita	Bukombe DC	Runzewe Mashariki	Msonga
Geita	Chato	Kigongo	Bukamila B
Geita	Chato	Makurugusi	Mabila-A
Geita	Chato	Muungano	Magufuli
Geita	Chato	Nyarutembo	Nyantimba
Geita	Chato	Iparamasa	Tumaini
Geita	Geita DC	Butobela	Butobela
Geita	Geita DC	Bugulula	Kasota
Geita	Geita DC	Bukondo	Kitigiri
Geita	Geita DC	Nyakagomba	Luhuha
Geita	Geita DC	Nkome	Nkome
Geita	Geita DC	Magenge	Nyamalulu
Geita	Geita TC	Kalangalala	Kivukoni
Geita	Geita TC	Nyanguku	Mwagimagi
Geita	Geita TC	Kasamwa	Nyamahuna
Geita	Mbogwe	Masumbwe	Budoda
Geita	Mbogwe	Lulembela	Kashelo
Geita	Nyang'hwale	Kafita	Albert Mnali
Geita	Nyang'hwale	Kaboha	Shibumba
Iringa	Iringa DC	Idodi	Idodi
Iringa	Iringa DC	Ulanda	Lupalama 'b'
Iringa	Iringa DC	Kihorogota	Ngano
Iringa	Iringa DC	Wasa	Usengelindete
Iringa	Iringa MC	Gangilonga	Gangilonga
Iringa	Iringa MC	Mkwawa	Hoho
Iringa	Iringa MC	Kitwiru	Kibwabwa
Iringa	Kilolo	Bomalang'omb	Mwatasi
Iringa	Kilolo	Nyanzwa	Nyanzwa
Iringa	Kilolo	Uhambingeto	Uhambingeto
Iringa	Mafinga TC	Isalavanu	Kikombo
Iringa	Mafinga TC	Boma	Mafinga
Iringa	Mufindi	Malangali	Kinyangesi
Iringa	Mufindi	Makungu	Kitasengwa
Iringa	Mufindi	Ihalimba	Vikula
Kagera	Biharamulo	Nyamigogo	Kagoma
Kagera	Biharamulo	Kaniha	Kaniha
Kagera	Biharamulo	Lusahunga	Lusahunga
Kagera	Biharamulo	Biharamulo Mjini	Maendeleo
Kagera	Bukoba DC	Maruku	Karamagi
Kagera	Bukoba DC	Katoma	Katoma B
Kagera	Bukoba DC	Mugajwale	Mugajwale
Kagera	Bukoba DC	Rukoma	Nsheshe

Region	Council	Ward	School
Kagera	Bukoba MC	Bilele	Bilele
Kagera	Bukoba MC	Buhembe	Kashenge
Kagera	Bukoba MC	Kitendaguro	Kitendaguro
Kagera	Karagwe	Bweranyange	Chamchuzi
Kagera	Karagwe	Chonyonyo	Chonyonyo
Kagera	Karagwe	Rugu	Misha
Kagera	Karagwe	Rugera	Omukakajinja
Kagera	Kyerwa	Rukuraijo	Nyabikurungo
Kagera	Kyerwa	Mabira	Nyamilima
Kagera	Kyerwa	Kibingo	Rugasha
Kagera	Kyerwa	Kikukuru	Rwele
Kagera	Missenyi	Mutukula	Byeju
Kagera	Missenyi	Bugandika	Kyabajwa
Kagera	Muleba	Katoke	Bushumba
Kagera	Muleba	Kimwani	kabasharo
Kagera	Muleba	Kyebitembe	Kyebitembe
Kagera	Muleba	Bisheke	Mulambi
Kagera	Muleba	Muleba	Muleba
Kagera	Muleba	Kishanda	Mulela
Kagera	Muleba	Nyakatanga	Nyarugando
Kagera	Muleba	Kamachumu	Rutabo B
Kagera	Ngara	Nyamiaga	Mugasha
Kagera	Ngara	Ntobeye	Ntobeye
Kagera	Ngara	Rulenge	Rulenge
Kagera	Ngara	Bugarama	Rwinyana
