Integrated SMART Survey Report
Garissa County, Kenya
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By

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Contents

ABBREVIATIONS

ACF-USA	Action Contre la Faim- USA (Action Against Hunger-USA)
ANC	Antenatal care
BCG	Bacille Calmette Guerin
DEFF	Design Effect
DHRIO	District health record information officer
CDR	Crude death rate
CLTS	Community led total sanitation
CNC	County nutrition coordinator
CSI	Coping strategy index
ENA	Emergency nutrition assessment
FCS	Food consumption score
FSL	Food security and livelihood
FSOM	Food security outcome monitoring
GAM	Global acute malnutrition
HAZ	Height-for-Age z-scores
HiNi	High impact nutrition interventions
HH	Household
IFA	Iron-folate
IMCI	Integrated management of childhood illnesses
KCSE	Kenya certificate of secondary education
KNBS	Kenya national bureau of statistics
KRCS	Kenya Red Cross Society
MOH	Ministry Of Health
MUAC	Mid Upper Arm Circumference
NDMA	National drought management authority
OPV	Oral Polio Vaccine
PNC	Postnatal Care
PPS	probability proportional to size
RUSF	Ready to use supplementary food
RUTF	Ready to use therapeutic food
SAM	Severe acute malnutrition
SMART	Standardized Monitoring Assessment of Relief and Transitions
SUN	Scaling Up Nutrition
TDH	Terres Des Hommes
U5DR	Under-five death rate
UNICEF	United nation children education fund
V.A.T	Value added tax
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WHO	world health organization
WHZ	Weight-for-Age z-scores
WAZ	Weight-for-Age z-scores

EXECUTIVE SUMMARY

Garissa County is located in the former North eastern province of Kenya and covers an area of 44,175.5 km^2. The County has 7 sub Counties namely Garissa, Fafi, Lagdera, Ijara, Balambala, Hulugho and Dadaab. The County has an estimated population of 623,060[1]persons spread in following livelihood zones namely: pastoral, agro-pastoral and casual/ formal employment. Mercy USA has been taking lead in six sub Counties since 2010 while ACF has been operating in Dadaab sub County since 2013, The integrated nutrition survey was conducted between 27th May to 7th June 2014; incorporating both training and data collection. The seasonality of survey timing is characterized by dry and cold climatic conditions "Hagaa" which spreads in most parts of the County.

A. SURVEY OBJECTIVES

Overall objective

- To estimate the prevalence of malnutrition among children aged 6 to 59 months in Garissa County

Specific objective

- To determine the prevalence of malnutrition among children aged 6-59 months;
- To determine the immunization coverage for measles, Oral Polio Vaccines (1 and 3), and vitamin A supplementation in children aged 6-59 months;
- To determine maternal nutritional status based on MUAC measurements
- To estimate coverage of iron / folic acid supplementation during pregnancy in women of reproductive age;
- To collect information on possible underlying causes of malnutrition such as household food security, water, sanitation, and hygiene practices
- To estimate the retrospective crude and under five mortality rates in Garissa County

B. METHODOLOGY

The integrated SMART survey was conducted in Garissa County as from 27th May 2014 to 7th June 2014. The survey was a cross sectional study with two-stage cluster sampling using Standardized Monitoring of Relief and Transition (SMART) methodology. In stage one, a total of 37 villages were randomly selected using ENA for SMART software where PPS was applied. In stage 2, 16 households for both anthropometric and mortality were randomly selected from complete and updated list of households at the cluster level
The nutrition status of children aged 6-59 months from sampled households was assessed using anthropometric measurements. Emergency Nutrition Assessment (ENA) for SMART software delta version 2011 November 2013 was used for anthropometric and mortality sample size calculation (parameters used for sample size calculation are illustrated in table 1 and table 3).

[1] Kenya National Bureau of Statistics (KNBS) 2009 Census Report

C. DATA QUALITY

A total of *769* children aged 6-59 months were assessed for their nutritional status through anthropometric measurements from sampled household. Design effect for these survey was 1.32 (DEFF=1.32); indicating a relative homogenous population. The data quality analysis is presented in table 2 below (plausibility check on anthropometric results).

Table 1: Sample size calculation for nutritional status (under-five) using ENA for SMART software 2011 version November 2013

Estimated GAM[2]	Precision	DEFF[3]	U5 Population[4]	Av. HH size	Contingency	Sample size Children	Sample size HHs	Clusters (17HHs/ cluster)
12.1%	3.6%	1.63	18%	6	3%	559	**593**	**37**

Table 2: Plausibility check summary for anthropometric results

CRITERIA	Missing/ flagged data	Overall sex ratio	Overall age distribution	Digit pref. score Weight	Digit pref. score Height	Digit pref. score Height	Standard deviation WHZ	Skewness WHZ	Kurtosis WHZ	Poisson distribution WHZ	Overall score WHZ
SCORE	0(0.5%)	0(P=0.14)	4(p=0.011)	0(4)	0(6)	0(5)	0(1.09)	0(0.06)	0(-0.18)	1(p=0.048)	5%
Interpretation	Excellent	Excellent	Acceptable	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Excellent

Table 3: Sample size calculation for mortality using ENA for SMART software 2011 version November 2013

Estimated death rate/10,000/day	Desired precision/10,000/day	DEFF	Recall period	Population to be included	Average household size	% non-response households	Household to be included	Clusters (17HHs/ cluster)
0.56%	0.4%	2	84	3485	6	3%	**599**	**37**

[2] Estimated point prevalence of Garissa SMART Survey 2013
[3] Results of Design effect based on WHZ from results of Garissa SMART Survey 2013
[4] Kenya National Bureau of Statistics (KNBS) census data

D. SUMMARY OF FINDINGS

A total of 569 households were sampled and nutritional status of 769 children (6-59 months) was assessed based on Weight for Height Z-scores (WHZ) with 4 children excluded through SMART flags with z-scores out of range. Migration in most parts of the County among pastoral livelihood zones might have limited the survey teams in achievement of 593 households. The survey results for Global acute malnutrition (GAM) and severe acute malnutrition (SAM) are at 14.6% and 2.9% respectively. This is classified as serious based on WHO thresholds. No cases of bilateral pitting oedema were reported throughout the survey. Table 1, summarizes the results of nutrition and health indicators while table 2, summarizes the recommendations.

Table 4: Summary of nutrition and health indicator results, [Garissa, June 2014]

Index	Indicators			Results
WHO 2006	WHZ-scores	**Global Acute Malnutrition** *Weight for height< -2 z and/or oedema*		14.6%(11.8-17.8 95% CI)
		Severe Acute Malnutrition *Weight for height < -3 z and/or oedema*		2.9% (1.9-4.2 95% CI)
	HAZ-scores	**Stunting** *Height for age <-2 z-score*		7.6% (5.6-10.2 95%CI)
	WAZ-scores	**Underweight** *Weight for age <-2 z-score*		12.3%(9.9-15.1 95%CI)
	MUAC	**Global Acute Malnutrition** *MUAC <125 mm or oedema*		4.1%(2.5-6.9 95%CI)
		Severe Acute Malnutrition *MUAC <115 mm or oedema (<115mm)*		1.6%(0.8-2.9 95%CI)
Maternal Malnutrition		Pregnant and lactating mothers (MUAC<210 mm)		9.5%
Measles vaccination (months)		9-59 months; by card		30.2%
		9-59 months; both by card and recall		83.1%
Measles vaccination (months)		18-59 months; by card		5.2%
		18-59 months; card and recall		35.9%
BCG vaccination		6-59 months; scar		91.3%
Vitamin A supplementation		6-11 months	Once	71.6%
		12-59 months	Once	32.3%
		12-59 months	twice	30.3%
Vitamin A supplementation		6-59 months	recall	74.3%
			card	25.7%
Iron-folate supplementation		Pregnant mothers supplemented		67.5%
		Utilization of Iron-folate was supplemented	Within 30 days	72.9%
			60 days	22.7%
			90 days	4.4%
Mortality indicators		**Sphere Emergency thresholds**		
Crude death rate(CDR)		2/10,000/day		0.48(0.21-1.09 95%CI)
Under-five death rate (U5DR)		4/10,000/day		0.43(0.10-1.88 95%CI)
*The prevalence of oedema was 0.0 %				

