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Malnutrition Hotspots Mapping & Analysis in Marsabit County

USAID FROM THE AMERICAN PEOPLE

COUNTY GOVERNMENT OF MARSABIT THE CRADLE OF MANKIND

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Nawiri

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List of Abbreviations and Acronyms

ASAL	Arid and Semi-Arid Lands
CRS	Catholic Relief Services
ENA	Emergency Nutrition Assessment
GAM	Global Acute Malnutrition
IPC	Integrated Phase Classification
MUAC	Mid-Upper Arm Circumference
NAWIRI	Nutrition in ASALs Within Integrated Resilient Institutions
NCA	Nutrition Causal Analysis
NDMA	National Drought Management Agency
PPS	Proportionate to Population Size
SMART	Standardized Monitoring and Assessment of Relief and Transitions
USAID	United States Agency for International Development
WFH	Weight-for-Height
WHO	World Health Organization
WHZ	Weight-for-Height Z-Scores

Executive Summary

Introduction

This report summarizes the outcomes of the identification of acute malnutrition hotspots and seasonality trends analysis in Marsabit County. The rates of acute malnutrition in Marsabit County are persistently above the emergency threshold (≥15%) despite significant investment for both programming and research, triggering humanitarian responses to the problem in the short term. In response to these persistent and high levels of acute malnutrition, the Nawiri project aims to increase stakeholder understanding of the drivers of persistent acute malnutrition through a collaborative learning process involving a wide range of actors. The learning will be useful in designing context-sensitive, systems-driven, multisectoral approaches to sustainably reduce acute malnutrition. The identification of clusters of acute malnutrition (hotspots) in Marsabit County that consistently show high levels of acute malnutrition will inform the targeting of research and learning activities.

Methodology

A retrospective systematic review of secondary data of children under age 5 from 2010 to 2019 was conducted to establish the levels of acute malnutrition at the county, subcounty and ward levels. Two sets of data were used: (a) Integrated Standardized Monitoring and Assessment of Relief and Transitions (SMART) to establish the level of global acute malnutrition (GAM) for identification of the malnutrition hotspots; and (b) Middle Upper Arm Circumference (MUAC) data from sentinel surveillance sites by the National Draught Management Authority (NDMA) to analyze malnutrition trends over the years and seasons. The granularization of data was applied from county to subcounty and ward levels.

MUAC data is collected on a monthly basis and is, therefore, appropriate for trend analysis. Only data that met the quality parameters (representativeness, plausibility checks, number of clusters/sentinel sites, sample size, etc.) were included in the data set for analysis. Malnutrition hotspots were identified at the subcounty and ward levels, whereas seasonality was analyzed at the county and subcounty levels. GAM based on the weight for height (WHZ) and MUAC were the nutritional status outcome indicators used. Integrated Phase Classification (IPC) for acute malnutrition was used to categorize the severity of acute malnutrition.

Major findings

Malnutrition hotspots

Marsabit County experienced persistent acute malnutrition (WHZ) among children under age 5 during the period 2010 to 2019. The county showed either critical (15%–29.9% GAM) or serious (10%–14.9% GAM) phases of acute malnutrition based on the IPC classification of acute malnutrition. There were variations in the GAM rates from one year to another, with the most critical years of malnutrition being 2011, 2014, 2017, 2018 and 2019. At the subcounty level, North Horr and Laisamis are acute malnutrition hotspots whereas Saku and Moyale subcounties were stable with GAM (WHZ) rates below emergency levels in the period 2010 to 2019.

All the wards in North Horr (North Horr, Turbi, North Horr, Illeret, Maikona and Dukana) and Laisamis subcounties (Korgi-South, Loiyangalani, Laisamis, Korr-Ngurut and Loglogo) showed the greatest vulnerability to acute malnutrition (GAM ≥ 15%) in the majority of the years from 2012 to 2019.

Despite Moyale Subcounty not being a hotspot, there were pockets in three wards (Golbo, Uran and Obbu) that reported acute malnutrition at the emergency level (≥15%) at least once between 2010 and 2019. Golbo Ward presented acute malnutrition above the emergency threshold in three of the 10 years, while Uran and Obbu each exhibited one emergency year in the same period. These findings demonstrate that the granularity of data to ward levels is worthwhile to show exactly where the hotspots are situated and is thus useful for targeting program interventions.

Saku Subcounty is the most stable, with GAM rates below emergency levels in all years except 2019 in Karare Ward, which reported a GAM of 27.3%. Karare is a ward to watch out for as most of the years it registered a serious phase (10%–14.9%) of acute malnutrition, mostly tending toward the upper margin of the phase classification.

Acute malnutrition by seasonality

There are four seasons in Marsabit county: the short dry season (January to March); the long rains season (April to June); the long dry and cool season (July to October); and the short rains season (November to December). The seasonality trend analysis was conducted based on GAM from SMART and MUAC data. In most of the years, SMART surveys were conducted during the dry and cool seasons; therefore, there is no representation of all the seasons in the SMART survey data. The rationale for conducting surveys during the dry and cool season is that Marsabit relies on the long rain season and, should the rains fail, there is a high likelihood of increased food insecurity and, consequently, increased acute malnutrition. The surveys conducted during this season offer an opportunity to monitor malnutrition trends when they are expected to increase to the highest level. The GAM trend seasonality analysis based on SMART survey data is therefore indicative and not conclusive. The monthly MUAC data from NDMA was also used to analyze the trends of acute malnutrition across the seasons from 2010 to 2019.

Overall, there were differences in seasonality trends based on data from SMART surveys and MUAC data. Based on the SMART survey data, the dry and cool season presented the highest risk or vulnerability to acute malnutrition and the long rains season was also observed to be a major risk factor for malnutrition. In contrast, based on the MUAC data, the risk for high malnutrition was spread across seasons; the dry season, the long rains seasons and the short rains season presented the highest risk for malnutrition, with the dry cool season presenting the least vulnerability to acute malnutrition.

Conclusions

Marsabit County, like the other ASAL counties, has always been known to be an acute malnutrition hotspot. The findings about the acute malnutrition hotspots have demonstrated the importance of granularity in the identification of the hotspots. The GAM rates from the SMART surveys are presented only at the county level; the granularity of the data to ward level has helped identify hotspots that may need more attention in the efforts to mitigate malnutrition.

Acute malnutrition in Marsabit County manifests across the seasons of the year based on both SMART survey and MUAC data. This may be an indication of the presence of other drivers, apart from seasonality, that influence acute malnutrition. Based on the SMART survey data, the dry cool season presented the greatest risk for malnutrition. The majority of the surveys were, however, conducted during the dry cool season and this may have introduced bias in the findings. Judged by MUAC data, the seasons which presented the greatest risk for malnutrition were the dry season, the long rains season and the short rains season; the least risk was the dry and cool season. These findings are an indication of the need to investigate, at the ward level, the risks for malnutrition because they are context-specific and, therefore, should be addressed specifically and appropriately.

1. Introduction

This report summarizes the outcomes of acute malnutrition hotspots mapping and analysis in Marsabit County for the recently launched U.S. Agency for International Development USAID Nawiri program, a five-year, evidence-based nutrition initiative which is being led by Catholic Relief Services (CRS) in Isiolo and Marsabit counties.

1.1 Background Information on Marsabit County

Marsabit County is located in the upper eastern region of Kenya. It shares an international boundary with Ethiopia to the north, borders Lake Turkana to the west, Samburu County to the south and Wajir and Isiolo counties to the east. It covers an area of 70,961.2km2. The county has four subcounties, namely North Horr, Moyale, Saku and Laisamis. Marsabit County is among the 23 ASALs of Kenya.[1] The county has a total population of 459, 785 persons.[2] Additionally, it is the least populated county in the country in terms of people per km2 with a density of four people per km2. The county is composed of different ethnic groups including the Gabbra, Rendile, Borana, Turkana, Samburu, Burji, El Molo, Dassanach and Waata. The county is hot and dry most months of the year, with two rainy seasons. The long rains season occurs between April and June, and the short rains season occurs between November and December.

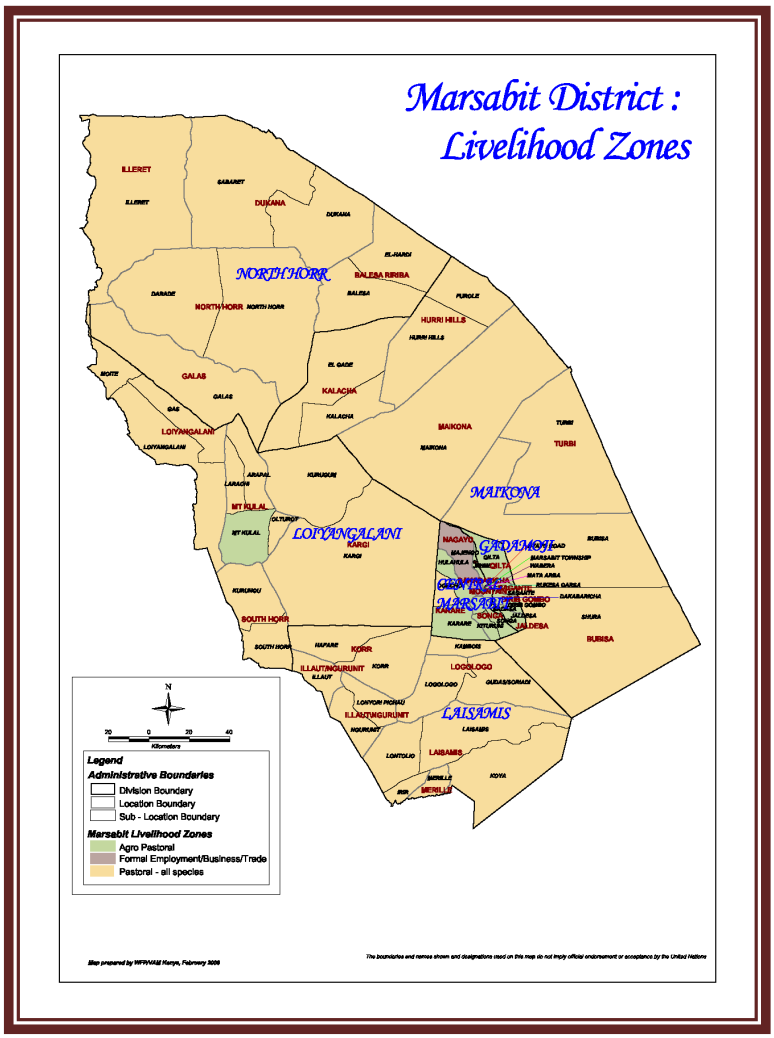


Figure 1: Livelihoods in Marsabit County

The county is characterized by recurrent droughts and is a hot and dry climate with low and erratic rainfall patterns. The dry season is characterized by a short dry season (January to March) and a long dry and cool season from (July to October).[3]

[1] Republic of Kenya, County Government of Marsabit, Second County Integrated Development Plan, 2018–2022
[2] Republic of Kenya, 2019 Kenya Population and Housing Census. Volume I: Population by County and Subcounty. November 2019.
[3] Republic of Kenya, County Government of Marsabit, Second County Integrated Development Plan, 2018–2022

The county is divided into four ecological zones, namely:

- Agro-ecological zone III: This zone has rainfall and is suitable for horticultural and food crop production such as maize, beans, fruits and vegetables. It comprises only 1% of the total land area in the county.
- Agro-ecological zone IV covers 2% of the total land area and is suitable for settled livestock rearing and some mixed farming with dryland crops.
- Agro-ecological zone V covers 28% of the total land area and includes landmasses falling between 700m-1000m above sea level. The vegetation here includes acacia tortillas woodland on stony soils and acacia bushland on deeper soils. The land is suitable for small animals such as goats.
- Agro-ecological zone VI covers 69% of the total land area and lies 700m above sea level. High rates of evaporation and salt deposits cause stunted grass growth. It is only suitable for camels.

The county has three main livelihood zones: pastoral, agro-pastoral, and formal employment/business/trade representing 81%, 16% and 3% respectively,[4] as shown in Figure 1. Pastoralists dominate almost all parts of the four subcounties, with agro-pastoralists mostly notable in Saku and some parts of Moyale subcounties. The other livelihoods are mainly notable in urban areas of the county and subcounty capitals. Agricultural and livestock productivity is worsened by limited, unreliable, and poorly distributed rainfall patterns. In recent years, the rains have become erratic and unpredictable making it difficult to plan for farming.[5]

1.1.1 Resilience

Marsabit is vulnerable to many shocks affecting the county's resilience. Marsabit is among the most conflict-prone counties in Kenya. The residents are mainly pastoralist nomads who often clash over access to scarce pasture and water, and cross-border tensions. Women bear the sole responsibility for collecting water and firewood and for feeding their children—the maternal load being too high for them to afford adequate time to provide quality care for their young children. Pastoralist families in this region rely heavily on markets for buying core foods such as rice, sugar, potatoes and cooking fat against a background of the poor transportation system. The county experiences poor health and nutrition outcomes due to poor community health services, the vastness of the county and rough terrain, particularly in North Horr and Laisamis, affecting transportation and accessibility to health facility health services.

Marsabit remains amongst the counties with the highest poverty index in Kenya and ranked 44 out of 47 counties, with a poverty rate of 83.2% compared to the national level as of 2012.[6] The county has initiated programs and projects geared toward poverty eradication, such as supplementing the national government cash transfer programs to the vulnerable groups, especially the poorest of the poor—total orphans, older persons and people with disabilities, among others. The county government plans to address gendered social and economic inequalities to ensure that all men and women, particularly the poor and the vulnerable, have equal rights to economic resources. This includes access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services such as microfinance. As a result, this will build the resilience of the

[4]Republic of Kenya, County Government of Marsabit, Second County Integrated Development Plan, 2018–2022

[5] Republic of Kenya. Isiolo County Integrated Development Plan, CIDP 2018–2022. March 2018

[6] Republic of Kenya, County Government of Marsabit, Second County Integrated Development Plan, 2018–2022

poor and other vulnerable groups and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

Marsabit is vulnerable to climate change, and this affects agricultural and livestock production. The county is committed to supporting agricultural production and local economic growth by strengthening extension service to farmers, including women agriculturalists, and by providing basic transport infrastructure and markets to promote exchange in local food chains.

To improve Marsabit's health and nutritional situation, the county plans to use health care services to address the nutritional needs of women and children. It will also use early childhood development education centers (ECDEs) to identify and tackle child malnutrition so that everyone can enjoy a safe, nutritious diet year-round. The county has the huge responsibility of ensuring local communities have access to good quality health care so they can live a healthy life. The county will establish various programs and projects geared toward improving health care services. All these programs are geared toward improving the resilience of people in the county.

1.1.2 Food security situation

Marsabit, like other ASAL counties, faces chronic food insecurity. Food insecurity is often classified as a stress or crisis based on the IPC food security and malnutrition analysis conducted twice yearly (long rains and short rains seasons). The most current IPC[7] classified the county as being in a critical situation. Among the drivers of food insecurity is poor rainfall amounts and distribution. This results in poor crop and livestock production, and the scarcity of rangeland resources. This scarcity triggers livestock migration to other grazing areas, leading to resource-based conflict among ethnic groups. Infestation by desert locusts in the year 2020 affected cropland and rangeland. COVID-19 slowed down operations due to limited access to livestock markets. Transport operators also raised costs. Poor marketing of food products is another driver of food insecurity. The county government plans to address food insecurity through investment in the livestock sector and crop farming. The county will seek to boost food production through targeted irrigation schemes around mega-dams planned by the water sector in areas with farming potential. The county aims to improve livestock productivity by developing adequate water infrastructure, timely control of vector-borne diseases, training and equipping animal health workers, and developing a strategic policy for livestock sector development. To improve the profitability of the livestock trade sector, the county shall invest in better coordination of livestock value chains, creative branding of meat products from Marsabit County and structural changes to enable better linkages to meat clients in Nairobi and export markets. In addition to the main livestock sector, the county plans to invest in the fishing, poultry and leather industries to benefit from conditional funding from the national government.