Katavi	Mlele DC	Inyonga	Inyonga
Katavi	Mpanda DC	Kapalamsenga	Kapalamsenga
Katavi	Mpanda DC	Mishamo	Kapemba
Katavi	Mpanda DC	Tongwe	Vikonge
Katavi	Mpanda MC	Makanyagio	Makanyagio
Katavi	Mpanda MC	Mwamkulu	Mwamkulu
Katavi	Mpimbwe	Kasansa	Rungwa
Katavi	Mpimbwe	Usevya	Usevya
Katavi	Nsimbo	Machimboni	Katisunga
Katavi	Nsimbo	Ugalla	Mnyamasi
Kigoma	Buhigwe	Munzeze	Kigogwe
Kigoma	Buhigwe	Mugera	Mugera
Kigoma	Buhigwe	Munanila	Nyakimue
Kigoma	Kakonko	Gwanumpu	Gwanumpu
Kigoma	Kakonko	Kakonko	Itumbiko
Kigoma	Kakonko RC	Zone 6	AMani
Kigoma	Kakonko RC	Zone 5	Maendeleo
Kigoma	Kakonko RC	Zone 10	Umoja
Kigoma	Kasulu DC	Heru Ushingo	Heru uShingo
Kigoma	Kasulu DC	Rusesa	Kakirungu

Region	Council	Ward	School
Kigoma	Kasulu DC	Kitagata	Kitagata
Kigoma	Kasulu DC	Nkongoi	Malalo
Kigoma	Kasulu DC	Nyachenda	Mwali
Kigoma	Kasulu DC	Heru Ushingo	Nyarugusu
Kigoma	Kasulu DC	Kurugongo	Nyenge
Kigoma	Kasulu RC	Zone 1	Faraja
Kigoma	Kasulu RC	Zone 8	Maendeleo
Kigoma	Kasulu RC	Zone 6	Rehema
Kigoma	Kasulu RC	Zone 9	Safari
Kigoma	Kasulu RC	Zone 10	Shukuru
Kigoma	Kasulu RC	Zone 11	Sifa
Kigoma	Kasulu TC	Murusi	Juhudi
Kigoma	Kasulu TC	Ruhita	Malembo
Kigoma	Kasulu TC	Muganza	Mwibuye
Kigoma	Kibondo	Biturana	Biturana
Kigoma	Kibondo	Bunyambo	Bunyambo
Kigoma	Kibondo	Kumsenga	Kibuye
Kigoma	Kibondo	Busagara	Kifura
Kigoma	Kibondo RC	Zone 3	Kasimu Majaliwa
Kigoma	Kibondo RC	Zone 15	Maendeleo
Kigoma	Kibondo RC	Zone 21	Nyagwa
Kigoma	Kibondo RC	Zone 22	Tumaini
Kigoma	Kibondo RC	Zone 8	Undugu
Kigoma	Kigoma MC	Kagera	Kagera
Kigoma	Kigoma MC	Katubuka	Katubuka
Kigoma	Kigoma MC	Kibirizi	Kibirizi
Kigoma	Kigoma Rural	Matendo	Mayange
Kigoma	Kigoma Rural	Mwandiga	Mwandiga
Kigoma	Kigoma Rural	Nyarubanda	Nyarubanda
Kigoma	Uvinza	Kazuramimba	Kazuramimba
Kigoma	Uvinza	Mganza	Malagarasi
Kigoma	Uvinza	Mwakizega	Mwakizega
Kigoma	Uvinza	Sunuka	Sunuka
Kigoma	Uvinza	Buhingu	Vilongwa
Kilimanjaro	Hai	Masama Magharibi	Lukani
Kilimanjaro	Hai	Mnadani	Mgungani
Kilimanjaro	Hai	Masama Kusini	Msamadi
Kilimanjaro	Hai	Machame Uroki	Nkwasaringe
Kilimanjaro	Moshi DC	Kimochi	Kisaseni
Kilimanjaro	Moshi DC	Kibosho Magharibi	Kombo
Kilimanjaro	Moshi DC	Mabogini	Mabogini
Kilimanjaro	Moshi DC	Mwika Kaskazini	Marimeni
Kilimanjaro	Moshi DC	Kahe Magharibi	Mawala