Table 5: Summary of Recommendations

Findings	Recommendation	Actor
Nutrition and health	1. Improve IMAM coverage at facility and outreach site; • On-job training on newly recruited health workers and CHEWs • Active case finding to facilitate early treatment, referral and admissions • Improve RUTF/RUSF commodity distribution at the facility and outreach sites • Need to integrate health services in order to improved coverage of health and nutrition services are administered to the child, ie. Growth monitoring, immunization and supplementation. • Improve documentation of child health card; ensure child health and nutrition card is updated whenever a child visits a health facility 2. Promote daily health and nutrition talks at facility and outreach sites through community health workers, mother to mother support groups, and other forums for PLWs and other influencers to trigger awareness at the community on need to visit a public health facility for treatment of illnesses, improved ANC access and hospital delivery, and improved nutrition practices including iron folic supplementation, childhood vaccination, and appropriate breastfeeding 3. Promote maternal screening at the village by MUAC and linkage to the facility; this shortens the gap of malnutrition with early triage of pregnant and lactating mothers and linking them to supplementary feeding programs for those below <21.0cm by MUAC, ANC pregnant mothers counselling, iron-folate supplementation) and PNC(lactating mothers) 4. Revive ORT "corners" at facility/outreach sites to ensure treatment modalities for diarrhoea cases are administered promptly 5. Support pneumococcal pcv10 vaccination as advocated in IMCI to lower the incidences of pneumonia illnesses among under-fives 6. Advocate for increased health facilities, outreaches and enhanced coverage in line with coverage assessments and existing gaps to support health and nutrition activities, including supporting links with appropriate facilities such as ECD and madrasas to reach school-going children between 3 ½ to 5 years of age	Garissa County government &partners
Water, sanitation and hygiene	1. Public health education at outreach and facility level on simple water treatment techniques such as boiling to improve safety of drinking water at the household level 2. Promote critical handwashing practices compulsory with soap and water at facility, outreach sites and schools 3. Support communication for development for best sanitation practices that will increase awareness thus triggering community led total sanitation (CLTS)	Garissa County government &partners
Food security and livelihood	1. Integrate NDMA early warning bulletins in planning process; ensuring that food security activities are encompassed at all levels 2. Enhance cooking demonstration and displays of various food groups rarely eaten at community level, including vegetables and pulses which are drought-resistant and high in nutrient composition, ensuring that women and men groups are involved 3. Support micro-irrigation among communities to diversify household food and cash income by utilizing County own resources such as land, water from rivers/boreholes, manure &human work force; this can be achieved through importing expertise from other Counties to help in training of women and men on suitable crop farming, livestock husbandry and agricultural economics to maximum their own production	Garissa County government &partners

1.0. INTRODUCTION

1.1 Background information

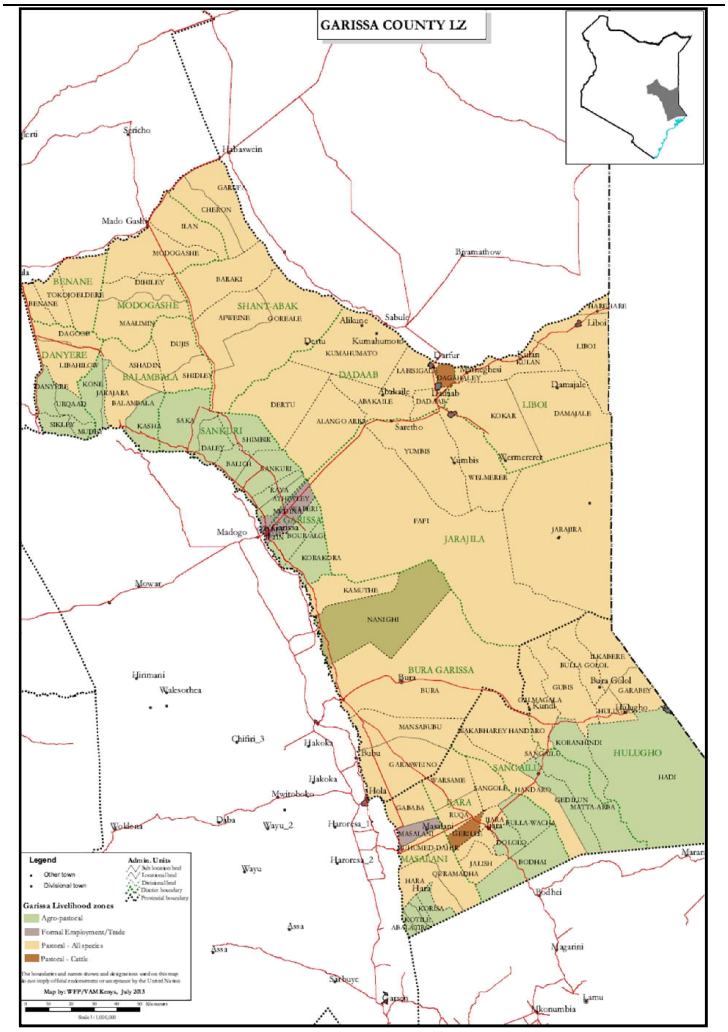

Figure 1: Map of Garissa County by livelihood zones

Garissa County is located in the former North eastern province of Kenya and covers an area of 44,175.5 km^2.It borders Wajir County to the North, Tana River County to the West, Isiolo County to the North West, Lamu County to the South and federal republic of Somalia to the East. The County has an estimated population of 623,060[6]persons spread in following livelihood zones namely: pastoral (camels, goat, sheep and cattle), agro-pastoral, casual/ waged labour and formal employment. Action Against Hunger | ACF - USA (ACF) and Mercy USA in partnership with the County government MOH and other have been supporting the implementation and scale up of HiNi (High Impact Nutrition Interventions) and strengthening the health system in Garissa County. Currently, Mercy USA has its operations in 6 Sub Counties; Balambala, Hulugho, Fafi, Garissa, Ijara, Lagdera (TDH/Mercy USA), while ACF covers the entire Dadaab Sub County.

1.2 Objectives

Overall objective

- To estimate the prevalence of malnutrition among children aged 6 to 59 months in Garissa County

Specific objective

- To determine the prevalence of malnutrition among children aged 6-59 months;
- To determine the immunization coverage for measles, Oral Polio Vaccines (1 and 3), and vitamin A supplementation in children aged 6-59 months;
- To determine maternal nutritional status based on MUAC measurements
- To estimate coverage of iron / folic acid supplementation during pregnancy in women of reproductive age;
- To collect information on possible underlying causes of malnutrition such as household food security, water, sanitation, and hygiene practices
- To estimate the retrospective crude and under five mortality rates in Garissa County
- To build the capacity of the National Drought Management Authority field monitors

[6] Kenya National Bureau of Statistics (KNBS) 2009 Census Report

1.3 Seasonality of the survey timing

Table 6 below highlights seasonal calendar for Garissa County and common activities noted among the households at the time of the year.

Table 6: Garissa County seasonal calendar

"Jilal" Dry season	"Guu" long rain season	"Hagaa" dry and cold season	"Deer" Short rainy season
Dry period from January to March. Activities carried out include: • Migration of livestock for pasture & water search • Herd separation • Livestock marketing • Pressure on boreholes use	Starts late March and ends May. Activities carried out include: • Selection/breeding of livestock • Weeding ceremonies • Restocking of livestock • Deworming of livestock • Male circumcision	From June to mid-October. Activities carried out include: • High rate of livestock and household migration • High labour demand • Destocking /culling • Surveillance for pasture /browse • Caravan water trekking	From late October to December. Activities carried out include: • Restocking of livestock • Breed improvement • Planting for rain fed crops • Calving/kidding

The seasonality of the survey timing is characterized by dry and cold season "Hagaa,"as observed in table 6 above. During the survey period, livestock and household migration has been noted in various parts of the County as herders search for pasture and water. According to NDMA early warning bulletin of May, 2014; the rainfall performance based on projections has been below expectations. Sporadic light showers received in the south (Bura, Galmagala) and south east (Liboi, Jarajila) parts of the county in the first dekad of the month while the rest of the county did not receive rains. The previous Integrated Nutrition SMART survey, which was conducted in April 2013, showed a serious nutritional status with GAM of 12.0% (9.3-15.5, 95% C.I.) and a SAM of 1.3% (0.8-2.3, 95% C.I.). Although it is best practice to conduct SMAT surveys during consistent yearly timings, the June 2014 integrated nutrition SMART survey was shifted from April to June due to the following reasons;

- The need to feed into seasonal assessments, for this case the long rains seasonal assessment
- Need for adequate and all conclusive data for planning and programming at County level more so with the devolution dispensation

1.3.1 Survey timing

The survey was undertaken by ACF and Mercy USA in close collaboration with MOH and other stakeholders/partners to include NDMA, KRCS, and TDH. The integrated nutrition survey was conducted between 27th May to 7th June 2014; this incorporated both training and data collection. The survey formed a baseline for other subsequent integrated nutrition surveys in the County.

2.0. METHODOLOGY

2.1 Type of survey

The integrated nutrition survey was undertaken in Garissa County in June, 2014. Prior to the survey, secondary information review of various existing data (March to May, 2014 NDMA monthly bulletins, District Health Information System (DHIS) and previous SMART surveys of April-May, 2013 and May, 2011) was undertaken. The actual data collection exercise was conducted after long rains of Mid-March to May 2014,

which was in line to national survey timelines for conducting assessments with an objective to determine the performance of rain " *Guu*" season on both core indicators (GAM/SAM,CDR/U5DR) and underlying indicators (Morbidity, household food security and WASH).

SMART methodology was employed during the anthropometric survey in planning, training, data entry and analysis. Other data sets collected concurrently include data on WASH (Water Sanitation and Hygiene), FSL (Food security and livelihood) and Mortality (Crude and under-five death rates).

2.2 Sampling procedures

A sample size of 37 clusters by 16 households was used based on various parameters as indicated in tables 7 and 8. A two stage sampling methodology was employed. In the first stage 37 clusters were sampled using probability proportional to population size (PPS). Population data was obtained from Kenya National Bureau of Statistics (Census 2009) then triangulated with population data from the administrative leaders.

The second stage involved obtaining an updated and complete list of households from village elder at the cluster/village level. 16 households were then selected using simple random sampling. All the households sampled were interviewed using the mortality, household questionnaire and anthropometric measurements taken on all children aged 6-59 months.