1.1.3 Nutritional situation

Marsabit, like other ASAL counties, continues to bear a high burden of malnutrition. The rate of wasting has consistently remained above the emergency threshold (>15%) despite the years-long presence of agencies and development partners implementing programs in these counties to improve household health, nutrition and food security. Levels of acute malnutrition remain a serious public health concern in Marsabit County.

[7] Integrated Phase Classification Acute Food Insecurity and Acute Malnutrition Analysis August–December 2020

Based on the most current SMART survey, conducted in July 2019, the rate of malnutrition among children under age 5 was 18%, with the highest rate in Laisamis Subcounty at 30.7% and North Horr at 25.1%.[8] It was projected in the August–December IPC[9] that Marsabit would be in the critical phase of malnutrition, implying no improvement of the nutrition situation of children under age 5.

According to the findings of SMART surveys and the IPCs, the drivers of poor nutrition in Marsabit County have not changed significantly. The main drivers of acute malnutrition include inappropriate infant feeding and childcare practices, suboptimal coverage of health and nutrition services and a high level of morbidity in children less than 5 years old. Other drivers of acute malnutrition include poor hygiene and sanitation practices. Poor hygiene and sanitation lead to an increase in waterborne diseases such as diarrhea and cholera outbreaks. Pre-existing vulnerabilities such as low literacy levels, limited livelihood assets and poverty continue to expose households and communities to persistently high levels of malnutrition.[10] The Ministry of Health, together with partners such as Concern Worldwide, has been implementing High Impact Nutrition Interventions (HiNi) services in the county to improve the nutritional status of children and women.

The COVID-19 pandemic has disrupted basic social services like health and education, as well as livelihood engagements for households. The interruption of essential services was observed in April 2020 and May 2020, with a drastic reduction in the number of clients seeking essential health and nutrition services. This was due to the fear and anxiety associated with COVID-19 pandemic testing and quarantine, misinformation on service availability across health facilities and the fear of contracting the disease at health facilities. Nonetheless, an upward trend in the number of clients was observed in June 2020 and July 2020, following community sensitization on the availability and continuity of health services.[11]

[8] Ministry of Health, Integrated Standardized Monitoring and Assessment in Relief and Transitions (SMART), July 2019.
[9] Integrated Phase Classification (IPCa Acute Food Insecurity and Acute Malnutrition Analysis August–December 2020
[10] Republic of Kenya. Ministry of Health. Integrated Food Security Phase Classification (IPC) Acute Food Insecurity and Acute Malnutrition Analysis February–March 2020.
[11] Republic of Kenya. Ministry of Health. Integrated Food Security Phase Classification (IPC); Acute Food Insecurity and Acute Malnutrition Analysis August 2020.

2. Background to the USAID Nawiri Project

2.1 Project goal

To sustainably reduce levels of persistent acute malnutrition in Kenya's ASALs—Isiolo, Marsabit, Turkana and Samburu

2.2 Project implementation

The five-year project (October 2019 to September 2024) will be implemented in two phases.

First phase (Yr. 1–2) will be collaborative learning and design to build evidence toward immediate and underlying drivers and remedies to sustainably reduce levels of acute malnutrition in the county.

The Second phase (Yr. 3–5) will be using the learning derived from the first phase to jointly design effective multisectoral approaches to sustainably reduce acute malnutrition. The design of the project is such that county government takes lead of the process and is facilitated by implementing partners**.**

2.3 Justification for the malnutrition hotspots malnutrition analysis and mapping

The identification of hotspot clusters with consistently high levels of acute malnutrition in Isiolo and Marsabit counties will enable Nawiri to target and implement interventions and strategies in geographical areas where the project would have the greatest impact.

3. Methodology for Malnutrition Hotspot Analysis and Mapping and Seasonality Trend Analysis

3.1 Design

A retrospective systematic review of secondary data of children under 5 years of age from 2010 to 2019 was conducted to establish nutritional status at the county, subcounty and ward levels.

The 10-year period was considered adequate to allow for the comparability of malnutrition thresholds across time, seasons and populations. The disaggregation of nutritional status data by subcounty and ward levels allowed for the analysis and identification of the malnutrition hotspots and for seasonal trend analysis.

Two sets of data were used: (a) SMART data to establish the level of GAM for the analysis and identification of the malnutrition hotspots and (b) MUAC data from sentinel surveillance sites by NDMA to analyze malnutrition trends over the years and seasons at the county, subcounty and ward levels. MUAC data is collected on a monthly basis and is therefore appropriate for trend analysis. The SMART data was also used, but to a limited extent, in establishing seasonal trends because the majority of the surveys were conducted during the same season—the dry season following the short rains season.

3.2 Indicators for hotspot mapping and seasonal trend analysis

Outcome indicators: The indicator used for GAM is Weight-for-Height Z-scores (WHZ- Scores) derived from the raw anthropometry data from SMART surveys conducted in Marsabit County from 2010 to 2019. GAM based on MUAC data was used to establish levels of malnutrition for the same period and for trend analysis over time and seasons.

3.3 Data Quality

3.3.1 SMART survey data

Data representativeness (indicators are shown in Table 1) was an important consideration in the selection of data to use for analysis and identification of malnutrition hotspots at county, subcounty, and ward levels. Data was derived from SMART surveys conducted in the county between 2010 and 2019. In the first stage of sampling, SMART surveys use the Probability Proportionate to Population Size (PPS) sampling technique to ensure proportionate distribution of clusters/villages. The second stage involves simple random sampling of households with the target population—children ages 6 to 59 months old. Therefore, SMART surveys, if appropriately conducted, are representative of the study population. The data from the SMART surveys was scrutinized for quality and representativeness before being included in the hotspot analysis. The data quality parameters used included the Design Effect (DEF), which is used to determine the homogeneity/heterogeneity of the distribution of acute malnutrition—DEF <1.3 indicates homogeneity and DEF ≥1.3 heterogeneity. Other quality parameters used for inclusion into the SMART data for analysis included having acceptable plausibility scores (<15%); having a minimum number of 25 clusters per analysis unit; GAM interpreted using SMART flags and WHO Child Growth Standards 2006.

GAM interpreted using WHZ was given higher evidence level than GAM based on MUAC, as shown in **Table 1.**

Available data from SMART surveys that met the quality parameters (Table 1) was considered, and both raw and processed data were used to determine the hotspots in Marsabit County. The raw data from SMART surveys conducted over the years had already been cleaned and validated by the National Information Technical Working Groups (NITWGs) and was confirmed to have met the thresholds for the quality criteria. All the data met the quality parameters and, therefore, no data was omitted from the analysis. Most of the sampling was done at the county level, and sample sizes met the quality criteria at the county and subcounty levels. The ward sample sizes, however, did not meet the minimum criteria for sample size. Hence, it has been used as indicative of vulnerability to acute malnutrition at that level.

The SMART data was sourced from the Ministry of Health, which is the custodian of this data.

Table 1: Thresholds for data quality checks and representativeness

Parameters	Quality and representativeness control	Remarks
1. Evidence (data source	• Representative surveys with PPS sampling for representativeness and comparability • Meet the minimum number of clusters/sample size (25 clusters)	• All SMART survey data met the criteria
2. Weight and height data	• Acceptable Plausibility scores (<15) using ENA	• Plausibility test met
3. MUAC data (NDMA)	• MUAC data must present age, sex, and numerical measurements and NOT color codes	• All data met the criteria
	• Age appropriateness (ages 6–59 months)	• Flags by age were 4,219, approximately 4% removed
	• MUAC measurements (70mm–220mm)	• Records removed: 649 (<1%)
	• Standard deviation (>18mm)	• NONE of the units of analysis (county and subcounty) had standard deviation (SD_ >18
4. Classification of acute malnutrition	• GAM by WHZ, MUAC or Edema • GAM based on WHZ gets a higher evidence level than e GAM based on MUAC	• GAM based on WHZ was used to classify acute malnutrition while MUAC data was used to analyze GAM trends across the seasons
5. Disaggregation of data from higher administrative level (county) and data	• The decision on the use of estimates and the reanalysis was based on the DEF	• Data at ward level did not meet the disaggregation criteria, and hence used as an

reanalysed rfor lower administrative level e.g., subcounty, or ward	○ DEF at the higher admin level of <1.3 indicated homogeneity in findings and the same estimates applied to lower levels (no need for reanalysis) ○ If DEF at the higher admin level is ≥1.3 and <1.7 indicated heterogeneity in findings and need to reanalyze for lower administration levels ✓ Need to have at least 5 clusters and 100 children per unit of analysis ✓ DEFF of the reanalyzed estimates should be DEF <1.3	indication of vulnerability due to the low number of children and clusters. They were, however, comparable at the ward level due to the PPS approach in sampling.

3.3.2 MUAC data

Data aggregation and quality checks

The NDMA collects information monthly from sentinel sites in Kenya's ASAL region as part of the early warning system that has been in place since the 1990s. Among the information collected is MUAC for children ages 6 to 59 months old. Sentinel Marsabit County was analyzed for the period 2010[12] to 2019 for the four subcounties of Marsabit—namely Laisamis, Moyale, North Horr and Saku Subcounties.

In 2015, the early warning system adopted online technology aimed at ensuring a more robust system of data collection, analysis and dissemination. During the transition period, the number of sentinel sites was reduced in the ASAL counties with sites in Marsabit County cut down to 11 from 16[13] (Table 2). In addition to the constitutional changes in 2010 that saw the formation of devolved county governments and the realignment of geographical boundaries, the change of database system meant that two distinct data sets existed and needed aggregation to inform the seasonality of acute malnutrition. Thus, two datasets existed for 2010 to 2015 and 2016 to 2019. The two data sets were aggregated to ensure that analysis could be conducted with consideration of the following data elements:

- MUAC measurements
- Age in months for the children
- Sex of the children, and
- Administrative boundaries, subcounties, wards and sentinel sites codes/names.

Data alignment of the sentinel sites in the three subcounties and data cleaning

Data alignment of the sentinel sites was done based on the four subcounties of Marsabit, namely Laisamis, Moyale, North Horr and Saku, as shown in Table 3 for the periods 2010 to 2015 and 2016 to 2019.

[12] 2016 to 2020—Moyale MUAC data available for analysis
[13] Moyale district not included at the time

Table 2: Sentinel site distribution by subcounty

Subcounty	2010 to 2015	2016 to 2019
Laisamis	5	3
Moyale	4	3
North Horr	4	3
Saku	3	2
Total	**16**	**11**

Note: Moyale MUAC data was not available before 2016 as it was not part of Marsabit district then.

To ensure the data was appropriate for determining seasonality trends of acute malnutrition, the following quality check parameters were applied:

Completeness of the monthly data sets for the period of analysis.

a) Moyale subcounty MUAC data was not available for analysis for the period of January 2010 to December 2015. Before the devolved government, Moyale was a standalone district and data was available for this period.
b) Data missing for the following seasons: 2011—dry cool season; 2014—short rain season; and 2016— long rain season.
c) 101 (0.08%) records had no identification details, i.e., county and subcounty
d) Records with the sex of child not indicated were excluded from the analysis accounting for 171 records (0.09%)
e) 449 (0.3%) records with missing or incorrect MUAC measurements (i.e., below 70 mm or above 220 mm) were excluded. The emergency nutrition assessment (ENA) for SMART recommends the above cutoffs based on the ages 6 to 59 cohort.
f) 465 (0.4%) of the data had missing age and/or incorrect age records, i.e., records with below or above ages 6 to 59 months were excluded.

Plausibility check for data quality was applied to the clean data using ENA for SMART with penalties on all parameters as follows:

I. Digit preference for MUAC
II. Age ratio
III. Sex ratio

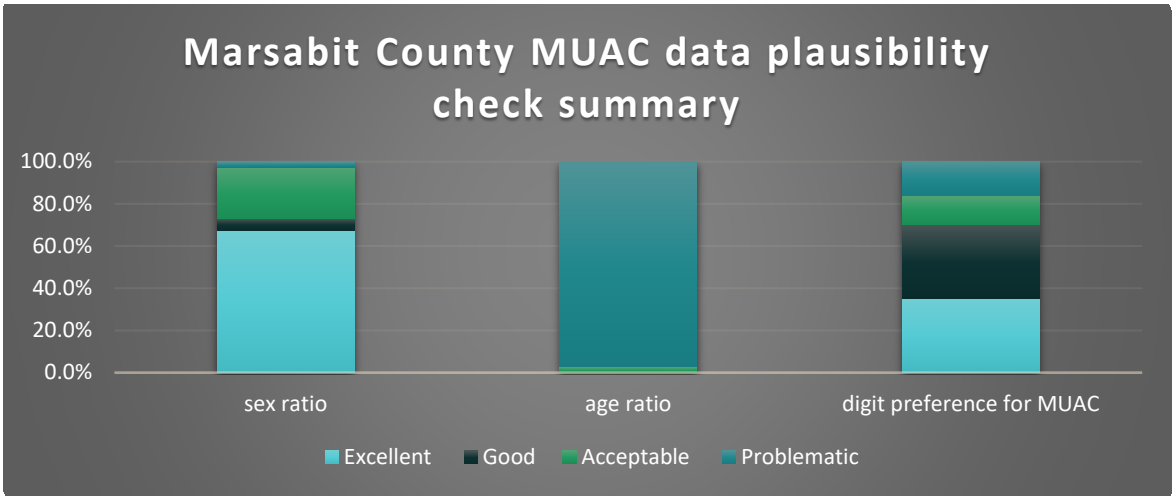


Figure 2: Summary of Marsabit plausibility check

The largest penalty was recorded in the age ratio during the period of analysis. In 36 of the 37 seasons, there were older children (ages 30 to 59 months) than younger ones (ages 6 to 5 months). The sex ratio performed well in most seasons, with data from 25 seasons falling in the excellent category. Data from six seasons had a problematic score in the digit preference for MUAC measurements (Figure 2). Overall, no records were excluded based on the plausibility check results because data was only used for seasonality trend analysis.

After data cleaning, a total of 113,373 (99.02%) records were available for analysis.

3.4 Data Analysis

3.4.1 Data analysis and malnutrition hotspot mapping based on SMART survey data

A data repository consisting of raw SMART surveys from Marsabit County was developed from the data provided by the Ministry of Health. After scrutiny for quality, a worksheet was developed on Microsoft Excel[14] and data was analyzed to provide GAM WHZ over the specified years and months when the data was collected. This enabled consolidation of the data by season over the specified period to study the trends and identify malnutrition hotspots. The analyzed GAM levels were compared to those presented in the processed data, in the SMART survey reports (as a further quality check), and no discrepancies were found. The worksheet also provided entries for acute malnutrition classification based on the IPC thresholds (shown in Table 3). The IPC acute malnutrition is color coded to give a pictorial magnitude of GAM. Acute malnutrition was estimated from a combination of the weight-for-height (WFH) index values (and/or edema) ENA software and cutoff points based on WHO (2006) Child Growth Standards. GAM was defined by WFH < -2 SD and/or existing bilateral edema.

IPC classification of acute malnutrition (Table 3) was adopted to summarize and indicate severity and vulnerability to acute malnutrition over the years and seasons.

[14] https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwjtt_rVr-X0AhWJnu0KHVqSBBEYABAAGgJkZw&ae=2&ei=UKW5YY2JCIfd1sQPveOPkAk&ohost=www.google.com&cid=CAESQOD2hmKuNzOzTrXCdT8W2vr1vhq0Bt4xlC68hQEpnS9wRMCInGRCX3TcJTYP6VbPEFfPuSMeVEkXG3jpjRbq6nQ&sig=AOD64_0u4x1L-h6k8FRoQf5IFktJIudcww&q&nis=1&sqi=2&adurl&ved=2ahUKEwiN8efVr-X0AhWHrpUCHb3xA5IQ0Qx6BAgEEAE

Table 3: Classification of acute malnutrition table (IPC for Acute Malnutrition Version 3.0)

Range	GAM WHZ phase	IPC Categories
<5	**1**	Acceptable
5-9.9	**2**	Alert
10- 14.9	**3**	Serious
15-29.9	**4**	Critical
>=30	**5**	Extremely critical

3.4.2 Trend analysis of malnutrition based on MUAC data

Data was analyzed at county and subcounty levels to establish the seasonality trends of malnutrition over the four seasons in the county over the period 2010–2019 because data was not available for 2020. The seasons are similar to those used by NDMA for early warning systems based on precipitation and vegetation cover index. The cutoff point for malnutrition was MUAC < 125 mm.