Kilimanjaro	Moshi DC	Mamba Kusini	Mkolowonyi
Kilimanjaro	Moshi DC	Kahe Mashariki	Soko

Region	Council	Ward	School
Kilimanjaro	Moshi DC	Kibosho Kirima	Usagara
Kilimanjaro	Moshi DC	Kirua Vunjo Kusini	Yamu
Kilimanjaro	Moshi MC	Njoro	Chemchem
Kilimanjaro	Moshi MC	Pasua	Jitegemee
Kilimanjaro	Moshi MC	Karanga	Magereza
Kilimanjaro	Mwanga	Kirya	Kiti cha Mungu
Kilimanjaro	Mwanga	Kivisini	Kivisini
Kilimanjaro	Mwanga	Kifula	Rangaa
Kilimanjaro	Rombo	Holili	Holili
Kilimanjaro	Rombo	Motamburu Kitendeni	Kamwanga
Kilimanjaro	Rombo	Mrao Keryo	Keryo
Kilimanjaro	Rombo	Shimbi Kwandele	Kirai
Kilimanjaro	Same	Msindo	Chabaru
Kilimanjaro	Same	Kisiwani	Ijinyu
Kilimanjaro	Same	Same	Kavambughu
Kilimanjaro	Same	Myamba	Kitubwa
Kilimanjaro	Same	Ruvu	Ngama
Kilimanjaro	Siha	Makiwaru	Makiwaru
Kilimanjaro	Siha	Ngarenairobi	Namwai
Lindi	Kilwa	Kipatimu	Darajani
Lindi	Kilwa	Lihimalyao	Lihimalyao
Lindi	Lindi Rural	KitoManga	KitoManga
Lindi	Lindi Rural	Pangatena	Madangwa
Lindi	Lindi Rural	Milola	Milola A
Lindi	Lindi Urban	Mikumbi	Stadium
Lindi	Liwale	Makata	Mpengere
Lindi	Nachingwea	Mbondo	Mbondo
Lindi	Nachingwea	Ugawaji	MshikaMano
Lindi	Nachingwea	Ngunichile	Ngunichile
Lindi	Ruangwa	Malolo	Nangumbu
Lindi	Ruangwa	Mbekenyera	Naunambe
Manyara	Babati DC	Kiru	Kiru ndogo
Manyara	Babati DC	Secheda	LuxManda
Manyara	Babati DC	Magara	Magara
Manyara	Babati DC	Mamire	Mamire
Manyara	Babati DC	Nkaiti	Minjingu
Manyara	Babati DC	Riroda	Sangara
Manyara	Babati TC	Bonga	Himiti
Manyara	Babati TC	Maisaka	Sinai
Manyara	Hanang	Endasak	Endasak
Manyara	Hanang	Mogitu	Gabadaw
Manyara	Hanang	Gehandu	Gehandu
Manyara	Hanang	Hirbadaw	Hirbadaw
Manyara	Hanang	Gisambalang	Waranga
Manyara	Kiteto	Makame	Makame

Region	Council	Ward	School
Manyara	Kiteto	Matui	Matui
Manyara	Kiteto	Bwagamoyo	Msente
Manyara	Kiteto	Dosidosi	Nchinila
Manyara	Kiteto	Sunya	Sunya
Manyara	Mbulu DC	Eshkesh	Endagulda
Manyara	Mbulu DC	Endahagichan	Endahagichan
Manyara	Mbulu DC	Geterer	Getanyamba
Manyara	Mbulu DC	Dongobesh	Qaloda
Manyara	Mbulu TC	Marang	Gwandumehhi
Manyara	Mbulu TC	Nahasey	Hhasama
Manyara	Mbulu TC	Muray	Kuta
Manyara	Simanjiro	Loiborsiret	Kimelok
Manyara	Simanjiro	Emboreet	Loborsoit A
Manyara	Simanjiro	Ngorika	Nyumba ya mungu
Mara	Bunda DC	Nyamuswa	Ikizu 'A'
Mara	Bunda DC	Namhula	Karukekere 'A'