Table 7 : Sample size calculation for anthropometric survey

parameters	Anthropometric survey	Rationale
Estimated prevalence of GAM	12.1%	Obtained from previous SMART survey results of April 2013
Desired precision	3.6%	The higher the malnutrition prevalence, the lower the precision; To meet survey objectives
Design effect	1.63	Design effect obtained in April 2013 survey results
Average household size	6	From KNBS (Kenya National Bureau of Statistics) 2009 census data Demographic data 2005-2010
Percent of under five children	18%	Population estimate from DHIS and Census report 2009
Percent of non-respondent	3%	To cater for any unforeseen circumstances
Households to be included	**593**	

Table 8: Sample size calculation for mortality survey

parameter	Mortality survey	Rationale
Estimated prevalence of GAM	0.56	No updated death rate at population level; County need to conduct an death rate estimates Point estimates for death rate obtained from SMART results of May, 2011 Review of secondary data justifies why we used the value
Desired precision	0.4	In order to meet set mortality objectives and inline to estimated death rate
Design effect	2	Cater for heterogeneity in the County
Average household size	84	Start point of recall period (during commemoration of Garissa County government in 13th March 2014; end of recall period will be 6th June 2014)
per cent of under five children	6	Census data 2009
Per cent of non-respondent	3%	Past experience from assessments Anticipated community mobilization is expected to create further awareness
Households to be included	**599**	

2.2.1 Selection of cluster

An updated list of all villages with their respective population in the entire Garissa County was established. A total of 473 villages in Garissa were entered into ENA for SMART Software 2011 delta version (November 2013). 37 Clusters/villages were then selected using probability to proportional to size in stage one of cluster sampling.

2.2.2 Selection of households within a cluster

A total of 16 households were randomly selected in each of the sampled villages by dividing total number of household to be sampled (593) by the number of cluster (37). An updated and complete list of households was generated from administrative unit list (chief/sub chief register) and village elders total household count for the entire village. The survey teams randomly selected the households using random number tables from the total list of household. Anthropometric, household and mortality questionnaires were administered to caregivers of sampled households. Data was obtained through structured questionnaires, observations and informal interviews.

2.3 Training framework

A total of thirty eight participants were trained on SMART methodology. They were drawn from the ministry of health (MOH) led by County nutrition coordinator (CNC), national drought management authority (NDMA) field monitors, local volunteers from the community and staff from partners (TDH, KRCS, Mercy USA and ACF). Priority was given to NDMA field monitors as per survey objectives of capacity building them on nutritional anthropometry. Community volunteers from the County, with KCSE[7] accreditation were also selected as part of survey enumerators and data clerks. Training was conducted as from 27th to 31st May 2014 and was facilitated by ACF and Mercy USA in close collaboration with Ministry of Health officials (DNOs, DHRIO, DMOH, and NDMA CDIO). The training covered the following areas;

- Introduction to SMART surveys

[7] Kenya Certificate of Secondary Education

- Survey goal and objectives
- Sampling procedures
- Taking anthropometric measurements
- Questionnaire design
- Field procedures

Standardization and pilot test were carried out as part of the training. The experience and feedback was shared among the team in the entire process. As indicated in the standardization test result in annex 2, it highlights on enumerators performance with respect to repeated children measurements and closeness of the results to that of supervisor measurements (true results). After the standardization various team leaders were able to organize their teams based on strength and weakness of each; close monitoring and supervision of teams to ensure accuracy and precision in anthropometric measurements was maintained during actual data collection.

2.4 Survey team and supervision

The survey teams was composed of three coordinators, three supervisors, seven team leaders, 21 enumerators and four data entry clerks eventually forming eight teams. Coordination and supervision of the entire process was led by the County Nutrition Coordinator under technical support from ACF and Mercy USA Staff. Daily supervision of teams was done by respective team leaders ensuring the survey team followed the right sampling procedures at the household level, including; administration of consent and data collection tools, anthropometric measurements and review of questionnaires before returning to the bases.

2.5 Analysis of quality of data collected

Data quality assurance process was maintained by observing the following steps;

- Validation of the survey methodology at the nutrition information working group
- SMART training, standardization and pilot test
- Daily support and supervision of teams at the cluster/village level
- Daily feedback session through plausibility and questionnaire checks
- Continuous daily data entry and primary analysis of all datasets

2.6 Important considerations noted during data collection process at household level

There were special cases in the field during data collection where the survey team had empty households; some of the sampled households had no eligible children.

Migratory households: Household movement was noted especially in pastoral livelihood zones of Garissa County. Survey teams recorded the sampled household on the nutritional data sheet and cluster control form as having migrated and survey team proceeded to the next house according to the sampling rules.

Polygamous families: Household definition was the basis for dealing with polygamous families. Polygamous households should be counted as one as long as they are living together and sharing a common cooking pot. This was explained to the community leaders prior to data collection.

Absent children: Children eligible and absent at the time of data collection were re-visited later in the day, after completion of other households within the cluster. The team went back to the house to find if the child had returned. In cases where the child was completely absent from the survey area and no chance of getting the child, for example, where young children eligible as survey subjects followed herders in search of pasture; the team recorded down the list of these children as missing children and proceeded with other sections or measurements in case other children eligible were in the sampled household.

2.7 Case definition and inclusion criteria

The basic sampling unit was the household. A household was defined as “people who live together and share food from a common pot”. The following information and data was collected for all eligible children aged 6-59 months;

2.7.1 Anthropometric Data

- **Age**: Birth certificate, birth notification and immunization card were used as the primary source of the child's age. In the absence of these documents, a local calendar of events developed from discussions with community members, enumerators and key informants was used. 54% of child ages were determined by estimation using local calendar of events.
- **Child's Sex:** This was recorded as either '**f**' for female or '**m**' for male.
- **Weight:** A seca digital weighing scale was used to measure the children's weight. The scales were calibrated on daily basis to ensure accuracy. Emphasis was stressed on placement of weight scale on a hard flat surface with minimal or no movement of the child and accurate recording of measurements to the nearest 0.1kg.
- **Height:** A height board was used to measure children above 2 years of age while length was taken for children less than 2 years of age. Of emphasis was the ideal placement of the cursor as per instructions on height measurements ensuring minimal or no movement of the child and maintaining height readings at eye level to the nearest 0.1cm.
- **MUAC:** Mid Upper Arm Circumference was measured on the left arm, at the middle point between the tip of the elbow and the tip shoulder bone while the arm is at right-angle, then followed MUAC measurements of the arm while it is relaxed and hanging by the body's side. MUAC was measured to the nearest mm. In the event of a disability on the left arm or a left-handed child, the right arm was used. Of emphasis during the exercise was correct identification of mid-point and placement of MUAC tape on arm not too tight or too loose. Maternal MUAC tapes were used to measure MUAC in women of reproductive age.
- **Bilateral Oedema:** This was assessed by the application of moderate thumb pressure for at least three seconds on both feet. If a depression/pitting formed upon pressure application, then presence of bilateral oedema was confirmed. Emphasis was placed on double checking this with other members of the team and reporting to the supervisor.

2.7.2 Immunization and Vaccination Data

- **Measles vaccination:** The child's vaccination card was used as a source of verification of child immunization against measles (done subcutaneously on the right upper arm). In circumstances where this was not available, the caregiver was probed to determine whether the child had been immunized or not (for 1st dose at 9 months and 2nd dose from 18 to 59 months). All children with confirmed immunization (by date) on the vaccination card, the status were recorded as "1" (Card) otherwise as "3" (Not immunized). Oral confirmation from the caregiver without proof of card was recorded as "2" (Recall). In a situation whereby the caregivers could not ascertain whether the child has been immunized against measles, it was recorded as "4" (Don't know). Children between 9 to 18 months or greater were used to determine coverage of this in the final analysis**.**
- **BCG at birth** (confirmation of scar on the left arm); if immunized & with a scar the status was recorded as"1"**,** if not "2" was used**. Oral Polio Vaccine (OPV) 1 (**1st dose at 6 weeks) **and OPV3** (3rd dose at 14 weeks) was tabulated for all children aged 6-59 months.

2.7.3 Health Information

- **De-worming:** Determined by the number of times the child (12-59 months) received drugs for intestinal worms in the past one year. A sample was shown to the caregivers to enhance their recall.
- **Vitamin A coverage**: The number of times that the eligible children (6-59 months) received Vitamin A was recorded. Immunization booklet was used as the primary source of this information. In absence of this, a sample was shown to the caregiver to enhance their recall. Caregivers were probed on the number of times they received Vitamin A from the health facility or outreaches.
- **Morbidity:** This information was based on a recall period of two weeks. The caregivers were asked on whether their children (6-59 months) had been ill in the past two weeks. The type of illness and seeking behaviors were recorded in the household questionnaire.
- **Mortality:** A separate mortality questionnaire was used to determine the mortality rate. A recall period was 84 days from commemoration of Garissa County Government on 13th March 2014 to the end of recall period on 6th June 2014.

2.7.4 Other Data sets

The Household questionnaire was used to gather data on other variables related to HINI indicators, WASH (Water Sanitation and Hygiene) and FSL (Food Security and Livelihood).

2.7.5 Ethical considerations

Sufficient information was provided to the local authorities about the survey. Include the purpose and objectives of the survey, the nature of the data collection procedures, the target group, and survey procedures. Verbal consent was obtained from all adult participants and parents of all eligible children in the survey. The decision of caregiver to participate or withdrawal was respected. Privacy and confidentiality of survey respondent and data was protected.

2.7.8 Referrals

Referrals for eligible survey subjects who showed signs or symptoms that require immediate clinical attention and/ or below cut off points by MUAC were issued with referral letters and assisted the very sick to reach the health or feeding centre.

2.8 Data entry and analysis

Data entry was done daily as the survey progressed to ensure optimum supervision and data quality. Anthropometric and mortality data was entered and analyzed using ENA for SMART software (November 2013 version). Data on other variables was entered and analyzed on Microsoft Excel 2010.