3.5 Strengths of the data

A notable strength of the data analysis is that the SMART survey data used for hotspot mapping was of high quality as it adhered to all the data quality parameters; therefore, no data was excluded from the analysis. ENA for SMART software has inbuilt quality checks that ensure that quality data is collected, and analysis conducted appropriately. Furthermore, the Division of Nutrition and Dietetics (DND) has technical working groups at both the national and county levels which validate the design, implementation and reporting of the SMART surveys.

3.6 Limitations of the data

1. Missing SMART survey data, particularly for the period 2012 to 2014, limited the ability to conduct a systematic review of the historical data for certain seasons and subcounties. For example, in Laisamis data was missing for 2012, 2013 and 2014; Saku data was missing for 2012 and 2013; and North Horr data was missing for 2015.
2. Nutrition SMART surveys are conducted on a yearly or as needed basis and are thus limited in determining the seasonality of acute malnutrition. There was variability in the number of surveys conducted, with the largest number conducted in North Horr subcounty. In some cases, the same survey was conducted during different months across the subcounties because of funding issues.
3. The majority of the SMART surveys were conducted during the same season (mainly during the dry cool season), thus limiting comparability between seasons and years.
4. Nutrition SMART surveys are representative at the county level, thus limiting data granularity to the ward level. The findings at ward level are therefore only indicative of the vulnerability to acute malnutrition.
5. Realignment of MUAC data was important for the analysis; this process was, however, challenged by variations in geographical boundaries of the unit of analysis in the period before and after 2015, as well as changes in NDMA's data management system.
6. The quality of MUAC data was compromised, especially in terms of age ratio.

4.0 Findings

4.1 Malnutrition hotspots based on GAM (WHZ) from SMART survey data 2010-to 2019

Marsabit County experienced six years of high acute malnutrition with GAM rates ≥15% representing a critical phase of acute malnutrition between 2010 and 2019. The critical years were 2011 (23.5%); 2014 (20.8%); 2015 (25.4%); 2017(17.5%); 2018 (20.1%); and 2019 (19.7%). The years 2010 and 2016 presented serious phases of acute malnutrition (10%–14.9% GAM) while 2012 and 2013 presented alert phases (5%–9.9% GAM) of acute malnutrition (Table 4). In some years (2011, 2014 and 2018), more than one data set from the same SMART survey was presented because the data was collected during different months. After all, funding was not available to conduct the whole survey at one point in time (personal communication with an officer from the M&E program in the DND). This scenario was observed in Moyale in 2011 and in North Horr, Saku and Moyale in 2014. In 2018, data was collected only in the high-risk subcounties (North Horr and Laisamis) in January and July in 2015 respectively.

Table 4: Marsabit County GAM WHZ and IPC acute malnutrition based on SMART survey data

GAM WHZ		YEARS									
County	**Month**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	July			7.4%		20.8%		14.3	17.5	12.2	19.7%
	Aug				8.5%	8.0%					
	Sep					6.2%	25.4%				
	June	13.5	12.7								
	May		23.5								
Marsabit	Jan									20.1	

The trends of acute malnutrition based on WHZ in Marsabit County show a sharp increase from 2010 to 2011, followed by a sharp reduction in 2012 and 2013 at GAM rates (<15%). A sharp increase in acute malnutrition was observed in July 2014, with a marked reduction in August and September of the same year—only to increase sharply in September of 2015. In 2015, the SMART survey was conducted in only one subcounty (Laisamis) which was prioritized due to its high vulnerability and insecurity levels. Reduction in acute malnutrition was observed in 2016, with a gradual increase in 2017 and 2018. Similarly, a reduction was observed in July of the same year, but this was followed by an increase in 2019 (Figure 3).

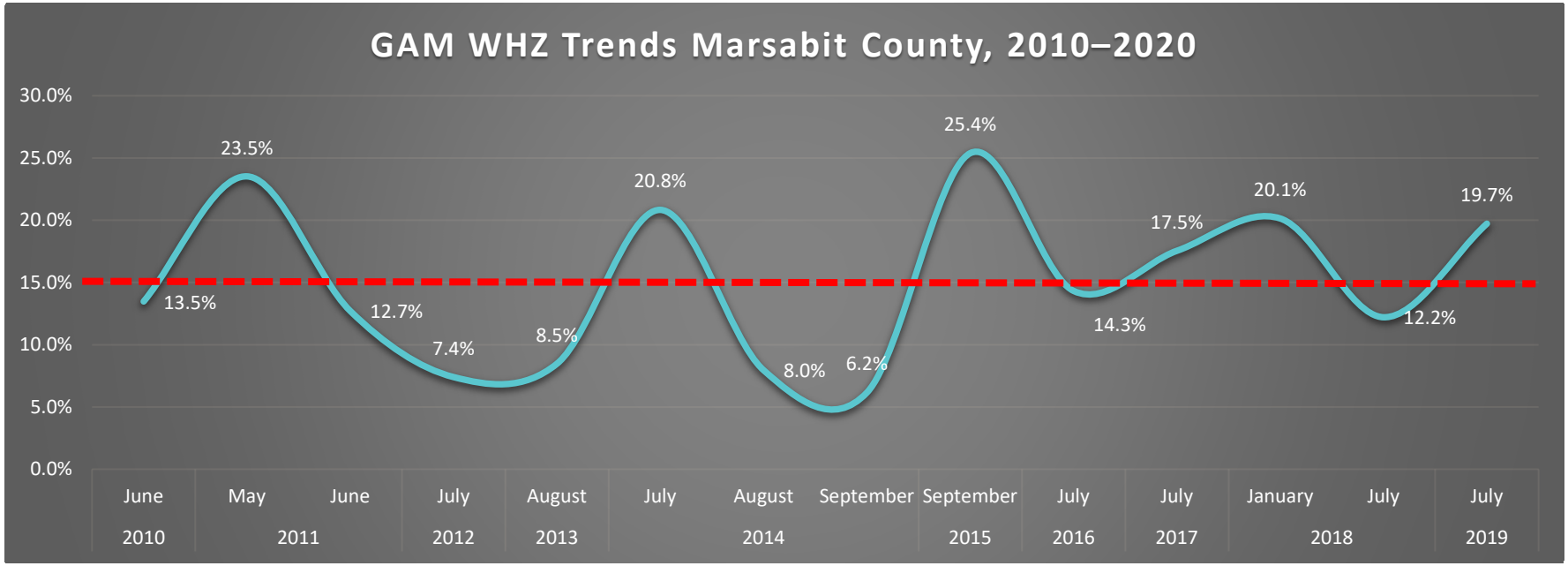


Figure 3: GAM WHZ trends—Marsabit County, 2010–2019

4.2 Malnutrition hotspots by subcounty

Marsabit County comprises four subcounties namely Saku, North Horr, Laisamis and Moyale. In terms of vulnerability to acute malnutrition, North Horr and Laisamis are the most vulnerable subcounties each having experienced seven years of acute malnutrition above the emergency threshold (GAM ≥15%) between 2010 and 2019. North Horr experienced a higher magnitude of acute malnutrition with five years of malnutrition in the critical phase (15%–29.9% GAM) as reported in 2013 (17.8%); 2014 (20.8%); 2016 (23.3%); 2018 (22.8%, 21.1%); and 2019 (25.1%); and two years of extremely critical phases (GAM ≥30%), with 2011 presenting a GAM rate of 40.9% and 2017 presenting a GAM rate of 31.0%. Laisamis experienced six years in the critical phase; 2010 (16.6%); 2011 (23.9%); 2015 (25.4%); 2016 (23.9%); 2017 (24.6%); and 2018 (19.2%), with one year of extremely critical phase (31.9%) in 2019 (Table 5). Saku and Moyale consistently reported GAM rates below the emergency threshold over the years implying less vulnerability to acute malnutrition compared to North Horr and Laisamis.

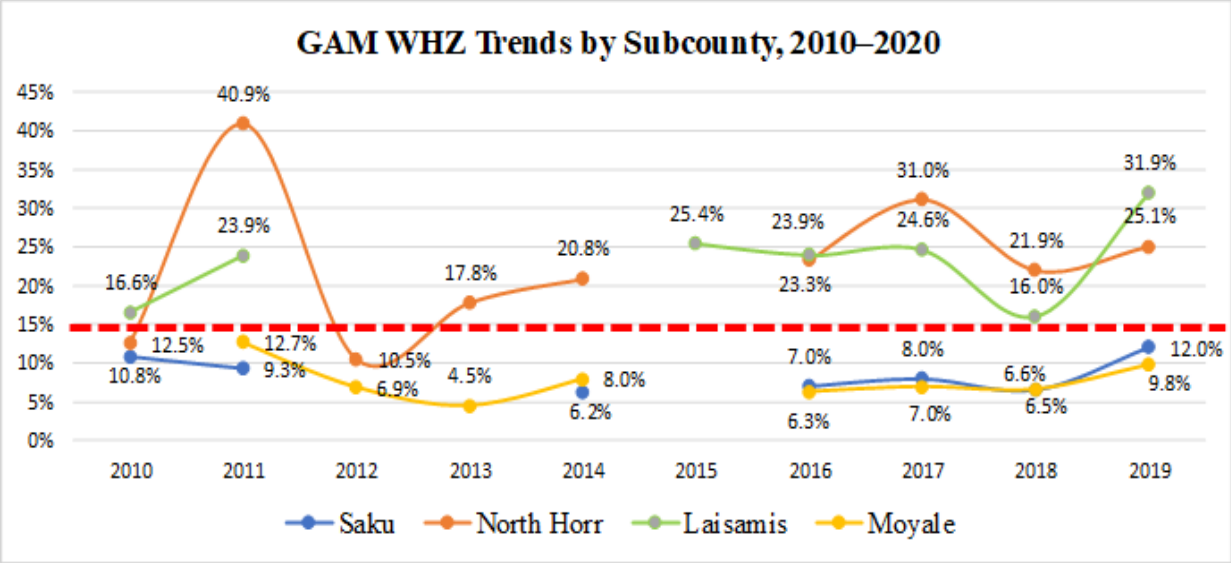
Table 5: GAM WHZ by subcounties based on IPC acute malnutrition

GAM	YEARS										
	Month	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Saku	July							7.0%	8.0%	6.5%	12.0%
Saku	September					6.2%					
Saku	May		9.3%								
Saku	June	10.8%									
North Horr	July			10.5%		20.8%		23.3%	31.0%	22.8%	25.1%
North Horr	August				17.8%						
North Horr	May		40.9%								
North Horr	June	12.5%									
North Horr	January									21.1%	
Laisamis	July							23.9%	24.6%	12.8%	31.9%
Laisamis	September						25.4%				
Laisamis	May		23.9%								

Laisamis	June	16.6%									
Laisamis	January									19.2%	
Moyale	July			6.9%				6.3%	7.0%	6.6%	9.8%
Moyale	August				4.5%	8.0%					
Moyale	June		12.7%								

Overall trends show an increase in acute malnutrition in 2011 in all subcounties except for Saku. It should be noted that the government of Kenya declared an emergency status for the ASAL counties in 2011 because of the high levels of acute malnutrition experienced at the time. There was a sharp reduction in the magnitude of acute malnutrition in 2012 but an increase in 2013 and 2015. A reduction in GAM rates was observed in 2016 followed by an increase in 2017, a reduction in 2018 and an increase in 2019—exhibiting an intermittent pattern in trends, especially in North Horr and Laisamis. Data was not available for some of the subcounties in some of the years (Figure 4).

Figure 4: Trends in acute malnutrition (GAM WHZ) by subcounty, 2010–2019



4.3 Hotspots by wards per subcounty

Data was granularized to ward level for hotspot analysis within the subcounties. These findings should be interpreted with caution since the sample sizes were not adequate for statistical viability. At the ward level, the values are therefore only indicative of vulnerability to acute malnutrition.

4.3.1 North Horr subcounty wards

In North Horr subcounty, data was not available for the years 2012 and 2015. Data was available for only seven out of the 10 years. In 2018, two surveys were conducted in each of the wards. For Illeret Ward, data was available for only four years: 2010, 2016, 2017 and 2018 (Table 6) because the ward was not accessible during the other years due to insecurity. All the wards in North Horr are considered hotspots. Overall, North Horr and Turbi wards were the most vulnerable, having exhibited acute malnutrition above the emergency threshold (GAM ≥15%) in all seven years. North Horr Ward is more vulnerable to acute malnutrition than Turbi considering the magnitude of acute malnutrition between the two wards. North Horr experienced five years of critical phase with GAM>20% in 2010, 2013, 2016, 2018 and 2019; and two extremely critical phases with GAM>30% in 2011(33%) and 2017 (38.5%). Turbi, on the other hand, reported six critical phases (GAM <20%) in the years 2010 (15.9%); 2013 (16.2%); 2014 (18.1%); 2016 (20.0%); 2018 (16.7%); and 2019 (26.7%); and one extremely critical phase in 2017 (30.2%). Illeret experienced extremely critical phases of malnutrition in 2011 (55.6%) and 2016 (39.1%). Maikona and Dukana wards exhibited the lowest vulnerability compared to other wards with six and five years of emergency levels of acute malnutrition out of the seven years, respectively (Table 6).

Table 6: GAM WHZ by wards in North Horr Subcounty based on IPC classification

GAM WHZ	YEARS									
WARD	Month	2010	2011	2012	2013	2014	2016	2017	2018	2019
	January								21.0%	
	May		45.0%							
	June	13.6%								
Dukana	July					23.5%	14.1%	29.5%	21.9%	29.7%
	January								25.4%	
	May		33.0%							
	June	20.3%								
	July						24.0%	38.5%	25.0%	24.8%
North Horr	August				22.2%					
	January								18.9%	
	May		30.1%							
	June	10.5%								
	July					20.9%	19.4%	35.3%	22.5%	19.0%
Maikona	August				14.9%					

	January								24.7%	
	May		55.6%							
	June									
Illeret	July						39.1%	21.7%	28.1%	
	January								15.3%	
	June	15.9%								
	July					18.1%	20.0%	30.2%	16.7%	26.7%
Turbi	August				16.2%					

Trend analysis of acute malnutrition in North Horr subcounty generally shows the rise and decrease in alternate years, with a sharp increase in 2011 that marked the peak of malnutrition over the years followed by a marked decrease in 2013 and an increase from 2014 to 2016. There was a sharp increase in 2017, followed by a decrease in 2018 and an increase in 2019 (Figure 5).