Mara	Bunda DC	Nansimo	Nansimo
Mara	Bunda DC	Salama	Salama Kati
Mara	Bunda TC	Mcharo	Mihale
Mara	Bunda TC	ManyaManyama	Mugaja
Mara	Butiama	Buhemba	Biatika
Mara	Butiama	Muriaza	Kizaru
Mara	Butiama	Buruma	Tonyo
Mara	Musoma DC	Bulinga	Kurugongo
Mara	Musoma DC	Tegeruka	Tegeruka B
Mara	Musoma MC	Kwangwa	Kwangwa
Mara	Musoma MC	Makoko	Nyarigamba 'A'
Mara	Musoma MC	Nyasho	Nyasho 'A'
Mara	Rorya	Bukura	Kirongwe
Mara	Rorya	Komuge	Komuge
Mara	Rorya	Nyamagaro	Muharango
Mara	Rorya	Goribe	Nyamusi
Mara	Serengeti	Sedeco	Bonchugu
Mara	Serengeti	Busawe	Ikorongo
Mara	Serengeti	Morotonga	Morotonga
Mara	Serengeti	Rigicha	Nyankomogo
Mara	Tarime DC	Mwema	Korotambe
Mara	Tarime DC	Kibasuka	Nyakunguru 'B'
Mara	Tarime DC	Nyanungu	Nyamombara
Mara	Tarime TC	BoMani	Buhemba
Mbeya	Busokelo	Isange	Isange
Mbeya	Busokelo	Ntaba	Kingili
Mbeya	Chunya	Nkung'ungu	Majengo
Mbeya	Chunya	Makongolosi	Mwaoga
Mbeya	Kyela	Kajunjumele	Kajunjumele

Region	Council	Ward	School
Mbeya	Kyela	Ipinda	Mwenge
Mbeya	Kyela	Ngana	Ushirika
Mbeya	Mbarali	Chimala	Lyambogo
Mbeya	Mbarali	Mawindi	Mawindi
Mbeya	Mbarali	Ruiwa	Motomoto
Mbeya	Mbeya CC	Uyole	Hasanga
Mbeya	Mbeya CC	Itagano	Itagano
Mbeya	Mbeya CC	Mabatini	Mabatini
Mbeya	Mbeya CC	Majengo	Majengo
Mbeya	Mbeya CC	Ruanda	Mkapa
Mbeya	Mbeya CC	Mwansanga	Mwasanga
Mbeya	Mbeya CC	Itezi	Mwasote
Mbeya	Mbeya DC	Mjele	Chang'ombe
Mbeya	Mbeya DC	Itewe	Idunda
Mbeya	Mbeya DC	Iyunga Mapinduzi	Izuo
Mbeya	Rungwe	Nkunga	Ibililo
Mbeya	Rungwe	Masukulu	Kiloba
Mbeya	Rungwe	Kawetela	Magereza
Morogoro	Gairo DC	Chigela	Ibuti
Morogoro	Gairo DC	Nongwe	Lukinga
Morogoro	Gairo DC	Madege	Ndogomi
Morogoro	Ifakara TC	Viwanjasitini	Ifakara
Morogoro	Ifakara TC	Mlanzi	Machipi
Morogoro	Kilombero DC	Chisano	Chisano
Morogoro	Kilombero DC	Igima	Mpofu
Morogoro	Kilombero DC	Mkula	Msufini
Morogoro	Kilombero DC	Masagati	Tanganyika
Morogoro	Kilosa DC	Talawanda	Kisanga
Morogoro	Kilosa DC	Bupigu	Mabula
Morogoro	Kilosa DC	Mkwatani	Manzese
Morogoro	Kilosa DC	Mhenda	Mhenda
Morogoro	Kilosa DC	Pemba Mnazi	Mkundi
Morogoro	Kilosa DC	Lumuma	Mkung'hulu
Morogoro	Malinyi	Malinyi	Malinyi
Morogoro	Malinyi	Sofi	Sofi
Morogoro	Morogoro DC	Bwakira Chini	Bonye
Morogoro	Morogoro DC	Kinole	Kalundwa
Morogoro	Morogoro DC	Mkambarani	Kizinga
Morogoro	Morogoro DC	Mvuha	Mvuha