2.9 Nutrition indices and thresholds used

2.9.1 Anthropometric indices

The reference values used are WHO standards 2006.The indices are expressed in Z-scores, according to WHO 2006 reference standards.

Weight for height (WHZ) index: The percentage of acute malnutrition was estimated from weight-for-height (WFH) index values combined with presence of oedema (and/or oedema). The weight for height index compares the weight of the child measured to the median weight of a reference population for that particular height.

Height for age (HAZ) index: Chronic malnutrition is characterised by a deficit in height for age, which results in stunted growth. The prevalence of chronic malnutrition was estimated from the height for age index. This index compares the height of a child to the average height of a reference population for that particular age.

Weight for age (WAZ) index: The prevalence of underweight was estimated from the weight for age index. The index weight for age compares the weight of a child to the median weight of a reference population for that particular age.

Table 9: Threshold values for weight for height, height for age and weight for age indices based on WHO 2006 reference standards

	Acute malnutrition (Weight for height)	Chronic malnutrition(height for age)	Acute and chronic (weight for age)
Global	<-2SD and/or bilateral Oedema	<-2SD	<-2SD
Moderate	<-2SD and ≥3SD and Oedema	<-2SD and ≥3SD	<-2SD and ≥3SD
Severe	<-3SD and/or existing bilateral oedema	<-3SD	<-3SD

2.9.2 Indicators, guidelines and formulas used in acute malnutrition

Weight for height (WHZ) index

This was estimated from a combination of the weight for height (WHZ) index values (and/or oedema) and by sex based on WHO[1] standards 2006. This index was expressed in WHZ indices in Z-scores, according to WHO 2006 reference standards.

Z-Score:

- Severe acute malnutrition is defined by WHZ < -3 SD and/or existing bilateral oedema
- Moderate acute malnutrition is defined by WHZ < -2 SD and >-3 SD and no oedema.
- Global acute malnutrition is defined by WHZ < -2 SD and/or existing bilateral oedema.

Mid upper arm circumference (MUAC)

MUAC measurements was also undertaken to determine the nutrition status of eligible children and mothers/caretaker (15-49 years of age) from sampled households. The following MUAC criteria were applied.

Table 10: MUAC thresholds for children less than five years[12]

MUAC Guideline	Interpretation
MUAC <115mm and/or bilateral Oedema	Severe acute malnutrition
MUAC >=115mm and <125mm *(no bilateral oedema)*	Moderate acute malnutrition
MUAC >=125mm and <135mm *(no bilateral Oedema)*	Risk of malnutrition
MUAC > 135mm (no bilateral Oedema)	Adequate nutritional status

Table 11: Maternal MUAC thresholds

Maternal MUAC cut off	Interpretation
MUAC < 21.0cm	Malnourished
MUAC ≥21.0cm-<23.0cm	At risk
MUAC >23.0cm	Normal

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[12] Integrated Management of Acute Malnutrition

3.0 Results

3.1 General characteristics of study population and household

The total population covered from 569 random sampled households was 3,308 persons. This shows that the County average household size is at 5.81 persons per household. The average number of children below 5 years of age in the County is at 1.5 children per household. Assessment of occupation of a household head showed that livestock keeping/herding (56.5%) was the major means to obtain food and cash income at household level. Other reported forms of occupation among household heads include; waged labour (15%), petty trade (12.3%), salaried employment (5.9%), own farm labor (2.8%), firewood and charcoal selling (4%), merchants/traders (1.5%) and other forms of occupation (2%). The survey assessed enrollment rates in schools for the school going age (3-18 years) with the findings showing that (61.2%) were enrolled in school at different levels. The enrollment levels are below national targets of >80%. The reason for not attending school was most caregivers preferred their children attending "duksi and madrasa" with more than half (52.3%) stating these as major reason. Other reasons for not attending school include; no school(s) nearby (6.6%), households too poor to buy school items (6.2%), family labor responsibilities (14.2%) ,households do not see the value of schooling(10.4%), chronic illness (5.4%), harsh weather (1.0%), teacher abseentism (1.4%), migrated (1.6%), insecurity (0.2%) and early marriages(0.9%).

3.2 Anthropometry

3.2.1 Distribution by Age and Sex

The anthropometric survey involved 769 children. Four values with Z scores out of range were excluded from the analysis. The ratio for boys and girl was 1.05, which is within the estimated range of 0.8-1.2 with a p-value of 0.591. This shows that the boys and girls were equally represented in the sample as observed in table 12 below.

Table 12: Distribution of age and sex of sample

	Boys		Girls		Total		Ratio
AGE (months)	**no.**	**%**	**no.**	**%**	**no.**	**%**	**Boy: girl**
6-17	108	58.7	76	41.3	184	23.8	1.4
18-29	96	52.7	86	47.3	182	23.5	1.1
30-41	104	53.3	91	46.7	195	25.2	1.1
42-53	73	47.1	82	52.9	155	20.1	0.9
54-59	26	45.6	31	54.4	57	7.4	0.8
Total	407	52.7	366	47.3	773	100.0	1.1

3.2.2 Nutritional status of children 6-59 months

A. Prevalence of acute malnutrition based on weight-for height Z-scores

The World Health Organization 2006 Growth Standards was used to compute and interpret the survey results. As observed in table 13 below and figure 2, a total of 769 children were included in main survey results based on weight-for-height (WHZ) z-scores. Four children were excluded based on z-scores out of range. The survey result unveiled a global acute malnutrition (GAM) prevalence of 14.6% (11.8-17.8, 95% C.I.) and a SAM prevalence of 2.9% (1.9- 4.2 95% C.I.). Boys and girls were equally malnourished with no significant difference with (p-value =0.862). No case of edematous child was reported. The classification of acute malnutrition rate

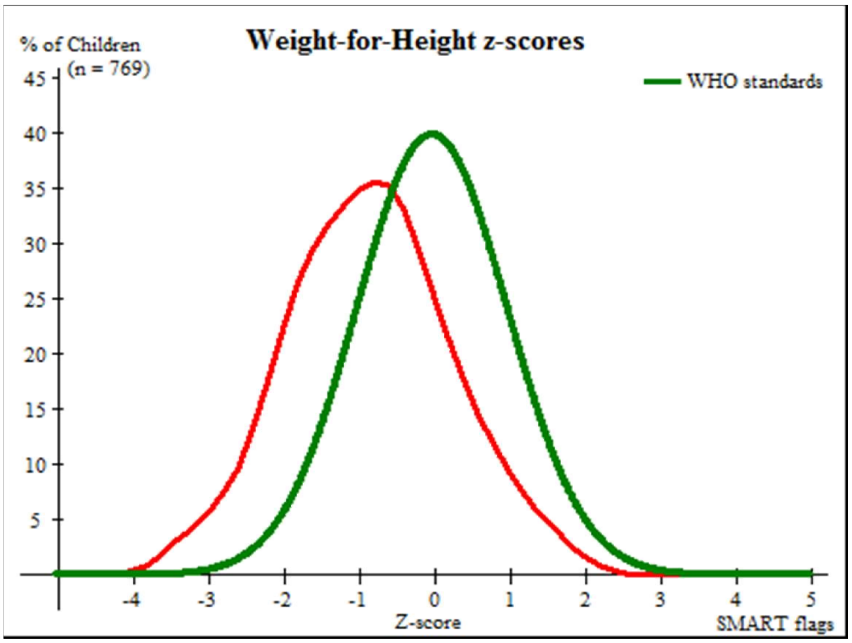
(WHZ) based on WHO 2000[14] shows a serious state of global acute malnutrition. Global wasting is high among older children aged 54-59 months (29.8%) (n=17 out of 57), 42-53 months (18.1%) (n=28 out of 155) and lower in young children aged 6-17 months (9.3%) (n=17 out of 182) and 18-29 months (12.1%) (n=22 out of 182) respectively. Table 14 shows the prevalence of acute malnutrition by age. There were no cases of marasmic-kwashiokor or kwashiorkor in the total number of children surveyed. There was a slight increase in GAM rates though statistically insignificant with current GAM prevalence at 14.6% (11.8-17.8 95% C.I.) when compared to last year (April, 2013) GAM prevalence of 12.1% (9.3-15.5 95% CI) with a p-value of 0.223. However SAM prevalence had increased from 1.3% (0.8-2.3 95% C.I.) to current SAM rates of 2.9% (1.9-4.2 95% C.I.)[15], which is a statistically significant difference calculation revealed by the p-value (p-value=0.021). The slight increase in acute malnutrition has been attributed to household food insecurity with poor performance of long rains (March-May 2014) noted in most areas of Garissa County, with sporadic showers noted in few areas[16]. The situation has deteriorated, coupled with the failure of the short rains (October-December 2013); the household food security situation is expected to deteriorate further with pastoral livelihood zones most affected as they rely on both seasons. Increased incidences in child illnesses namely ARI/cough (59.3%), Fever/Malaria (27.4%), diarrhoea (14.7%) and multiple infections (8%) with 39.9% of sampled children sick two weeks prior to survey might have contributed to increased GAM and SAM rates.