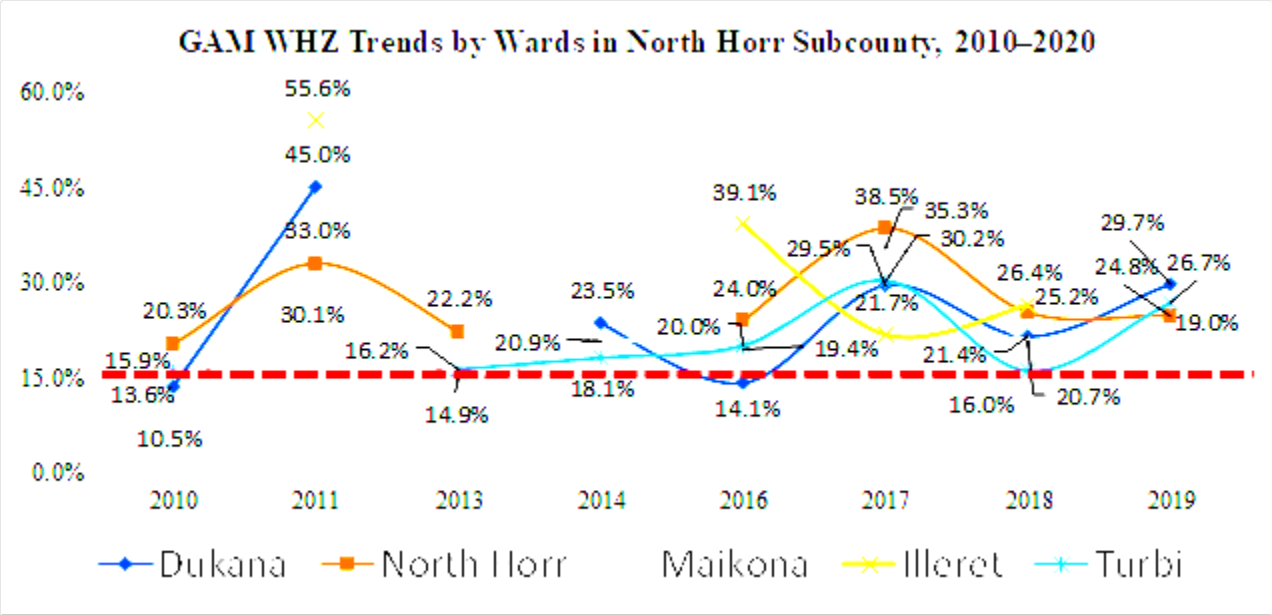


Figure 5: Trends of acute malnutrition (GAM WHZ) by wards in North Horr Subcounty, 2010–2019

4.3.2 Laisamis subcounty by Wards

Overall, all the wards in Laisamis are hotspots. Presenting by the level of vulnerability, Loiyangalani and Korgi South bear the greatest burden of malnutrition in the subcounty, with each ward presenting four extremely critical phases (GAM ≥30%) of acute malnutrition between the years 2010 to 2019. Kargi Southward is most vulnerable, having experienced extremely critical phases of acute malnutrition in four out of the seven years: 2010 (30.8%); 2016 (30.1%); 2017 (34.1%); and 2019 (42.9%); and critical phase in

2018 (January at 26.9% and July at 29.4%). Loiyangalani follows closely with four critical phases of acute malnutrition in the years 2011 (42.9%); 2016 (32.7%); 2017 (34.6%); and 2019 (33.3%); and a moderate critical phase in 2010 (15.8%) and 2018 January (19.8%). The third ward in vulnerability is Laisamis, which presents two years of extremely critical phases of 30.5% and 30.9% in the years 2011 and 2019, respectively, and four years of critical phase (GAM≥15%) in the years 2010, 2015, 2016 and 2018. The fourth hotspot ward is Korr/Ngurunit, which presents six years of critical phase (<30%) of acute malnutrition, and the last hotspot is Loglogo, which presents three years of critical phase of acute malnutrition (Table 7).

Table 7: GAM WHZ by wards in Laisamis Subcounty based on IPC classification

GAM WHZ		YEARS						
WARD	**Month**	**2010**	**2011**	**2015**	**2016**	**2017**	**2018**	**2019**
Laisamis	January						17.2%	
Laisamis	May		30.5%					
Laisamis	June	15.0%						
Laisamis	July				17.1%	13.5%	15.2%	30.9%
Laisamis	September			28.0%				
Loiyangalani	January						19.8%	
Loiyangalani	May		42.9%					
Loiyangalani	June	15.8%						
Loiyangalani	July				32.7%	34.6%	8.1%	33.3%
Kargi south_horr	January						26.9%	
Kargi south_horr	May							
Kargi south_horr	June	30.8%						
Kargi south_horr	July				30.1%	34.1%	29.4%	42.9%
Loglogo	January						8.6%	
Loglogo	June	13.3%						
Loglogo	July				19.0%	12.7%		26.0%
Loglogo	September			28.0%				

Korr/Ngurunit	January						23.7%	
Korr/Ngurunit	May		22.2%					
Korr/Ngurunit	June	7.9%						
Korr/Ngurunit	July				20.3%	28.2%	11.2%	26.6%
Korr/Ngurunit	September			20.2%				

Trends in acute malnutrition by GAM (WHZ) in Laisamis subcounty generally show a sharp increase in 2011, followed by a slow decrease that remains above the emergency threshold in 2015 and 2016, and an alternate increase and decrease observed from 2017 to 2019 (Figure 6).

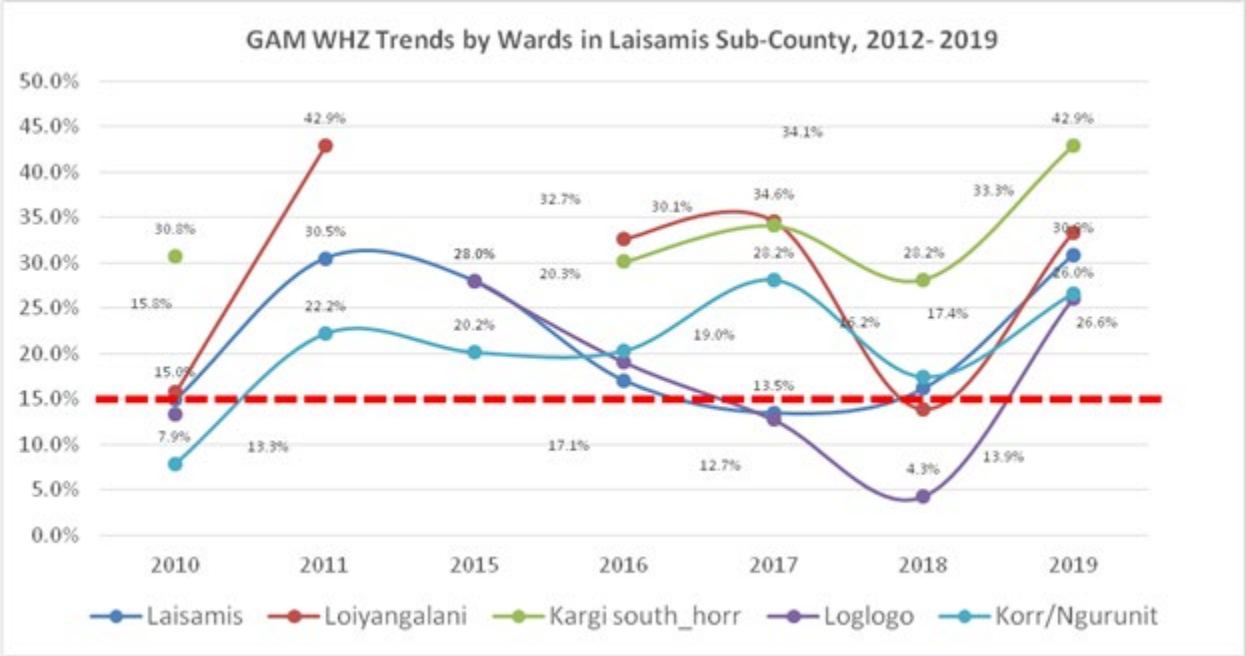


Figure 6: Trend of acute malnutrition (GAM WHZ) by wards in Laisamis Subcounty, 2010–2019

4.3.3: Moyale subcounty wards

In Moyale subcounty, data was not available at the ward level for 2010, unlike in the other subcounties. Moyale is, however, not considered a hotspot. The levels of acute malnutrition at the ward levels in Moyale subcounty are lower than in the other subcounties. There are pockets (years) in three wards (Golbo, Uran and Obbu) that have reported acute malnutrition at emergency levels (≥15%) at least once between 2011 and 2019. Golbo is the most vulnerable ward reporting critical phase (15%–29%) of acute malnutrition in the years 2011 (18.1%); 2018(17.5%); and 2019 (15.9%). Obbu and Uran each presented one case of a critical phase in the years 2017 (16.7%) and 2019 (18.8%), respectively (Table 8).

Table 8: GAM WHZ by wards in Moyale Subcounty

GAM WHZ	YEARS								
WARD	Month	2011	2012	2013	2014	2016	2017	2018	2019
Golbo	June	18.1%							
Golbo	July		9.7%			11.8%	9.5%	17.5%	15.9%
Golbo	August			10.1%	7.5%				
URAN	June	11.5%							
URAN	July		4.6%			0.0%	8.8%	10.0%	18.8%
URAN	August			6.3%	12.2%				
Butiye	June	9.5%							
Butiye	July		7.2%			7.8%	3.4%	4.5%	9.4%
Butiye	August			3.1%					
Heilu_Manyatta	June	12.6%							
Heilu_Manyatta	July		9.1%			6.2%	2.2%	2.6%	3.2%
Heilu_Manyatta	August			4.0%					
Moyale township	June	11.1%							
Moyale township	July		1.7%			0.0%	0.0%	0.0%	5.7%
Moyale township	August			3.9%					
Obbu	June	13.5%							
Obbu	July					8.3%	16.7%	11.9%	
Obbu	August			0.0%	4.2%				
Sololo	July		9.0%			10.0%	8.1%	0.0%	6.1%
Sololo	August			4.0%					

Overall, there seems to be no specific general trend for acute malnutrition at the ward level. In 2011 there was a peak of acute malnutrition followed by a general decline in 2012 and 2013. The level of acute malnutrition increased in 2014 and then decreased in 2016; it increased again in 2017 and 2019. Individual ward trends indicate an alternating increase and decrease in acute malnutrition with each year, and more so in Golbo and Uran between 2010 and 2019 (Figure 7). It should be noted that like in the other subcounties, the levels of acute malnutrition peaked in 2011 and 2017 but that the magnitude of malnutrition was much lower in Moyale than in the other subcounties that are considered hotspots.

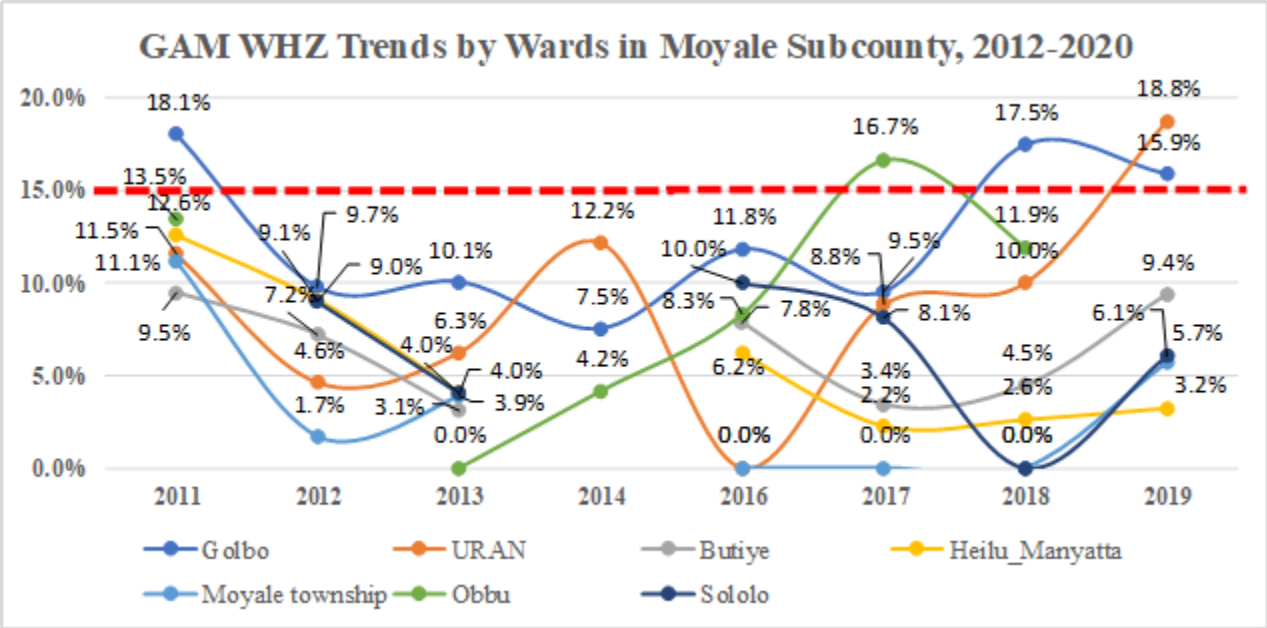


Figure 7: Trends of acute malnutrition (GAM WHZ) by wards in Moyale Subcounty, 2010–2019

4.3.4 Saku Subcounty Wards

Saku Ward had data gaps in 2012, 2013 and 2015. Overall, the wards in Saku subcounty show low vulnerability to malnutrition as GAM (WHZ) were below emergency levels (<15%) between 2010 and 2019 except for Karare, which reported one year (2019) of emergency GAM levels of 27.3%. Karare is the most vulnerable ward in the subcounty with the majority of the years (2010, 2011, 2014, 2016 and 2017) presenting the serious phase (GAM WHZ 10%–14.9%) of acute malnutrition and one critical phase (≥30%) in 2019 (Table 9). It should be noted that Saku subcounty had a low vulnerability to malnutrition even in the years 2011 and 2017, when the majority of the subcounties in Marsabit were vulnerable to malnutrition.

Table 9: GAM WHZ by wards in Saku Subcounty based on IPC classification

GAM WHZ		YEARS						
WARD	**Month**	**2010**	**2011**	**2014**	**2016**	**2017**	**2018**	**2019**
Marsabit Central	May		**10.0%**					
Marsabit Central	June	**3.7%**						
Marsabit Central	July				**3.1%**	**7.3%**	**0.8%**	**4.1%**
Marsabit Central	September			**2.5%**				
Karare	May		**12.2%**					
Karare	June	**14.8%**						
Karare	July				**11.8%**	**10.2%**	**7.1%**	**27.3%**
Karare	September			**11.9%**				
Sagante_jaldesa	May		**0.0%**					
Sagante_jaldesa	June	**14.0%**						
Sagante_jaldesa	July				**7.9%**		**11.7%**	**4.8%**
Gada moji	May		**14.3%**					
Gada moji	July				**9.1%**	**6.3%**		
Gada moji	September			**4.1%**				

There is no general pattern in trends of acute malnutrition at the ward level in Saku subcounty. Karare and Marsabit central wards presented data in most of the years between 2010 and 2019. Despite Saku subcounty constantly remaining in the acceptable or alert phase, Marsabit Central Ward indicated a sharp increase in acute malnutrition in 2011 and a decrease in 2014, with a rise in 2016 and 2017, a decrease in 2018 and an increase in 2019. Karare remained stable most of the years with a decline in 2018 followed by a sharp increase in 2019 beyond the emergency threshold of GAM WHZ ≥15% (Figure 8).