Morogoro	Morogoro MC	Kihonda	Kihonda
Morogoro	Morogoro MC	Bigwa	Misongeni
Morogoro	Morogoro MC	Boma	MliMani
Morogoro	Morogoro MC	Mwembesongo	Mtawala
Morogoro	Morogoro MC	Kiwanja cha ndege	Sabasaba
Morogoro	Mvomero DC	Bunduki	Bunduki

Region	Council	Ward	School
Morogoro	Mvomero DC	Hembeti	Dihombo
Morogoro	Mvomero DC	Melela	Melela
Morogoro	Ulanga DC	Ketaketa	Ikangao
Morogoro	Ulanga DC	Uponera	Uponera
Mtwara	Masasi DC	Mlingula	Chikoweti
Mtwara	Masasi DC	Chiungutwa	Chiungutwa
Mtwara	Masasi DC	Nanganga	Mkwera
Mtwara	Masasi DC	Mnavira	Mnavira
Mtwara	Masasi TC	Mkuti	Mkuti
Mtwara	Masasi TC	Mumbaka	Mumbaka
Mtwara	Mtwara Rural	Kitere	Kitere
Mtwara	Mtwara Rural	Mahurunga	Kitunguli
Mtwara	Mtwara urban	Naliandele	Mkangala
Mtwara	Nanyamba	Njengwa	Njengwa
Mtwara	Nanyumbu	Kitunda	Lukula
Mtwara	Nanyumbu	Michiga	Michiga A
Mtwara	Nanyumbu	Nandete	Nandete
Mtwara	Newala DC	Chiwonga	Mmulunga
Mtwara	Newala DC	Nakahako	Nakahako
Mtwara	Newala TC	Luchingu	Butiama
Mtwara	Tandahimba	Tandahimba	AMani
Mtwara	Tandahimba	Mkoreha	Kilidu Mkoreha
Mtwara	Tandahimba	Mkwiti	Mkwiti
Mwanza	Buchosa DC	kazunzu	Kakobe
Mwanza	Buchosa DC	Kanoni	Kanoni
Mwanza	Buchosa DC	Kafunzo	Luhorongoma
Mwanza	Buchosa DC	Lugaja	Nyakabanga
Mwanza	Ilemela	Buswelu	Bulola
Mwanza	Ilemela	Nyakato	Ibeshi
Mwanza	Ilemela	Kirumba	Kirumba
Mwanza	Ilemela	Sangabuye	Nyafula
Mwanza	Kwimba DC	Lyoma	Busule
Mwanza	Kwimba DC	Ng'hundi	Igunguhya
Mwanza	Kwimba DC	Mwagi	Mwabilanda
Mwanza	Kwimba DC	Fukalo	Ndamhi
Mwanza	Kwimba DC	Shilembo	Shigangama
Mwanza	Magu DC	Kahangara	Bundilya
Mwanza	Magu DC	Nkungulu	Mwashepi
Mwanza	Magu DC	Bujashi	Sese
Mwanza	Missungwi	Bulemeji	Buganda
Mwanza	Missungwi	Gulumungu	Lukanga
Mwanza	Missungwi	Lubili	Mabale
Mwanza	Missungwi	Kalebezo	Misungwi
Mwanza	Missungwi	Shilalo	Mwamboku
Mwanza	Nyamagana	Buhongwa	Bulale

Region	Council	Ward	School
Mwanza	Nyamagana	Butimba	Butimba
Mwanza	Nyamagana	Igoma	Igoma
Mwanza	Nyamagana	Mabatini	Mabatini A
Mwanza	Nyamagana	Pamba	Miembeni
Mwanza	Nyamagana	Mirongo	Mirongo
Mwanza	Nyamagana	Igoma	Shamaliwa
Mwanza	Nyamagana	Mhandu	Shigunga
Mwanza	Sengerema DC	Kagunga	Kagunga
Mwanza	Sengerema DC	Kahumulo	Kahumulo
Mwanza	Sengerema DC	Kasenyi	Kasenyi
Mwanza	Sengerema DC	Nyamizeze	Nyamizeze
Mwanza	Ukerewe DC	Bukiko	Bukiko