Table 13: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 769	**Boys** n = 405	**Girls** n = 364
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(112) 14.6 % (11.8 - 17.8 95% C.I.)	(58) 14.3 % (10.9 - 18.6 95% C.I.)	(54) 14.8 % (10.9 - 19.8 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(90) 11.7 % (9.4 - 14.5 95% C.I.)	(43) 10.6 % (7.5 - 14.8 95% C.I.)	(47) 12.9 % (9.6 - 17.1 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(22) 2.9 % (1.9 - 4.2 95% C.I.)	(15) 3.7 % (2.2 - 6.2 95% C.I.)	(7) 1.9 % (0.9 - 3.9 95% C.I.)

The prevalence of oedema is 0.0 %

[14] WHO (2000), Classification of public health significance for under-five
[15] Integrated health and nutrition SMART survey for Garissa County, April 2013
[16] NDMA early warning bulletin of May, 2014



Gaussian curve as shown in figure 2 below indicates the surveyed curve (red colour) has deviated to the left of the reference(WHO) curve (green colour) with a mean and standard deviation based on WHZ[17](n=769 at–0.85 and ± 1.09) respectively. This indicates relatively serious nutrition status of the survey population.

Figure 2: Gaussian curve illustrating distribution of weight-for-height Z-score compared to WHO reference standard with Z-score exclusion by SMART flags

Table 14: Prevalence of acute malnutrition by age based on WHZ and/or oedema

		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Global wasting (<-2 Z-score)		Oedema	
Age (months)	Total no.	No.	%	No.	%	No.	%	No.	%	No.	%
6-17	182	3	1.6	14	7.7	165	90.7	17	9.3	0	0.0
18-29	182	3	1.6	19	10.4	160	87.9	22	12.1	0	0.0
30-41	193	8	4.1	20	10.4	165	85.5	28	14.5	0	0.0
42-53	155	6	3.9	22	14.2	127	81.9	28	18.1	0	0.0
54-59	57	2	3.5	15	26.3	40	70.2	17	29.8	0	0.0
Total	769	22	2.9	90	11.7	657	85.4	112	14.6	0	0.0

Figure 3 below shows the trends in both GAM and SAM based on weight-for-height z-scores since 2011, with no results for 2012 to compare. In 2011, the GAM (16.2%) and SAM (3.2%) prevalence were at critical levels attributed to prolonged failure of rains coupled with mass conflicts at the time which resulted to loss of livelihood and population movements in areas affected with children and women most affected[18]. In 2013, the GAM (12.1%) and SAM (1.3%) rates decline was attributed to improved household food security situation which was linked to good performance of rains and significance decline in insecurity/conflicts[19].

[17] Weight-for-height Z-scores
[18] Integrated SMART Survey for Garissa County, May 2011
[19] Integrated Nutrition and Health SMART Survey for Garissa County, April 2013

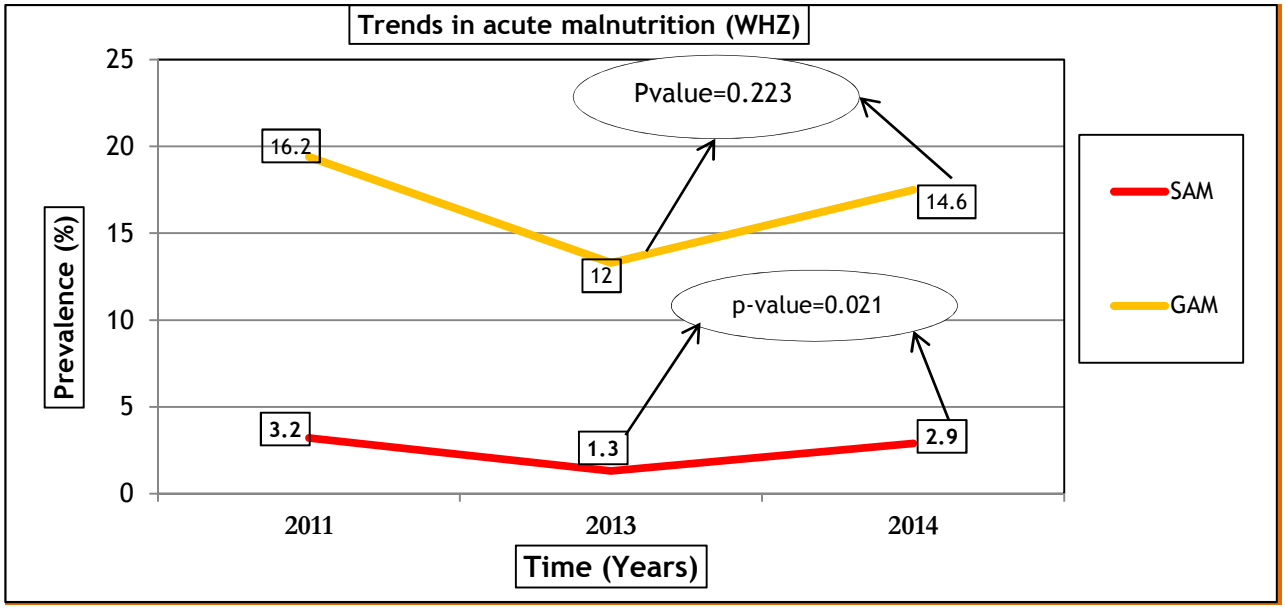


Figure 3: Trends in acute malnutrition based on Weight-for-height Z-scores

B. Prevalence of Acute Malnutrition by MUAC

Mid upper arm circumference (MUAC) is a good predictor in identifying malnourished children at a high risk of death[20]. Survey findings indicate that GAM and SAM prevalence by MUAC was 4.1% (2.5-6.9, 95% C.I.) and 1.2% (0.5-2.6 95% C.I.) respectively. GAM prevalence by MUAC was higher in younger children aged 6-17 months and 18-29 months at 7.1% and 5.5% respectively. It was lower in older ages of 42-53 months (0.0%) and 54-59 months (3.6%). Both boys and girls are equally malnourished based on MUAC cut off. Table 15 below shows the MUAC cut offs by sex. No significant difference observed when current GAM and SAM prevalence by MUAC were compared to the April 2013 results where GAM and SAM by MUAC was at 4.4% (3.1-6.3 95% C.I.) and 0.5% (0.2-1.4 95% C.I.) respectively.

Table 15: Prevalence of acute malnutrition based on MUAC cut offs (and/or oedema) and by sex

	All n = 772	**Boys** n = 406	**Girls** n = 366
Prevalence of global malnutrition (< 125 mm and/or oedema)	(32) 4.1 % (2.5 - 6.9 95% C.I.)	(14) 3.4 % (1.7 - 7.0 95% C.I.)	(18) 4.9 % (2.7 - 8.9 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(23) 3.0 % (1.6 - 5.6 95% C.I.)	(9) 2.2 % (0.8 - 5.9 95% C.I.)	(14) 3.8 % (2.0 - 7.3 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(9) 1.2 % (0.5 - 2.6 95% C.I.)	(5) 1.2 % (0.4 - 3.5 95% C.I.)	(4) 1.1 % (0.4 - 2.9 95% C.I.)

C. Prevalence of underweight based on weight-for-age z-scores (WAZ)

Low weight-for-age (underweight) arises from insufficient weight gain relative to age. Based on the findings of the survey, the prevalence of global underweight was 12.3% (9.9-12.3, 95% C.I.) and severe underweight was 1.8% (1.1-3.0, 95% C.I., Table 13). Both boys and girls were equally malnourished based on weight-for-age z-scores. Prevalence of underweight was higher in children aged 54-59 months (14.0%) and lower in children aged 6-17 months (9.8%). No statistical significant difference was observed when current prevalence of underweight by (WAZ) were compared to the April 2013 results where prevalence of underweight and severe underweight were at 14.0 (10.8-17.9 95% C.I.) and 3.2% (1.8-5.6 95% C.I.) respectively with a (p-value=0.439).

Table 16: Prevalence of underweight based on weight-for-age Z-scores and by sex

	All n = 767	**Boys** n = 401	**Girls** n = 366
Prevalence of underweight (<-2 z-score)	(94) 12.3 % (9.9 - 15.1 95% C.I.)	(47) 11.7 % (8.7 - 15.6 95% C.I.)	(47) 12.8 % (9.2 - 17.6 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(80) 10.4 % (8.4 - 12.9 95% C.I.)	(40) 10.0 % (7.5 - 13.2 95% C.I.)	(40) 10.9 % (7.8 - 15.1 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(14) 1.8 % (1.1 - 3.0 95% C.I.)	(7) 1.7 % (0.8 - 3.8 95% C.I.)	(7) 1.9 % (0.9 - 4.2 95% C.I.)

D. Prevalence of stunting bases on height-for-age z-scores (HAZ)

Stunting (low height-for-age) arises from a prolonged duration of inadequate food intake, poor dietary quality, increased morbidity, poor infant and young child feeding practices or a combination of these factors. The prevalence of stunting and severe stunting is currently at 7.6% (5.6-10.2 95% C.I.) and 0.9% (0.4-2.1 95% C.I.) respectively. Stunting rates based on (HAZ) and sex is illustrated in (Table 17). Both boys and girls were chronically malnourished based on (HAZ).Children aged 18-29 months (11%) (n=19 out of 173) were more stunted than other age groups. Table 18 illustrates stunting by age and sex and table 19 illustrates mean z-scores. There was a general decline in stunting rates from 17.1% (13.6-21.2 95% C.I.) in April 2013 to the current of 7.6% (5.6-10.2 95% C.I.) with a (p-value=0.000) thus demonstrating a statistical significance difference.