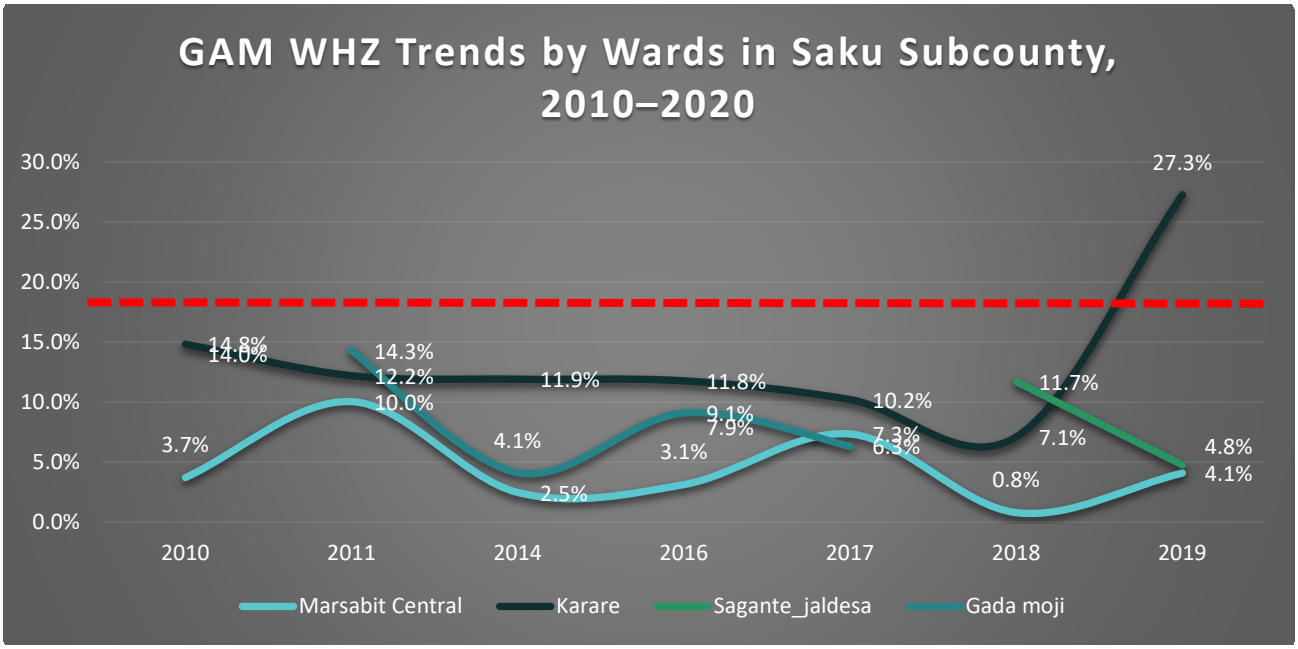
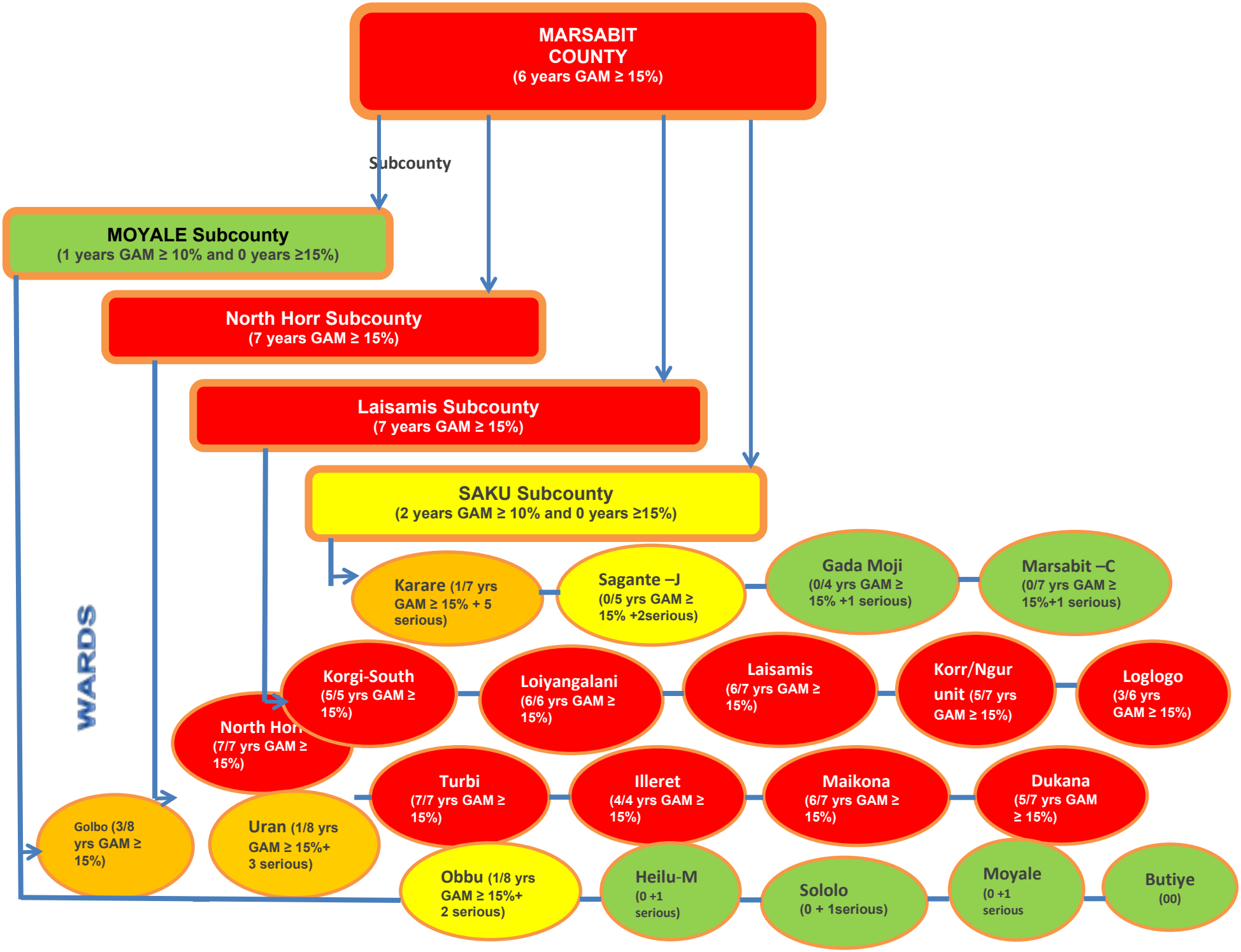


Figure 8: Trend of acute malnutrition (GAM WHZ) by Wards in Saku Subcounty, 2010–2019

In conclusion, Marsabit County is a hotspot for acute malnutrition with North Horr and Laisamis subcounties also considered malnutrition hotspots. All the wards in North Horr and Laisamis are malnutrition hotspots. Moyale and Saku subcounties are not malnutrition hotspots (Figure 9).

Figure 9:Marsabit flow chart on vulnerability to acute malnutrition by subcounty and ward levels



4.4 Acute Malnutrition (WHZ) By Seasonality Based on Data from Smart Surveys

There are four seasons in a year in Marsabit County: the short dry season (January to March); the long rains season (April to June); the long dry and cool season (July to October); and the short rains season (November to December). The dry and cool season from July to September is the long dry spell, and most of the SMART surveys are conducted during this season. The rationale for conducting the surveys during this season is that Marsabit relies heavily on the short rain seasons as a buffer between the two dry seasons; should the short rains fail, then there is a high likelihood of increased food insecurity and therefore heightened levels of acute malnutrition during the dry season. This informs the timing of the SMART surveys (conducted mainly once per year) during the dry and cool season to monitor acute malnutrition in Marsabit County. The SMART survey data is therefore not very appropriate for showing seasonality trends of acute malnutrition; this was a limitation in the analysis and, therefore, the findings should be interpreted with caution.

4.4.1 Seasonal trends of acute malnutrition (GAM by WHZ) in Marsabit County

The number of SMART surveys conducted varied from year to year. Three surveys were conducted during the long rains season in 2010 and 2011. One survey was conducted during the dry season in 2019. The majority of the surveys (eight) were conducted during the dry and cool seasons (Figure 10). The highest vulnerability to acute malnutrition based on GAM rates (≥ 15%) was observed in the years 2011, 2014, 2015, 2017, 2018, and 2019; the majority of them (four) during the dry and cool season. Vulnerability to malnutrition during the long rains season was observed in only one year (2011) and the same for the dry season in 2018. The overall observation is that the GAM rates tended to be higher during the dry and cool seasons, an indication that the children were more vulnerable during this season compared to the long rains season and the dry season (Figure 10). The findings should be interpreted with caution since most of the data was collected during the dry cool season; for some years, the data for the same survey was collected in different months—sometimes spanning different seasons.

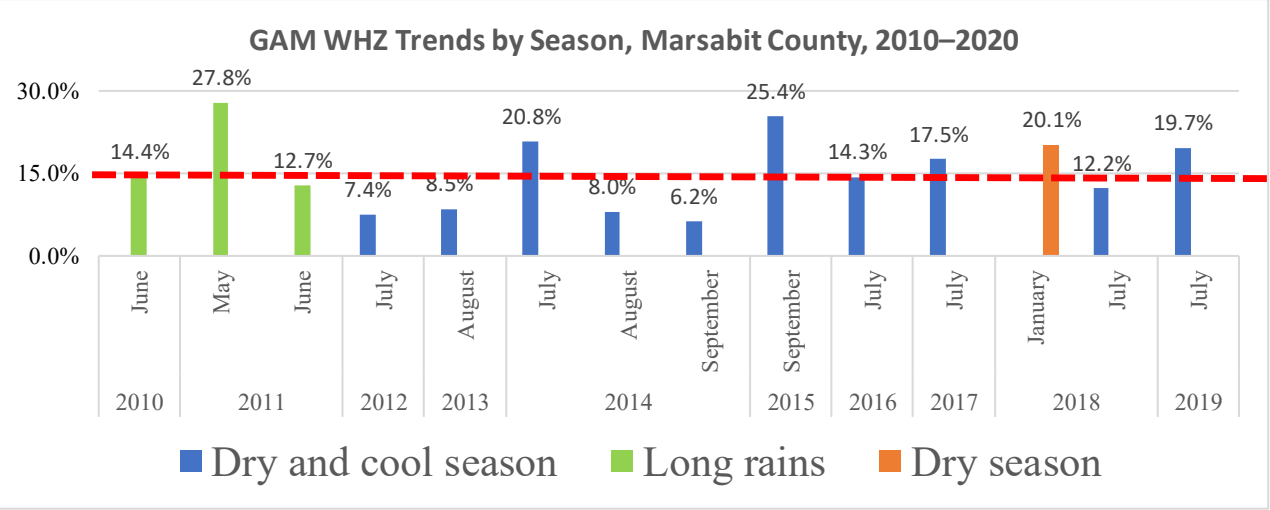


Figure 10:Marsabit County GAM (WHZ) malnutrition seasonal trends 2010–2019

4.4.2 Seasonal trends of acute malnutrition (GAM by WHZ) in Marsabit at the subcounty level

At the subcounty level, the number of surveys varied by subcounty, year and the seasons during which they were conducted. North Horr subcounty had the highest number of surveys, at 10. Two were conducted during the long rains, one during the dry season, and seven during the dry and cool season. A total of eight surveys were conducted in Laisamis; two during the long rains season, one during the dry season and five during the dry and cool season. A similar number (eight) of surveys were conducted in Moyale, one during the long rains season and seven during the dry cool season. The lowest number of surveys (seven) was conducted in Saku; five during the dry and cool season and two during the long rains (Figure 11). The highest vulnerability to malnutrition was during the dry and cool season and less for the long rains, short rains and short dry seasons. The dry and cool seasons, therefore, present the highest vulnerability to malnutrition. North Horr and Laisamis bear the highest risk of malnutrition among the subcounties and Moyale bears the least, having recorded no acute malnutrition above the emergency threshold (GAM ≥15%). Again, these findings should be interpreted bearing in mind that most of the surveys were conducted during the dry and cool season.

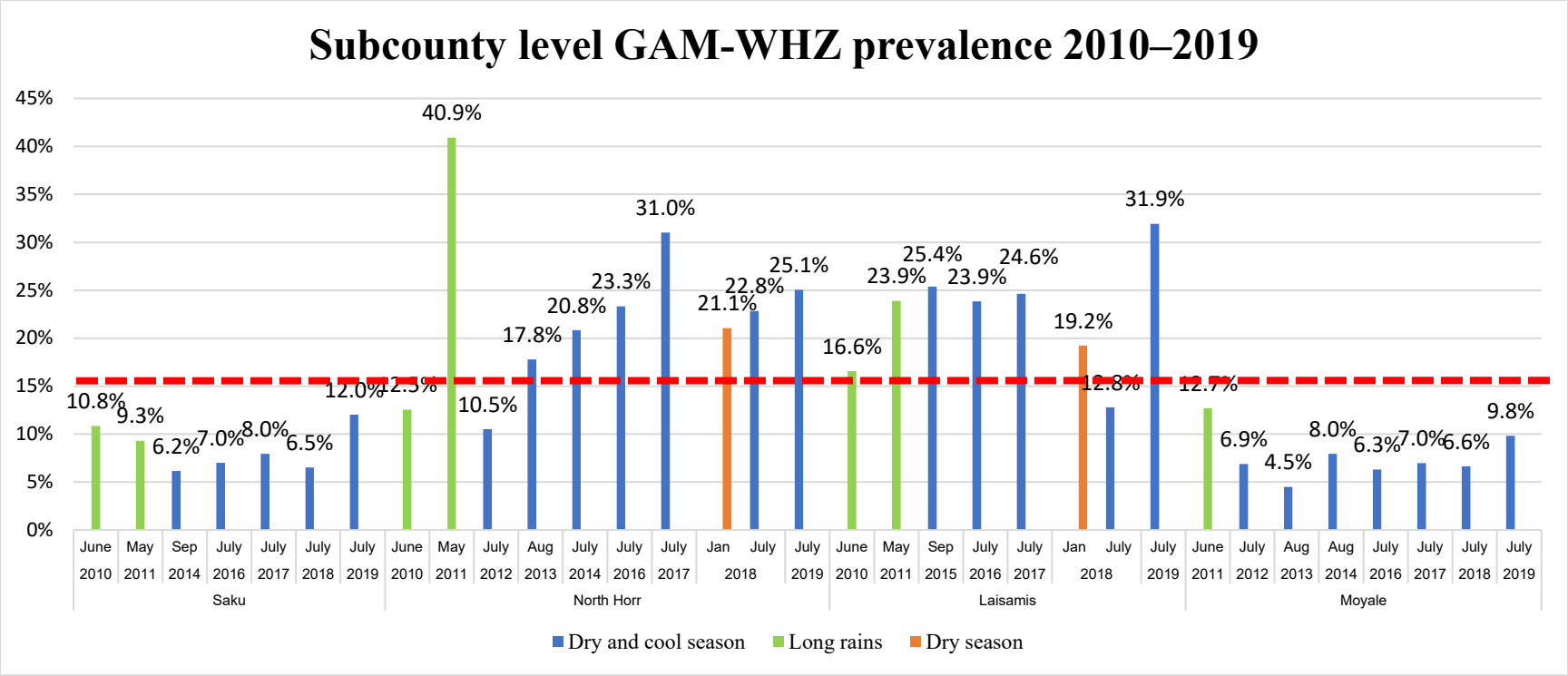
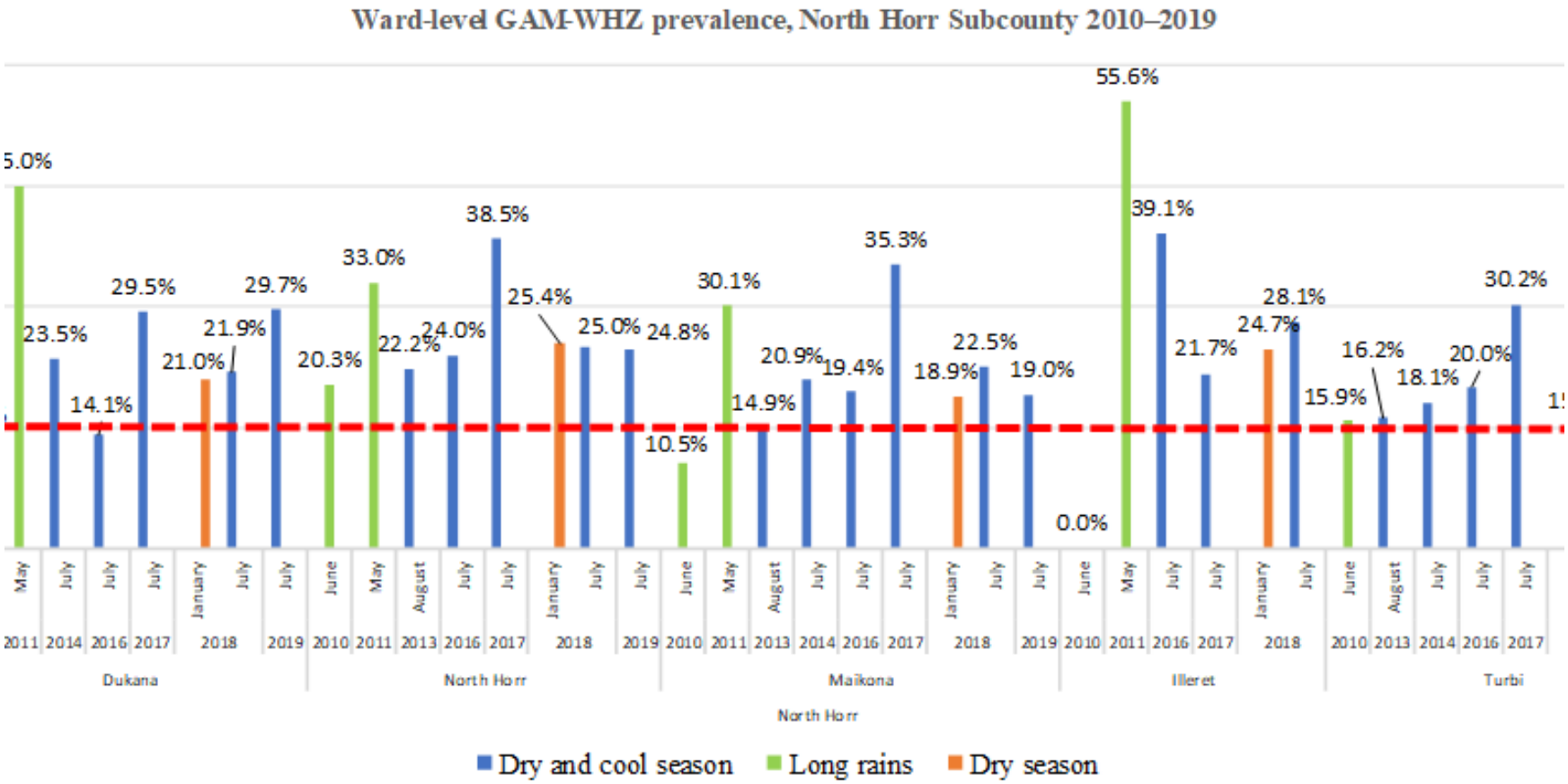


Figure 11: Marsabit Subcounty acute malnutrition by seasonality trends

4.4.2.1: Seasonal trends in North Horr Subcounty by Wards

At the Wards level, the greatest vulnerability to acute malnutrition (above emergency levels GAM≥15%) was in the dry and cool season. This was followed by the long rains season and lastly, the dry season had the least vulnerability to acute malnutrition. North Horr ward was the most vulnerable with the highest number of years with GAM≥15% (Figure 12).