Mwanza	Ukerewe DC	Namagondo	Mukasika
Mwanza	Ukerewe DC	Bwiro	Mwigoye
Mwanza	Ukerewe DC	Ngoma	Nantare
Njombe	Ludewa	Lupingu	Lupingu
Njombe	Ludewa	Mundindi	Njelela
Njombe	Makambako TC	Utengule	Mawande
Njombe	Makambako TC	Maguvani	MshikaMano
Njombe	Makete	Kinyika	Kinyika
Njombe	Makete	Lupalilo	Mago
Njombe	Njombe DC	Kichiwa	Ibumila
Njombe	Njombe DC	Mfriga	Iditima
Njombe	Njombe TC	Kifanya	Msindu
Njombe	Njombe TC	Yakobi	Yakobi
Njombe	Wang'ing'ombe	Igima	Igima
Njombe	Wang'ing'ombe	Igosi	Ivigo
Njombe	Wang'ing'ombe	Uhambule	Uhambule
Pwani	Bagamoyo	Makurunge	Bigilo
Pwani	Bagamoyo	Kerege	Kerege
Pwani	Chalinze	Mandera	Hondogo
Pwani	Chalinze	Mbwewe	Kwang'andu
Pwani	Chalinze	Vigwaza	Ruvu darajani
Pwani	Kibaha DC	Kikongo	Ngeta
Pwani	Kibaha TC	Mkuza	Jitihada
Pwani	Kibaha TC	Visiga	Visiga
Pwani	Kibiti	Mchukwi	Mchukwi
Pwani	Kibiti	Mahege	Tomoni
Pwani	Kisarawe	Msimbu	Msimbu
Pwani	Mafia	Baleni	Kipingwi
Pwani	Mkuranga	Mnongodi	Kilimahewa
Pwani	Mkuranga	Mkuranga	kitumbo
Pwani	Mkuranga	Magawa	Nganje
Pwani	Rufiji	Mwaseni	Mtanza

Region	Council	Ward	School
Pwani	Rufiji	Mohoro	Ndundutawa
Rukwa	Kalambo	Kasanga	Kasanga
Rukwa	Kalambo	Mbuluma	Mbuluma
Rukwa	Kalambo	Legeza Mwendo	Mkombo
Rukwa	Nkasi	Isale	Ifundwa
Rukwa	Nkasi	Kabwe	Kanchui
Rukwa	Nkasi	Kate	Kate
Rukwa	Nkasi	Ninde	Kisambala
Rukwa	Sumbawanga DC	Ilemba	Ilemba
Rukwa	Sumbawanga DC	Mpui	Ilembo
Rukwa	Sumbawanga DC	Mfinga	Kasekela
Rukwa	Sumbawanga DC	Miangalua	Miangalua
Rukwa	Sumbawanga DC	Msanda Muungano	Msanda Muungano
Rukwa	Sumbawanga DC	Muze	Rukwa
Rukwa	Sumbawanga MC	Matanga	Chelenganya
Rukwa	Sumbawanga MC	Mollo	Isesa
Rukwa	Sumbawanga MC	Sumbawanga	Momoka
Rukwa	Sumbawanga MC	Senga	Wipanga
Ruvuma	Madaba	Mateteleka	Matetereka
Ruvuma	Madaba	Gumbiro	Ngadinda
Ruvuma	Mbinga DC	Litumbandyosi	Litumbandyosi
Ruvuma	Mbinga DC	Maguu	Maguu
Ruvuma	Mbinga TC	Mbinga A	Kiwanjani
Ruvuma	Mbinga TC	Mpepai	Mpepai
Ruvuma	Namtumbo	Kitanda	Karume
Ruvuma	Namtumbo	Ligera	Ligera
Ruvuma	Namtumbo	Namtumbo	Suluti
Ruvuma	Nyasa	Liuli	Hongi
Ruvuma	Nyasa	Luhangarasi	Kimbango
Ruvuma	Nyasa	Linga	Litumba Kuhamba
Ruvuma	Songea DC	Magagula	Magagura
Ruvuma	Songea DC	Mahukuru	Nakawale
Ruvuma	Songea MC	Lilambo	Likuyufusi
Ruvuma	Songea MC	Msamala	Miembeni
Ruvuma	Songea MC	Mletele	Mletele
Ruvuma	Songea MC	Majengo	Songea