The decline can be argued with following facts;

1. Age estimation; with regard to verification by card or recall
2. Declining chronic malnutrition is evident with underweight children (where age is the main anthropometric variable computed in the two nutrition indicators)
3. An improved chronic malnutrition situation; where the children with older ages between (48-59 months) who were stunted and eligible in the survey of April, 2013 might have graduated above eligibility for this survey, thus the reason for declining stunting rates.
4. Z-scores out of range and z-scores are not be available; the April 2013 survey had very high survey results with 220 and 47 children Z-scores out of range and not available respectively.

Age estimation for eligibility of children (6-59 months) is key in identification of survey subjects. Age is an important variable in categorizing stunting (HAZ) based on WHO thresholds. The age estimation for children with no exact birthdate for current stunting rates is at 54%; the proportion of children with no exact birthdate was 71% in 2013. Z-scores were not available and Z-scores out of range was 220 and 47 respectively in April 2013. [21]Z-scores not available and out of range was 0 and 24 respectively in June, 2014. The age-distribution penalty score in April 2013 was 10%; while a penalty score of 4% was given for June 2014. These differences in the 2013 and this survey may suggest that stunting was estimated high in 2013. Since stunting is a proxy indicator for chronic malnutrition, further studies to establish the various reasons for declining trend is highly recommended for Garissa County.

[21] Garissa County Integrated Nutrition and Health SMART Survey, April 2013

Table 17: Prevalence of stunting based height-for-age z-scores and by sex

	All n = 749	Boys n = 397	Girls n = 352
Prevalence of stunting (<-2 z-score)	(57) 7.6 % (5.6 - 10.2 95% C.I.)	(33) 8.3 % (5.7 - 12.0 95% C.I.)	(24) 6.8 % (4.4 - 10.4 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(50) 6.7 % (5.0 - 8.9 95% C.I.)	(31) 7.8 % (5.4 - 11.2 95% C.I.)	(19) 5.4 % (3.3 - 8.6 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(7) 0.9 % (0.4 - 2.1 95% C.I.)	(2) 0.5 % (0.1 - 2.1 95% C.I.)	(5) 1.4 % (0.5 - 3.9 95% C.I.)

Table 18: Prevalence of stunting based on height-for-age z-scores and age

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Stunting(< -2 z score)		Normal (> = -2 z score)	
Age group (months)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	179	1	0.6	14	7.8	15	8.4	164	91.6
18-29	173	1	0.6	18	10.4	19	11	154	89.0
30-41	188	2	1.1	10	5.3	12	6.4	176	93.6
42-53	152	3	2.0	7	4.6	10	6.6	142	93.4
54-59	57	0	0.0	1	1.8	1	1.8	56	98.2
Total	749	7	0.9	50	6.7	57	**7.6**	692	92.4

Table 19: Mean z-scores, design effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	769	-0.85±1.09	1.32	0	4
Weight-for-Age	767	-0.86±1.01	1.15	0	6
Height-for-Age	749	-0.54±1.11	1.30	0	24

3.2.3 Mortality and health

A. Results of retrospective mortality

The mortality survey involved a total of 3,218 individuals inclusive of 769 children 6-59 months of age. The responses were prompted based on a recall period of 84 days or approximated 12 weeks (3 months); with start point of recall period as 13th March 2013. The date concurred with commemoration of the Garissa County government, which was acknowledged by households and was likely to be remembered by respondents. Mortality results are as shown in table 20 below.

Table 20: Mortality results and causes of death (retrospective over 84 days prior to interview)

	June, 2014	SPHERE emergency thresholds
CMR (total deaths/10,000 people / day)	0.48 (0.21-1.09 95% C.I.) n=13	2/10,000/day
U5MR (deaths in children under five/10,000 children under five / day)	0.43 (0.10-1.88 95% C.I.) n=3	4/10,000/day
Causes of death		
Children less than five years of age	Malaria/fever (n=1); delivery complications (n=1) and ARI/illness (n=1)	
Individuals aged 5 years and above	Unconfirmed (n=6); accident (n=1); respiratory illness (n=1); old age (n=2)	

3.3 Child morbidity

A recall period of two weeks was used in assessing child illness. Out of 769 children assessed for illness, 307 cases (39.9%) were reported to be ill two weeks prior to actual data collection exercise. The main illnesses among under-five(s) was acute respiratory infection (ARI)/cough at (59.3%), fever like malaria (27.4%) and watery diarrhea (14.7%), and multiple illnesses, which referred to children sick with a combination of illnesses at (8.8%) as illustrated in table 21 below. Malnutrition among under-five children is directly linked to disease prevalence; this is evident from UNICEF conceptual frameworks and meta-analysis of data from various sources strengthens the link. The case definition for illnesses as used in data collection tool was derived from the IMCI[22] handbook.

Table 21: Morbidity among children aged 6-59 months in Garissa County

Child Morbidity 6-59 months (N= 769)	June 2014	
	n	%
Sick children 2 weeks prior to survey	**307**	**39.9%**
Fever like Malaria	84	27.4%
ARI/Cough	182	59.3%
Watery diarrhea	45	14.7%
Others (multiple infections)	27	8.8%
ARI & watery diarrhea	8	28.6%
Fever-malaria & watery diarrhea	9	33.3%
Fever-Malaria &ARI-cough	10	37.0%

The high incidences in ARI/cough concurs with seasonality changes experienced at the County, characterized with a dry, windy and cold climate “Hagaa” which predisposes under-five children to frequent ARI/cough infections. Agents of infections are blown away (air-borne) by wind/dust in this season which leads to increased cross contamination among the sick and healthy. Pneumonia vaccination (pcv10) has been recommended by health stakeholders at the County Health forum as means to prevent ARI/cough incidences.

[22] Integrated management of childhood illnesses by WHO and UNICEF,2005

Low levels of water treatment (25.4%), improper disposal of human-fecal waste/open defecation (40.8%), low levels of zinc supplementation (50%) and poor hand washing practices by soap and water (47.2%) have also increased incidences of watery diarrhea among children under-five.

Malaria/fever incidences among under-fives were attributed to low utilization of insect-treated mosquito nets (56.4%) at the household level. The long rain season might have also directly contributed to breeding of mosquitos with standing pools of rain water left, which act as a reservoir for larvae-a vital stage for mosquito development.

3.3.1 Health seeking behaviours

Caregivers were probed to assess whether they seek health assistance when their children are ill and the type of healthcare they sought for their children. Survey findings revealed that 63.2% of the respondents (n=196) sought assistance when their children were sick. The majority of caregivers sought health assistance for their ill children from public clinics (67.9%) and private clinics (21.9%). Other sought health assistance from community health workers (6.1%), mobile clinics (1.5%), traditional healers (1.5%), non-governmental and/or faith-based organizations (0.5%) and shops/kiosks (0.5%). Health education and awareness campaigns should strengthen health seeking behavior among caregivers to facilitate early triage of sick and malnourished children and linkage to better treatment modalities at health facility.

3.3.2 Child Immunization, Vitamin A Supplementation and Deworming

A. Immunization coverage

Immunization enhances one's body to resist to an infectious disease through administration of vaccine. Immunization is one of the most cost-effective health investments, with proven strategies that make it accessible to even the most hard-to-reach and vulnerable populations eliminating two to three million death each year[23].

The survey used five antigens as proxies for immunization coverage. These are Bacille Calmette Guerin (BCG), Oral Polio Vaccine (OPV 1 and 3) and measles vaccine (1st and 2nd doses). [24] BCG at birth for all children was observed with BCG scar on the left arm and/or confirmation by child health card. The survey indicated BCG coverage at 91.3% while 8.7% of survey subjects had not been immunized.

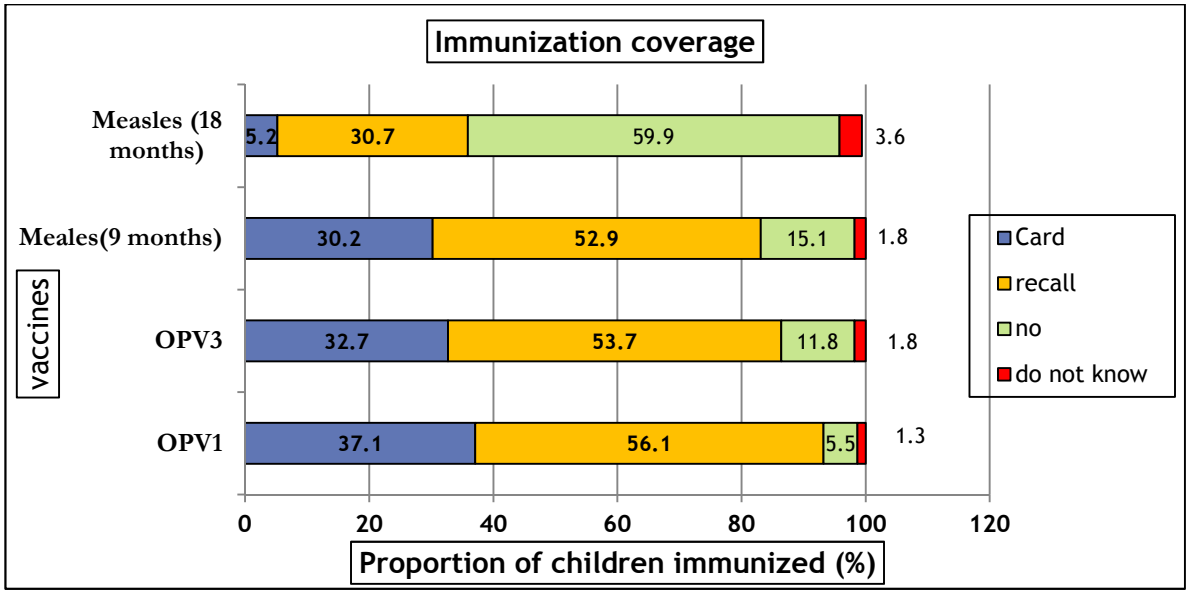


Figure 4: Immunization coverage among under-five

[23] Integrated Management of Child Illnesses by WHO and UNICEF, 2005
[24] Expanded Programme for Immunization by WHO

As illustrated in figure 4 above; Oral Polio Vaccine (OPV1) given at 6 weeks respectively had a coverage of 37.1% and 56.1% by card and recall respectively, while (OPV3) given at 14 weeks had a coverage of 32.7% and 53.7% by card and recall respectively.