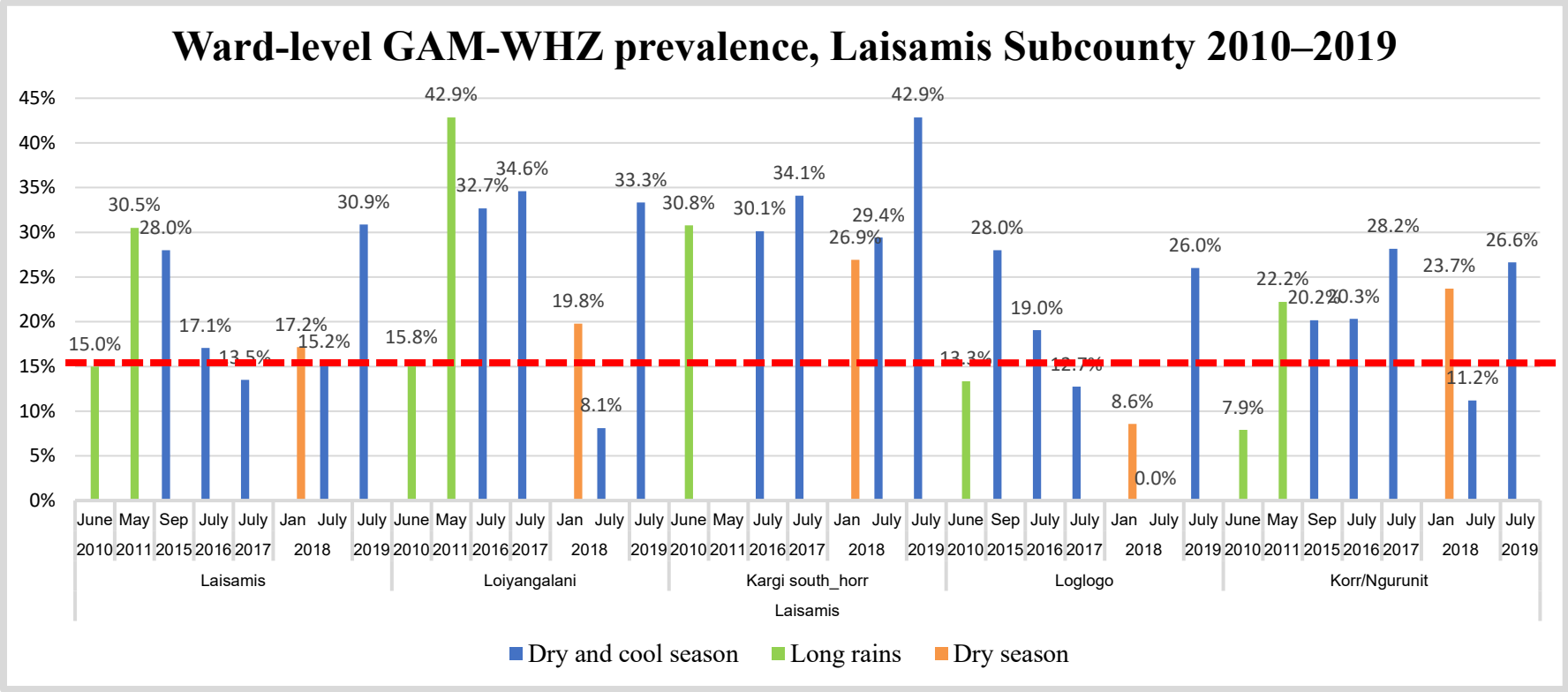
Figure 12: North Horr Subcounty malnutrition seasonal trends (GAM WHZ) 2010–2019



4.4.2.2: Seasonal trends in acute malnutrition in Laisamis Subcounty by wards

Again, the majority of the surveys were conducted during the dry and cool season. The findings show that the greatest vulnerability to acute malnutrition is during the dry and cool season, with some periods of vulnerability experienced during the long rains and dry seasons (Figure 13).

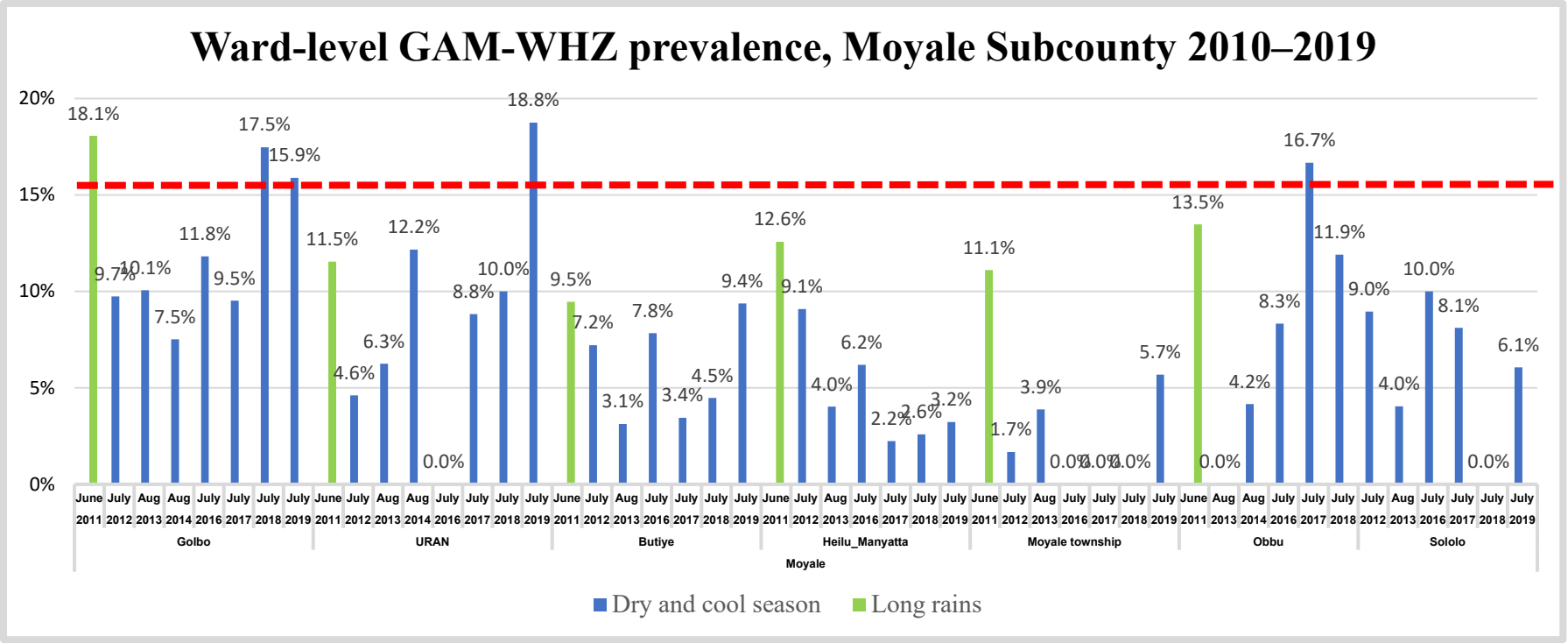
Figure 13: Laisamis Subcounty seasonal trends (GAM WHZ) 2010–2019



4.4.2.3: Seasonal trends in acute malnutrition in Moyale Subcounty by wards

Most of the SMART surveys in Moyale were conducted during the dry and cool season. A few were conducted during the long rains season, and none were conducted during the short rains and short dry seasons. Four out of the five years of acute malnutrition rates above the emergency threshold (≥15%) were experienced during the dry and cool seasons, and only one during the long rains season (Figure 14).

Figure 14: Moyale Subcounty malnutrition seasonal trends (GAM WHZ) 2010–2019



4.4.2.4 Seasonal trends in acute malnutrition in Saku subcounty by wards

Most of the surveys in Saku were also conducted during the dry and cool season and a few during the long rains season. In a majority of the years, acute malnutrition levels were below the emergency threshold except in Karare ward, which was 27.3% during the dry season in 2019. It should be noted that on the whole, the level of acute malnutrition tended to be higher during the rainy seasons than during the dry and cool season for most of the years, indicating vulnerability to malnutrition during long rains in Saku subcounty (Figure 15).

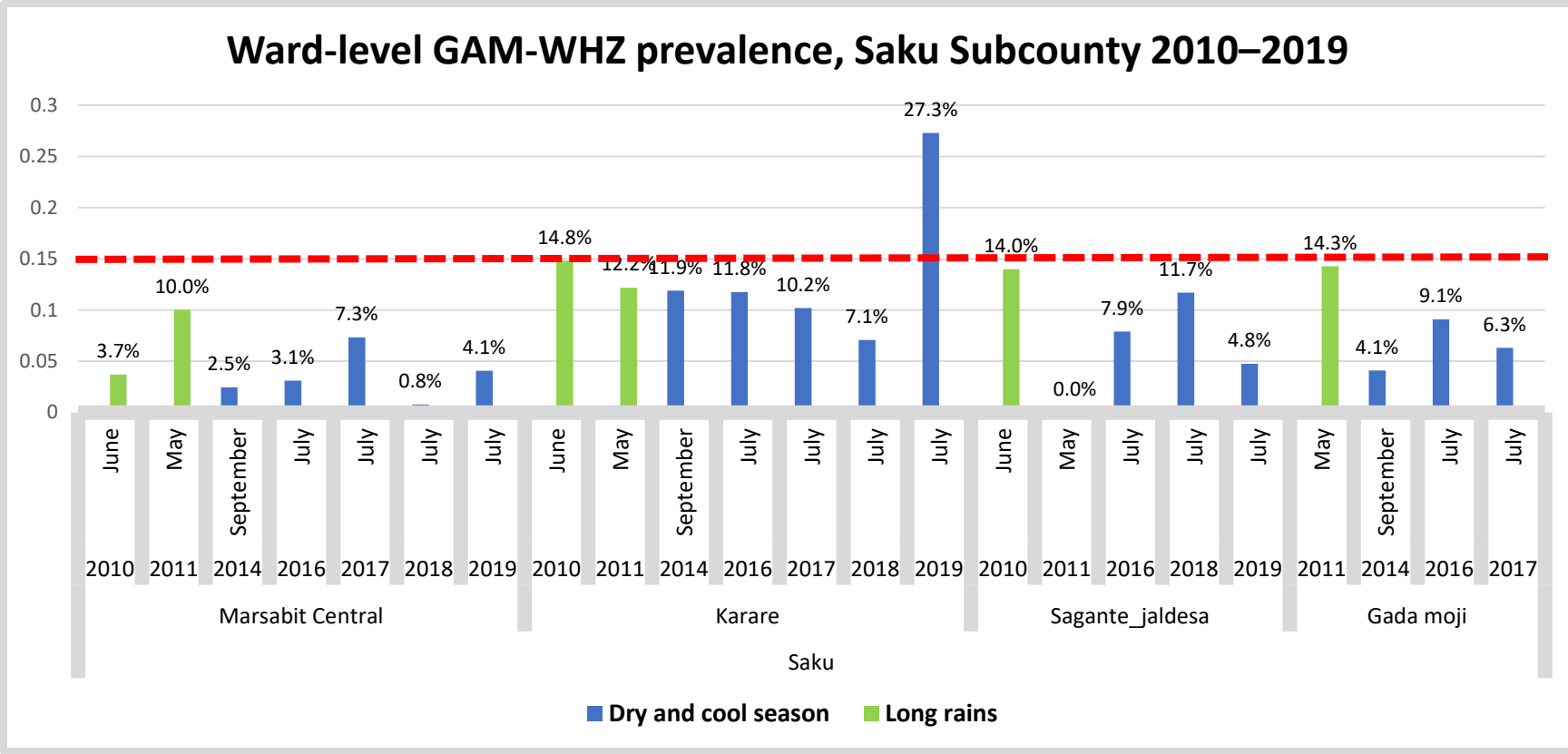


Figure 15: Saku Subcounty malnutrition seasonal trends (GAM WHZ) 2010–2019

4.5 Evolution of acute malnutrition by seasons based on NDMA MUAC sentinel data

4.5.1 Evolution of GAM by MUAC across the seasons in Marsabit County

Trend analysis was conducted based on GAM rates from MUAC data collected every month from the NDMA sentinel sites. This data is more comprehensive and appropriate for seasonal trend analysis than the SMART survey data because the data covers all the months and, therefore, seasons of the year.

The stacked area chart is used to display the evolution of malnutrition across the seasons per year and over the past 10 years. In most years, Marsabit County experienced low acute malnutrition in the dry cool season that increased during the subsequent short rains season and continued increasing into the dry season of the subsequent year, peaking in the long rains season indicating highest vulnerability during the dry season and long rains season (Figure 16).