Ruvuma	Tunduru	Ligoma	Ligoma
Ruvuma	Tunduru	Lukumbule	Lukumbule

Region	Council	Ward	School
Ruvuma	Tunduru	Namiungo	Namiungo
Ruvuma	Tunduru	Nandembo	Nandembo
Shinyanga	Kahama TC	Kagongwa	Kishima B
Shinyanga	Kahama TC	Majengo	Majengo
Shinyanga	Kahama TC	Zongomera	Zongomera
Shinyanga	Kishapu DC	Mwasubi	Mwasubi
Shinyanga	Kishapu DC	Ngofila	Ngofila
Shinyanga	Kishapu DC	Shagihilu	Shagihilu
Shinyanga	Kishapu DC	Songwa	Songwa
Shinyanga	Msalala DC	Ngaya	Butegwa
Shinyanga	Msalala DC	Jana	Kadati
Shinyanga	Msalala DC	Mega	Masabi
Shinyanga	Shinyanga DC	Samuye	Ishinabulandi
Shinyanga	Shinyanga DC	Itwangi	Kidanda
Shinyanga	Shinyanga DC	Lyamidati	Lyamidati
Shinyanga	Shinyanga DC	Lyabusalu	Mwajilugula
Shinyanga	Shinyanga MC	Kitangili	Kitangili
Shinyanga	Shinyanga MC	Kolandoto	Mwamagunguli A
Shinyanga	Shinyanga MC	Masekelo	Ndala
Shinyanga	Ushetu DC	Mapamba	Nussa
Shinyanga	Ushetu DC	Nyankende	Sinwankere
Simiyu	Bariadi DC	Matongo	Matongo 'B'
Simiyu	Bariadi DC	Mwadobana	mwadobana
Simiyu	Bariadi DC	Sakwe	Sakwe
Simiyu	Bariadi TC	Nyangokolwa	Gamondo B
Simiyu	Bariadi TC	Bunamhala	KidaliManda
Simiyu	Busega	Mkula	Kijereshi
Simiyu	Busega	Shigala	Shigala
Simiyu	Busega	Kiloleli	Yitwimila
Simiyu	Itilima	Mwamapalala	idoselo
Simiyu	Itilima	Lagangabilili	Lagangabilili
Simiyu	Itilima	Mwaswale	Ng'walali
Simiyu	Itilima	Sawida	sawida 'B'
Simiyu	Maswa DC	Malampaka	Bukigi
Simiyu	Maswa DC	Mpindo	IguMangobo
Simiyu	Maswa DC	Seng'wa	mwanundi
Simiyu	Maswa DC	Nguliguli	Mwashegeshi
Simiyu	Meatu	Mwanjolo	Chambala
Simiyu	Meatu	Mwabuma	Mwabuma
Simiyu	Meatu	MwaManongu	Mwamagembe
Singida	Ikungi	Irisya	Kisiluda
Singida	Ikungi	Ntuntu	Ntewa
Singida	Iramba	Kyengege	Mugundu
Singida	Iramba	Ndulungu	Mwanduigembe
Singida	Iramba	Shelui	Tintigulu

Region	Council	Ward	School
Singida	Iramba	Tulya	Tulya
Singida	Itigi	Itigi-Majengo	Mlowa
Singida	Manyoni	Manyoni	Majengo
Singida	Manyoni	Isseke	Mangoli
Singida	Mkalama	Mwangeza	Endasiku
Singida	Singida DC	Itaja	Kinyamwenda
Singida	Singida DC	Mudida	Mpipiti
Singida	Singida DC	Mrama	Mrama
Singida	Singida DC	Mughunga	Mughunga
Singida	Singida MC	Uhamaka	Itiiti
Singida	Singida MC	Mwankoko	Mwankoko
Singida	Singida MC	Utemini	Sabasaba
Songwe	Ileje	Bupigu	Ibungu
Songwe	Ileje	Chitete	Ikumbilo
Songwe	Ileje	Ikinga	Kapeta