The first dose of measles vaccine given at 9 months had coverage of 30.2% and 52.9% by card and recall respectively. The second dose of measles vaccine given at 18 months had coverage of 5.2% and 30.7% by card and recall respectively.

Immunization coverage for Garissa County is below national targets. This is attributed to poor documentation of immunization by card among under-fives which increases biasness with regards to caregiver recall.

B. Vitamin A supplementation

High impact nutrition interventions (HiNi) recommend that a child should be supplemented at-least twice a year (every six months) for children 6-59 months. The dosage offers protection against common childhood infections; averts blindness and substantially reduces mortality[25]. Survey results revealed that vitamin A supplementation among children aged 6 months (once) was 71.6%, while vitamin A supplementation among children aged 12-59 months was at 32.3% and 30.2% for once and twice supplementation respectively. Verification of Vitamin A supplementation by card and recall was at 25.7% and 74.3% respectively. Frequency of vitamin A supplementation at health facility and outreach was at 45.2%, 45.8% and 4.3% once, twice & thrice respectively. Vitamin A supplementation data is represented in table 22. Vitamin A supplementation coverage for Garissa County is below national targets of ≥80%.

Table 22: Vitamin A Supplementation for children aged 6-59 months

Vitamin A Supplementation		
Age-group	**frequency**	**coverage**
6-11 months	Once	71.6%
12- 59 months	Once	32.3%
	At least 2 times	30.2%

C. Deworming

Deworming promotes physical growth and cognitive development while preventing anaemia. Deworming should be given to children 12-59 months every 6 months to control intestinal worms[26]. Survey unveiled a deworming rate children aged 12-59 months at 59.8%. The coverage for deworming is below national thresholds of ≥80%.

3.4 Maternal Health

3.4.1 Maternal nutritional status

A total of 462 women from the sampled households were within the reproductive age of (15-49 years), 44% of them were lactating while 13.3% were pregnant. MUAC measurement was used to assess maternal nutrition status. The survey unveiled that 1.3% of the total women of reproductive age of 15-49 years were malnourished with MUAC less than 21cm. However, 9.5% of the total pregnant and lactating mothers were malnourished with MUAC less than 21.0cm. All pregnant and lactating mothers with MUAC less than 21.0cm were referred by card to nearest health facility or outreach for nutrition support.

A. Iron-folate supplementation coverage

Supplementary iron or iron-folate is effective in preventing anaemia and neural tube defects among infants[27]. The survey revealed that 67.5% of all respondents who were pregnant and/orwith children less than 24 months reported to have taken iron pills, sprinkles with iron, iron syrup or iron-folate tablets. The proportion of pregnant mothers who adhered to recommended 90 days period in consumption of iron-folate was very low at 4.4%. The proportion of iron-folate supplementation, adherence and frequency of supplementation is below WHO

[25] Scaling up Nutrition though High Impact Nutrition Interventions (HiNi), MOH/SUN movement (2011/12)
[26] Integrated Management of Acute Malnutrition, MOH (2010)
[27] Effects and Safety of Preventive Oral Iron or Iron-folate Supplementation for Women during Pregnancy, WHO

benchmarks of ≥80%.This is attributed to low awareness among mothers on the benefits of iron-folate supplementation on maternal and infant health and the need to consume within the recommended 90 days duration.

Table 23: Iron-folate supplementation

IFA Supplementation	Response	Percentage
IFA supplemented (last pregnancy	Yes	67.5%
	no	25%
	Don't Know	7.5%
Frequency of IFA supplementation	30days	72.9%
	60days	22.7%
	90days	4.4%

3.5 Water, sanitation and hygiene

3.5.1 Water

The survey unveiled that poor performance of the long rains of March to May 2014 in most areas of Garissa County[28] with minimal or no recharge of water sources attributed to water shortages experienced during the survey period. During the survey,areas such as Hagabul and Latho had serious water shortages, for which the County government through Ministry of Water mitigated efforts through water trucking in order to supply water to affected households.

3. 5.2 Household water sources for drinking

The main sources of water for Garissa County residents are piped water from boreholes and earth pan/dam with 59.1% and 21.3% of the households obtaining water for drinking from the mentioned sources. Other sources include water trucking (0.2%), earth pan with infiltration (1.5%), river/spring (3.6%) and unprotected shallow wells (14.3%). The survey unveiled that 40.9% of households in Garissa County use unsafe water sources for drinking. Figure 5, illustrates the main sources of water for drinking.

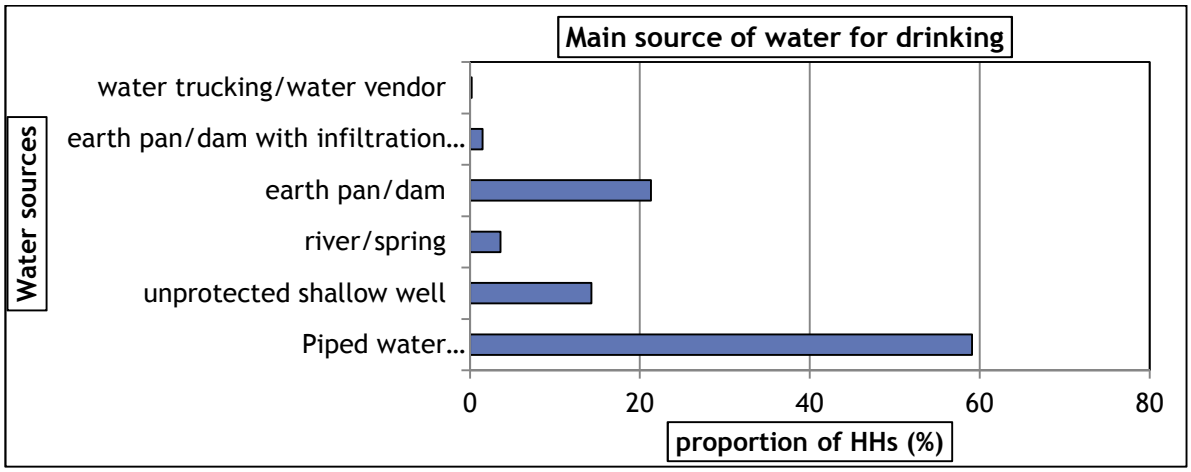


Figure 5: Main source of drinking water

3. 5.3 Water treatment methods

Survey unveiled that 74.6% of households do not treat water before consumption. A majority of households use chemicals (chlorine) which is added to water at the source. Other treatment options include boiling (9.8%), use of traditional herbs (6.1%), pot filters (11.4%) and waiting for water to settle (4.6%). Low water treatment at the household level is linked to increased incidences of watery diarrhoea among under-fives. Figure 6, illustrated reported water treatment methods.

[28] NDMA Early Warning Bulletin of May, 2014

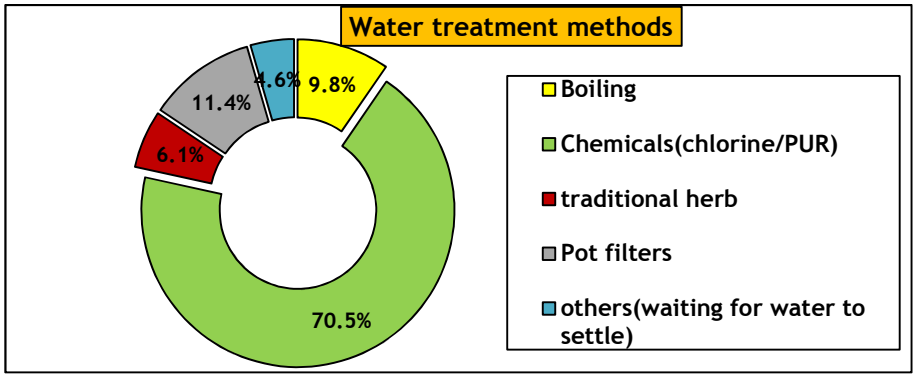


Figure 6: Household water treatment methods

3.5.4 Distance to main water source

A majority of households (60.6%) trek for less than 500 meters (<15 minutes) to access water. However, the rest of households are below SPHERE thresholds with those trekking for more than 500 meters and 2 kilometers at 25.9% and 13.4% respectively. Table 24, illustrates the trekking distance to the main water source by households. There has been a strong link between caregiver practices and household chores; chores such as trekking for long distances in search of water has compromised the ability of mothers to take their children to health facilities for treatment, leading to deterioration of both maternal and child health.

Table 24: Trekking distance to the main water source

Distance to main water source	Proportion
Less than 500m(<15 mins)	60.6%
More than 500m(15min-1hr)	25.9%
More than 2km(1-2 hrs)	13.4%

3.5.5 Queuing time at the main water source

The survey unveiled that 30.3% of households queue for water at the main water source.
Those households queuing for less than 30 minutes, between 30 to 60 minutes and more than one hour were 48.2%, 28.3% and 23.5% respectively.