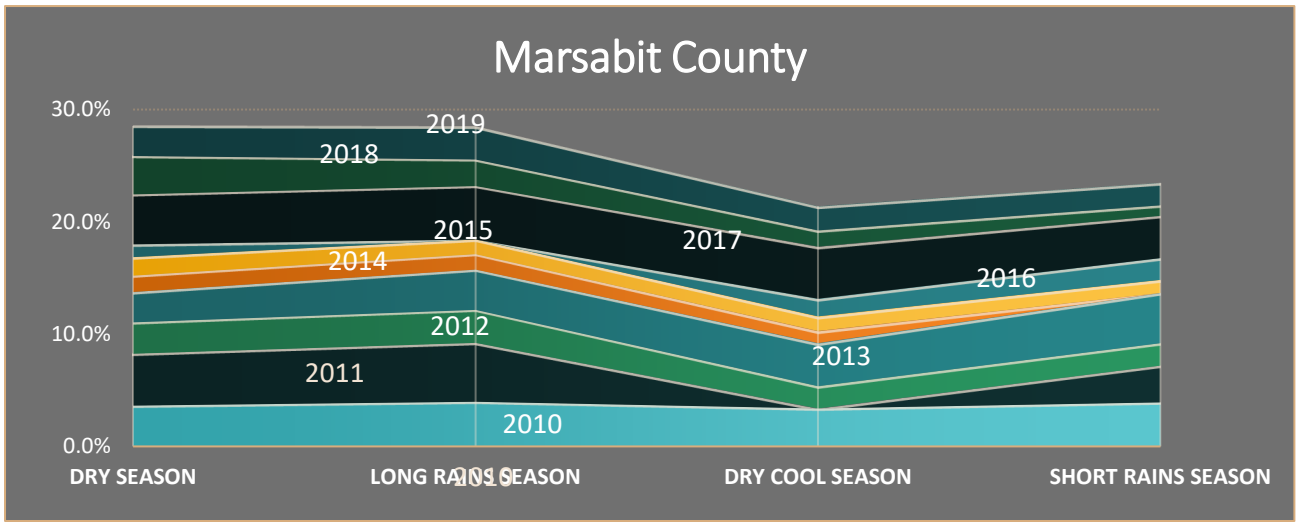


Figure 16: Evolution of acute malnutrition by seasonality in Marsabit County

To illustrate the seasonality trends further, the average GAM rate was computed and displayed using the area chart. The analysis showed the highest levels of malnutrition during the dry and long rains seasons and decreased over the other seasons, being lowest during the dry cool season (Figure 17). Again, this data shows that the dry season and the long rainy seasons present the highest risk for acute malnutrition in Isiolo County.

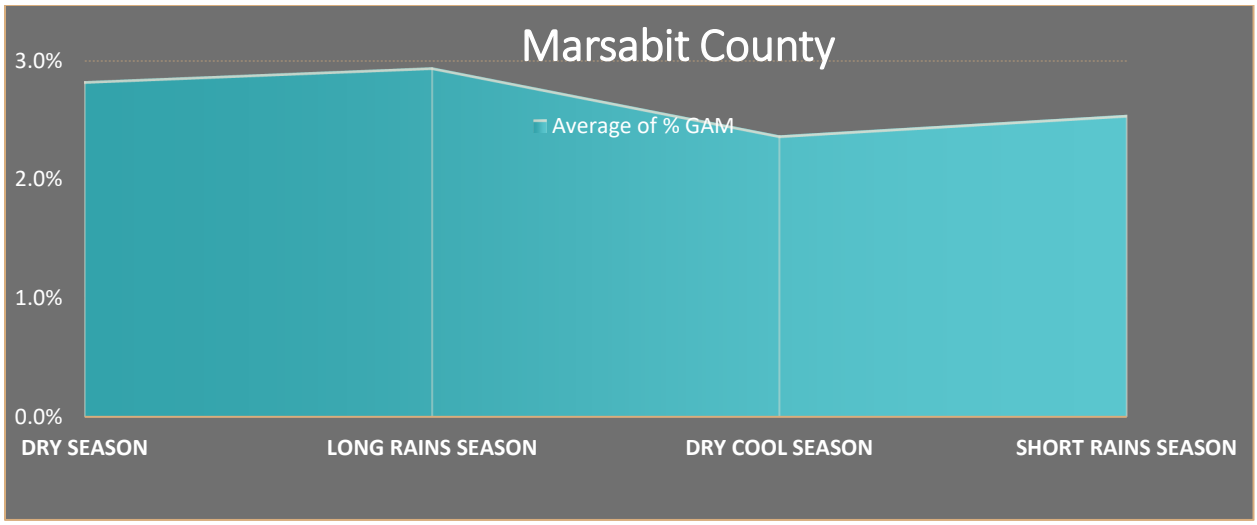


Figure 17: Trends of acute malnutrition in Marsabit County

4.5.2 Evolution of GAM by MUAC across the seasons in Laisamis Subcounty

In five (2011, 2012, 2015, 2017 and 2019) out of the 10 years, high vulnerability to acute malnutrition was observed during the dry season and long rains season. Exceptions are in 2013, which showed a peak in malnutrition during the short rains season, and 2016, which showed the long rains season as the most favorable. Overall, the long rains season poses the highest vulnerability to acute malnutrition in Laisamis subcounty (Figure 18).

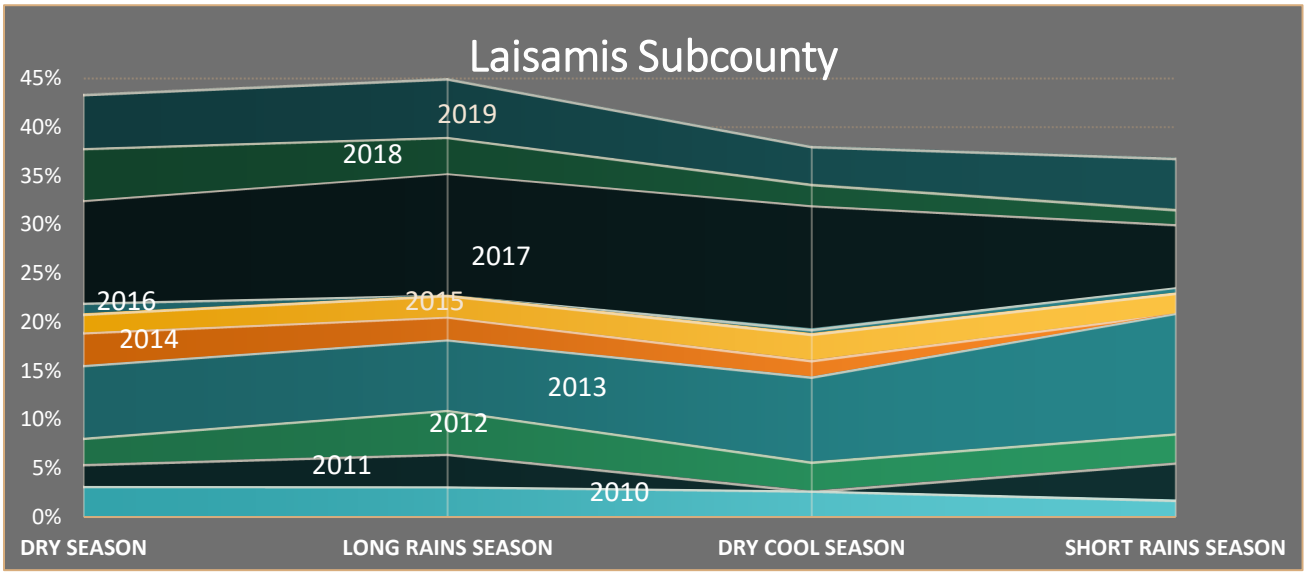


Figure 18: Evolution of acute malnutrition by seasonality in Laisamis Subcounty

Computed seasonal averages over the 10 years generally show the highest rate of malnutrition during the long rains seasons followed by the short rains season. The dry season has the least risk for acute malnutrition (Figure 19).

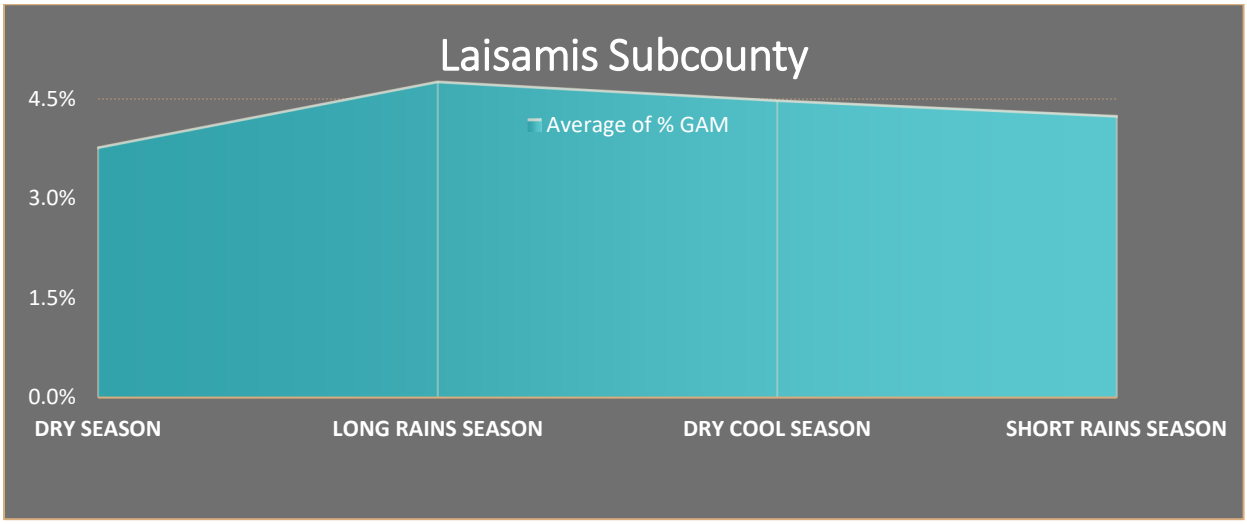
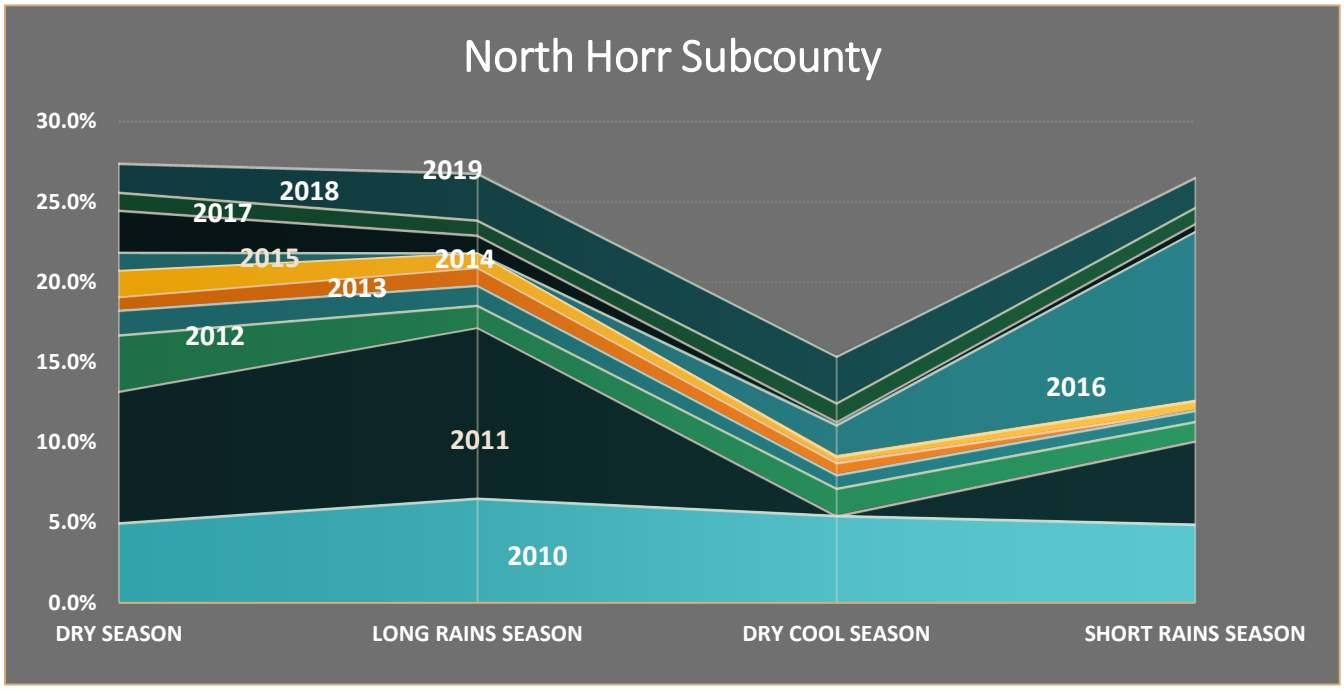


Figure 19: Trends of acute malnutrition in Laisamis Subcounty

4.5.3 Evolution of GAM by MUAC across the seasons in North Horr Subcounty

Most of the years (2012, 2013, 2015, 2017, and 2018) indicated high vulnerability to acute malnutrition in the dry season that decreases in the long rains season. The year 2019 indicated vulnerability in the dry season that increased into subsequent long rains and dry and cool seasons, while the short rains season showed the least vulnerability. The year 2016 presented a unique peak of vulnerability during the short rains season compared to all other years in the 10 years (2010–2019). The dry season is the most vulnerable to acute malnutrition in North Horr subcounty (Figure 20).

Figure 20: Evolution of acute malnutrition by seasonality in North Horr Subcounty



The average GAM by MUAC for the seasons over the 10 years (2010–2019) indicate that the highest vulnerability to acute malnutrition is experienced in North Horr subcounty during the dry season and decreases during the long rains season. The lowest vulnerability is experienced during the dry cool season. Seasonality therefore contributes to acute malnutrition in North Horr Subcounty (Figure 21).

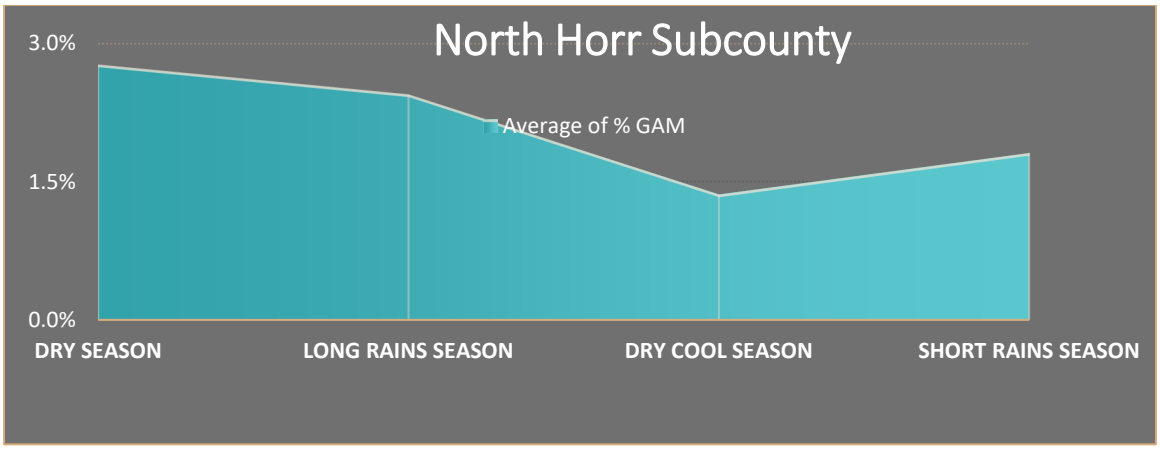


Figure 21: Trends of acute malnutrition in North Horr Subcounty

4.5.4 Evolution of GAM by MUAC across the seasons in Saku Subcounty

The dry season poses the highest vulnerability to acute malnutrition most of the years (2011, 2015, 2016, 2017 and 2018) followed by the long rainy season in the years 2012, 2013 and 2019. The least vulnerable was the short rains season (Figure 22)

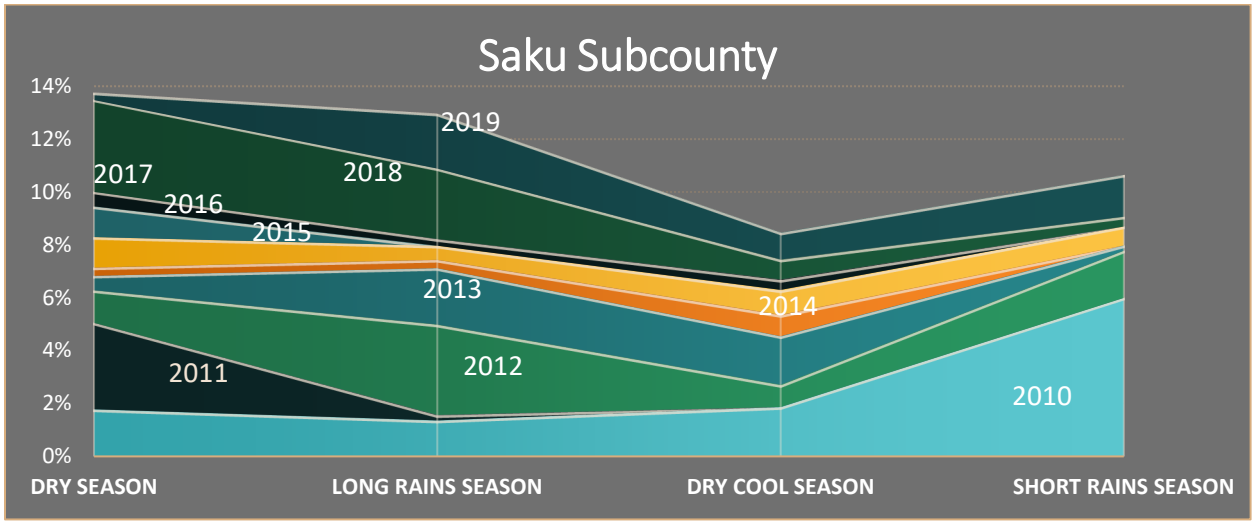


Figure 22: Evolution of acute malnutrition by seasonality in Saku Subcounty

The average GAM by MUAC indicates that the highest vulnerability is during the short and long rains seasons and the least vulnerability is during the dry cool seasons—in contrast to what was observed from the raw data. This may imply marked variations in the magnitude of malnutrition in similar seasons over the years (Figure 23).