Songwe	Mbozi	Idiwili	Idiwili
Songwe	Mbozi	Vwawa	Ilembo
Songwe	Mbozi	Itaka	Insani
Songwe	Mbozi	Ipunga	Ipanzya
Songwe	Mbozi	Itumpi	Itumpi
Songwe	Mbozi	Myovizi	Myovizi
Songwe	Mbozi	Nambinzo	Nambinzo
Songwe	Momba	Kapele	Chisitu
Songwe	Momba	Mkulwe	Chuo
Songwe	Momba	Mkomba	Mkomba
Songwe	Songwe DC	Mbangala	Maleza
Songwe	Songwe DC	Mkwajuni	Mkwajuni
Songwe	Tunduma TC	Chiwezi	Chiwezi
Songwe	Tunduma TC	Majengo	Majengo
Tabora	Igunga	Igoweko	buhekela
Tabora	Igunga	Chomachankola	Choma
Tabora	Igunga	Isakamaliwa	Hindishi
Tabora	Igunga	Nyandekwa	Itale
Tabora	Igunga	Igunga	Makomero
Tabora	Kaliua	Usinge	Majengo
Tabora	Kaliua	Nhwande*	Ng'wande
Tabora	Kaliua	Ushokola	Pozamoyo
Tabora	Kaliua	Uyowa	Uhindi
Tabora	Kaliua	Isagenhe	Zugimlole
Tabora	Nzega DC	Tongi	Chabutwa
Tabora	Nzega DC	Mwangoye	Isese
Tabora	Nzega DC	Kamanhalanga	Kahama ya Nhalanga
Tabora	Nzega DC	Milambo Itobo	Kakulungu
Tabora	Nzega DC	Isagenhe	Kidete
Tabora	Nzega TC	Nzega Ndogo	Nzega ndogo

Region	Council	Ward	School
Tabora	Sikonge	Mpombwe	Ibaya
Tabora	Sikonge	Kitunda	Kapumpa
Tabora	Sikonge	Kipili	Kipili
Tabora	Tabora MC	Uyui	Kalumwa
Tabora	Tabora MC	Cheyo	Mihayo
Tabora	Tabora MC	Ntalikwa	Mtakuja
Tabora	Urambo	Imalamakoye	Imalamakoye
Tabora	Urambo	Songambele	Mlangale
Tabora	Urambo	Nsenda	Mtakuja
Tabora	Uyui	Ufuluma	Chesa
Tabora	Uyui	Bukumbi	Ishihimulwa
Tabora	Uyui	Ibelamilundi	Itobela
Tabora	Uyui	Kizengi	Malongwe
Tabora	Uyui	Miswaki	Mwamdalaigwe
Tabora	Uyui	Isila	Ulimakafu
Tanga	Bumbuli	Funta	Gangacha
Tanga	Bumbuli	Mgwashi	Mgwashi
Tanga	Bumbuli	Nkongoi	Tuliani
Tanga	Handeni DC	Kitumbi	Kitumbi
Tanga	Handeni DC	Kwaluguru	Kwamagombe
Tanga	Handeni DC	Kwamsisi	Kwedikabu
Tanga	Handeni DC	Kwedizinga	Kwedizinga
Tanga	Handeni TC	Kideleko	Bangu
Tanga	Kilindi	Kilwa	Kimembe
Tanga	Kilindi	Kwekivu	Kitingi
Tanga	Kilindi	Kibirashi	Kwamaligwa
Tanga	Korogwe DC	Magoma	Kijango
Tanga	Korogwe DC	Mkomazi	Mkomazi
Tanga	Korogwe TC	Kilole	Kilole
Tanga	Lushoto	Lukozi	Kinko
Tanga	Lushoto	Lunguza	Kivingo
Tanga	Lushoto	Mwangoi	Majulai
Tanga	Mkinga	Bosha	Kuze
Tanga	Mkinga	Duga	Mwakikoya
Tanga	Muheza	AMani	AMani
Tanga	Muheza	Mtindiro	Mtindiro
Tanga	Pangani	Pangani Magharibi	Pangani
Tanga	Tanga CC	Mabokweni	Kiruku
Tanga	Tanga CC	Marungu	Kwamkembe
Tanga	Tanga CC	Makorora	Makorora