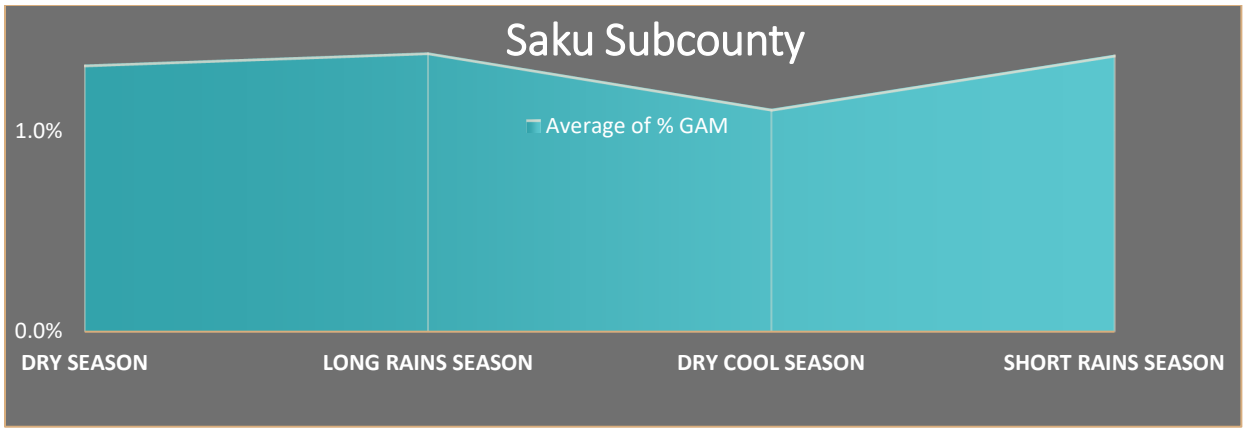


Figure 23: Trends of acute malnutrition in Saku Subcounty

4.5.5 Evolution of GAM by MUAC by seasons in Moyale Subcounty

Moyale subcounty did not have data for the years 2010 to 2015. Overall, the highest risk of malnutrition was during the short rains season, particularly for the years 2016 and 2017. The dry season was a high-risk factor for malnutrition during the years 2017, 2018 and 2019 (Figure 24).

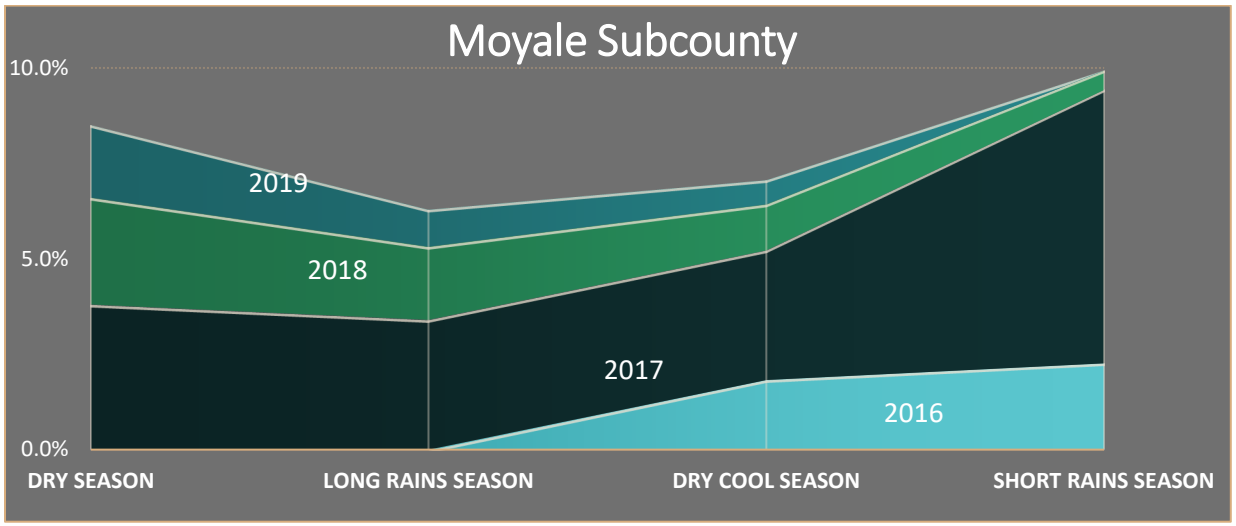


Figure 24: Evolution of acute malnutrition by seasonality in Moyale Subcounty

The seasonal average GAM by MUAC indicates the highest vulnerability to acute malnutrition in the dry season and short rains season. The least vulnerability was observed in the dry cool season (Figure 25).

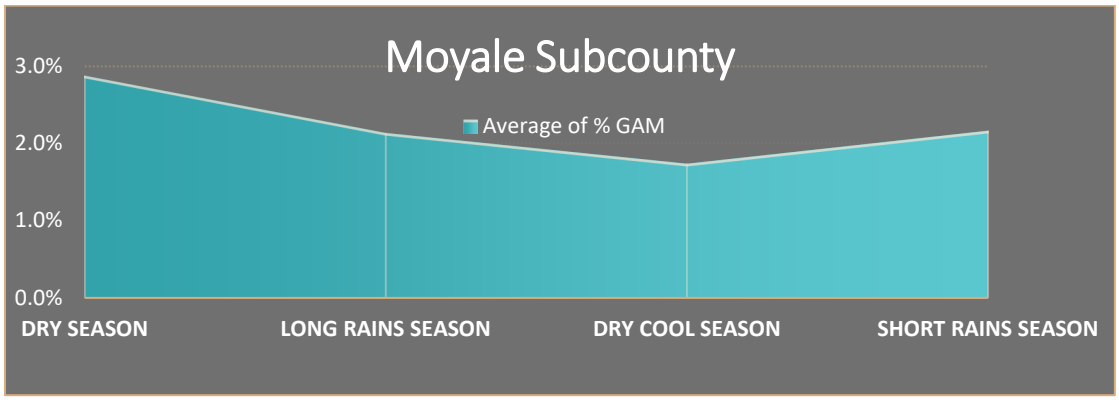


Figure 25: Trends of acute malnutrition in Moyale subcounty

4.5.6 Comparison of seasonality by GAM (MUAC) and GAM (WHZ)

The influence of seasonality on acute malnutrition judged by GAM MUAC and GAM WHZ is compared to establish the seasons of high vulnerability to acute malnutrition. Overall, based on the GAM WHZ, the dry cool season was the most vulnerable to acute malnutrition (in Marsabit County, North Horr and Laisamis subcounties) followed by the long rains season in North Horr and Laisamis subcounties (Figure 24). Analysis of vulnerability by GAM MUAC shows a different picture. The risk for high malnutrition was spread across seasons: the dry season, the long rains season, and the short rains season, with the dry cool season presenting the least vulnerability to acute malnutrition (Figure 24). The GAM WHZ consistently shows the dry cool season as presenting the highest vulnerability to malnutrition in all the subcounties, but most of the data was collected during this season whereas the MUAC data was collected monthly.

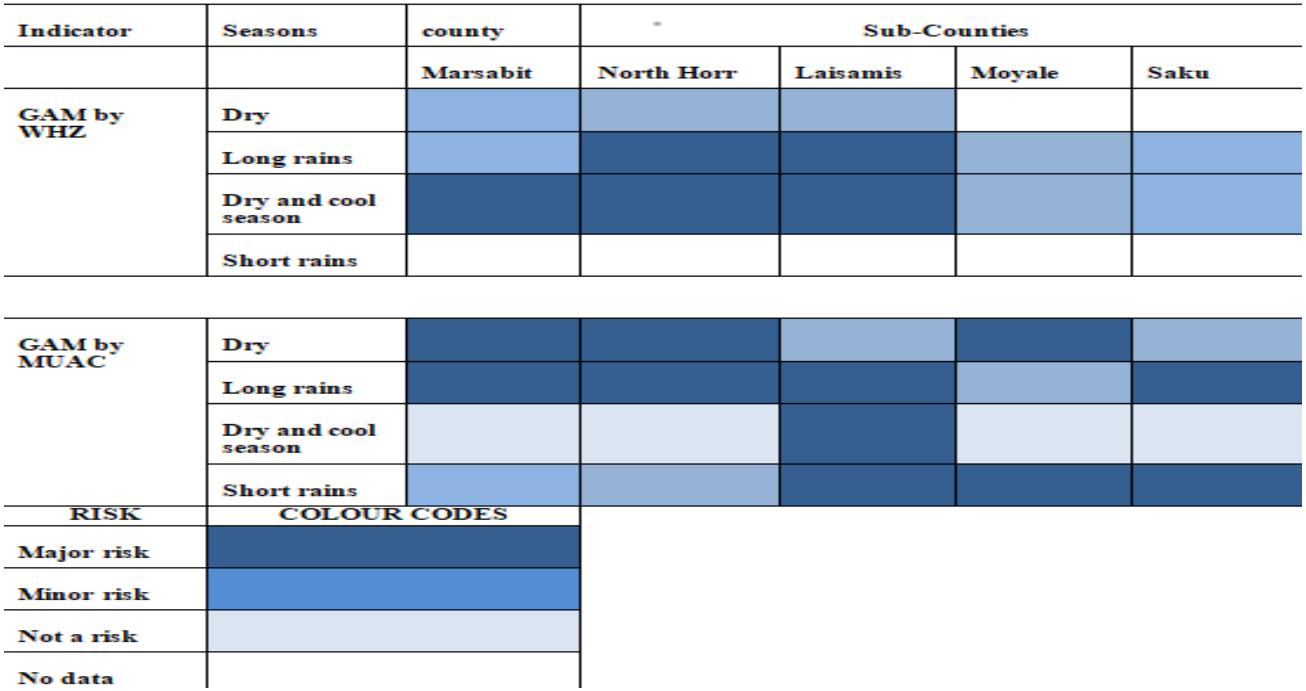


Figure 26: Comparison of vulnerability to acute malnutrition by seasonality between MUAC and WHZ indicators

5. Summary of Findings and Conclusions

5.1 Identification of malnutrition hotspots in Marsabit County disaggregated by subcounty and wards

Marsabit County experienced persistent acute malnutrition (WHZ) among children under age 5 during the period 2010 to 2019. The county showed either critical (15%–29.9% GAM) or serious (10%–14.9% GAM) phases of acute malnutrition based on the IPC classification of acute malnutrition version 3.0.[15] There was variation in the GAM rates from one year to another with the most critical years being 2011, 2014, 2017, 2018 and 2019. At the subcounty level, North Horr and Laisamis are acute malnutrition hotspots, whereas Saku and Moyale subcounties were stable with GAM (WHZ) rates below emergency levels in the period 2010 to 2019.

At the ward level, all wards in North Horr and Laisamis subcounties showed the greatest vulnerability to acute malnutrition (GAM ≥ 15%) in the majority of the years from 2012 to 2019. All the wards in Laiamis subcounty, that is; Korgi-South, Loiyangalani, Laisamis, Korr-Ngurut, and Loglogo and in North Horr; Turbi, North Horr, Illeret, Maikona, and Dukana are all considered malnutrition hotspots.

Despite Moyale subcounty not being a hotspot, there are pockets in three wards (Golbo, Uran and Obbu) that reported acute malnutrition at emergency threshold (≥15%) at least once between 2010 and 2019. Golbo ward presented acute malnutrition above the emergency threshold for three years, while Uran and Obbu each exhibited one emergency year between 2010 and 2019. These findings demonstrate that granularity of data to ward level is worthwhile to show where the hotspots are situated.

Saku subcounty is the most stable in Marsabit County, with GAM rates below emergency levels in all the years except in 2019 when Karare Ward reported 27.3% GAM. Karare is a ward to watch out for as most of the years it registered serious phase (10%–14.9%) of acute malnutrition, mostly tending toward the upper margin of phase classification.

5.2 Acute malnutrition by seasonality GAM (WHZ)

There are four seasons in a year in Marsabit County: the short dry season (January to March); the long rains season (April to June); the long dry and cool season (July to October); and the short rains season (November to December). The seasonality trend analysis was conducted based on GAM from SMART surveys and MUAC data. For a majority of the years, SMART surveys were conducted during the dry and cool seasons and, therefore, there is no representation of all the seasons in the SMART data. The rationale for conducting the surveys during this season is because Marsabit relies on the long rains season and,

[15] Integrated Food Security Phase Classification (IPC), Technical Manual Version 3.0- Evidence and Standards for Better Food Security and Nutrition Decisions 2019.

should the rains fail, there is a high likelihood of increased food insecurity and consequently a high risk of acute malnutrition. The surveys conducted during this season offer an opportunity to monitor malnutrition trends when they are expected to reach the highest rates. The GAM trend seasonality analysis based on SMART survey data is therefore indicative and not conclusive. The monthly MUAC data from NDMA was also used to analyze the trends of acute malnutrition across the seasons over the years from 2010 to 2019.

Overall, there were differences in the seasonality trends based on data from SMART surveys and MUAC data. Based on SMART survey data, the dry and cool season presented the highest risk or vulnerability to acute malnutrition. The long rains season was also a major risk factor for malnutrition in the county. In contrast, based on MUAC data, the risk for acute malnutrition was spread across seasons. The dry season, the long rains season and the short rains season presented the highest risk to malnutrition, with the dry cool season presenting the least vulnerability to acute malnutrition

5.3 Conclusions

Marsabit County, like the other ASAL counties, has always been known to be an acute malnutrition hotspot. The findings on the acute malnutrition hotspots have demonstrated the importance of granularity in the identification of the hotspots. The GAM rates from the SMART surveys are presented only at the county level; the granularity of the data to ward level has helped to identify hotspots that may need more attention in the efforts to mitigate malnutrition.

Acute malnutrition in Marsabit County manifests across the seasons of the year based on both SMART survey and the MUAC data. This may be an indication of the presence of other drivers, apart from seasonality, that influence acute malnutrition. Based on the SMART survey data, the dry cool season presented the greatest risk for malnutrition. The majority of the surveys were, however, conducted during the dry cool season and this may have introduced bias in the findings. Judged by MUAC data, the seasons which presented the greatest risk for malnutrition were the dry season, the long rains season and short rains season, and the least risk was the dry and cool season. These findings are an indication of the need to investigate, at the ward level, the risks for malnutrition because they are context-specific and therefore should be addressed specifically and appropriately. Granulation to the ward level in the investigation of the drivers is critical in the mitigation of malnutrition.