3.5.6 Storage of water

Majority of the households (86.4%) store their water in closed containers to prevent contamination. However, this needs to be emphasized at all levels especially when transporting the water to their households and storage of water for drinking purposes. Storage of water in closed containers has been advocated for in the first stages of maintaining hygienic practices at the household level.

3.5.7 Cost of water

The survey revealed that 89.9% of households in Garissa County pay for water. About 33.7% of survey respondents pay a monthly water bill ranging between Ksh.400 to 1000. A majority of households (66.3%) pay water charges based on 20 litre jerican; a charge of between Ksh 1 to 5 is paid by (78.3%) of the households. The cost of water per 20 jerrican is illustrated in table 25 below;

Table 25: Cost of water per 20 litres jerrican

Cost of water (20 litre jerican)	Ksh 1-<5	78.3%
	Ksh 5-<10	15.9%
	Ksh≥10	5.7%
Cost of water (monthly charges)	Average Kshs 400-1000	33.7%

3. 5 Hygiene

Regular hand washing reduces the spread of diarrheal and respiratory illness[29]. The survey assessed hand washing in four critical times and the results are illustrated in the table 26 below. Only 47.2% of households used soap and water when washing their hands.

Table 26: Hand washing in four critical times

Critical Times	Response	
	n	Percent
After toilet	474	94.4%
Before cooking	447	89.0%
Before eating	519	95.6%
After taking children to the toilet	394	84.7%

3.6 Sanitation

Inappropriate disposal of human waste is one of major cause of food and water borne illnesses worldwide. Safe disposal of human waste (urine, faeces or both) have a beneficial impact to health and nutrition status of households. Analysis undertaken indicates that approximately 40.8% of the households practice open defecation and 24.3% of the households share with neighbours a traditional or improved latrine. Few households (34.8%) have their own improved or traditional pit latrine.

3.7 Food security and livelihood

The food security situation is projected to remain stressed at integrated Phase 2 Classification)[30]. The poor performance of long rains (March-May 2014) was noted in most areas of Garissa County. Sporadic light showers were reported in the first decad of the month, only in few areas in the south (Bura, Galmagala) and south east (Liboi, Jarajila) parts of the county[28]. The survey unveiled the main occupation of the house head is livestock herding (56.5%).Other occupation embraced by house head include petty trade (12.3%), own farm labour(2.8%), employed/salaried(5.9%), waged labour/casual(15%) and firewood/charcoal(4%). The quantity and quality of pasture and browse continue to improve only in the south and south east parts of the County, with deterioration of pasture and browse experienced in most areas. Conflict over water pan ownership and location was reported between the pastoral communities of Balambala and Dadaab sub counties. However, the County government through peace building initiatives has been able to avert arising conflicts; by continuous talks at the community level and mitigating efforts to construct addition water pans. Internal livestock migration between the sub counties was reported following early cessation of long rains, but no out migration to other Counties has been confirmed. Food prices are expected to increase attributed to limitation of agro-pastoral communities relying on long rains for food production. The increased cost of food can also be linked closure of Somalia border, forcing petty traders to source for food from other markets including Nairobi, Thika and Mwingi. The additional costs attributed to V.A.T. and transports costs incurred have forced many households to embrace coping strategies to avert the looming food prices. The increased food prices might also be attributed to high inflation rates as highlighted by KNBS[32] May, 2014 report. The report indicated an increase in inter-annual inflation rate from 4.05% in May, 2013 to 7.3% in May, 2014.

3.7.1 Household Dietary Diversity

Household dietary diversity (HDDS) is used as a proxy indicator to measure the socio-economic ability of households to access a variety of foods and food consumption can be triangulated with other food-related information to contribute towards providing a holistic picture of the food and nutrition security status in a community or across

[29] Hygiene Practices at Household Level, Centre for Disease Control (CDC)
[30] Short Rain Assessment report for Garissa County by KFSSG, March 2014
[32] Kenya National Bureau of Statistics

a broader area[33] . The household dietary diversity was assessed using a 24-hour recall period. Figure 7 illustrates food groups accessed at the household level. Main source of food consumed of food consumed is by purchase at 87.2%.

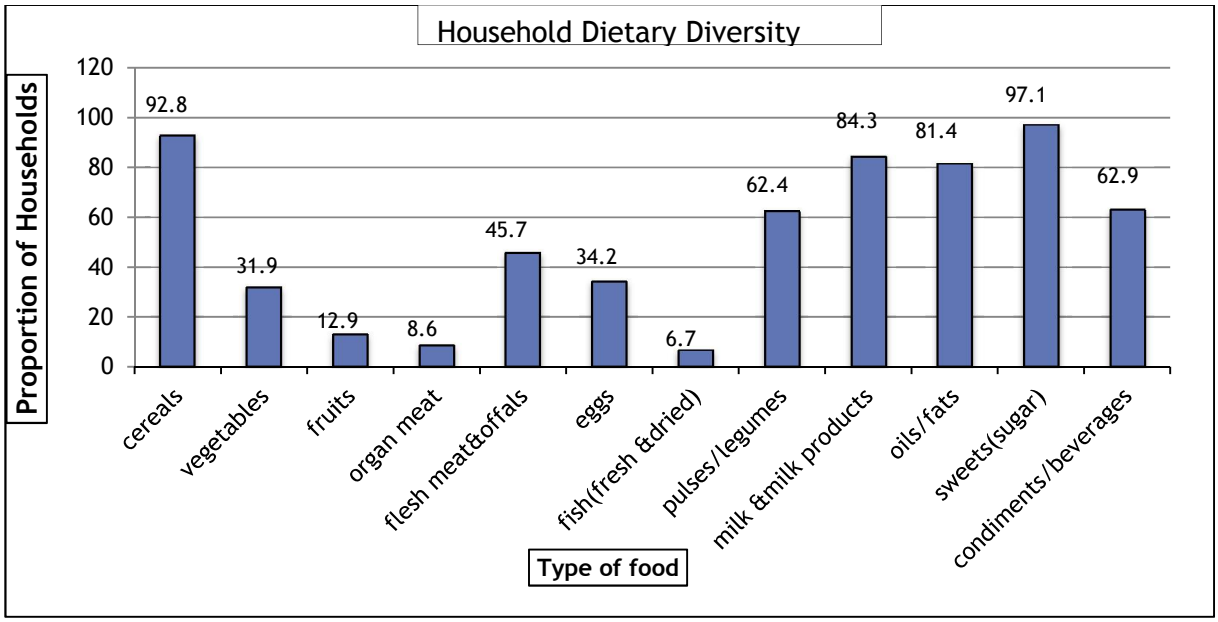


Figure 7: Household dietary diversity

3.7.2 Dietary diversity tercile (24 hour recall)

Table 27: Food groups consumed by >50% of households by dietary diversity tercile (24 hour recall)

Lowest dietary diversity (≤ 3 food groups **5.1%**)	**Medium dietary diversity** (4 and 5 food groups **12.3%**)	**High dietary diversity** (≥ 6 food groups **82.6%**)
Cereals	Cereals	Cereals
Sweets/Sugars	Milk and milk products	Milk and milk products
	Oils/Fats	Condiments/beverages
	Sweets/sugars	Oils/Fats
		Pulses/legumes
		Sweets/sugars
		Flesh meat

Most food groups consumed based on a 24 hour food recall for households categorized under the lowest dietary diversity were cereals and sweets. Most households were categorized under high dietary diversity tercile, however this is a proxy of food consumed and met by 50% of the household. The generalized poor dietary diversity for these households was highly attributed to poor performance of long rains[34] , accessibility of food items in terms of increased food prices at the market level and low diversification of livelihoods.

3.7.3 **Food Consumption Score (FCS)**

FCS captures elements in food consumption and food access. FCS is an adequate proxy for the current food security situation[35]. According to WFP FSOM[36] food consumption has deteriorated for both beneficiary and non-beneficiary households based on year comparison as seen in table 28. Most households in pastoral livelihood zones were consuming an average of 1 to 2 food groups in a day.

Table 28: Food Consumption Score by WFP FSOM

[33] Guidelines for Measuring Household and Individual Dietary Diversity, FAO (2011)
[34] NDMA Early Warning Bulletin of May, 2014
[35] Food Consumption Scores and IPC by World Food Programme, 2009
[36] Kenya Food Security and Outcome Monitoring by World Food Programme, May 2014

		May 2014		May 2013	
Main Threshold	Nomenclature	Beneficiary	Non-benefic.	beneficiary	Non-benefic.
0-21	Poor food consumption…mainly cereal and sugar	51%	43%	15%	24%
21.5-35	Borderline food consumption Cereal, protein or milk (3-4 days/week), oil, sugar	11%	6%	10%	10%
>35.5	Good food consumption Cereal, protein and milk (>5 days/week),condiment, vegetable, oil, sugar and flesh meat	37%	51%	74%	66%

3.7.4 Coping strategy weighted Index

A total of 349 (61.5%) households are embracing coping mechanisms with a total weighted coping strategy score of 15.4 (Table 29). Most households relied on less preferred food, borrowed from relatives/friends and/or opted for less expensive food. This combined with seasonal variations limits access to certain food items affecting household access. The most severe coping strategy index embraced by households surveyed includes the restriction of food consumption by adults for young children to eat; this was embraced by 213 households (37.4%) of the households with a weighted score of 4.8.

Table 29: Coping Strategy

Coping strategy	NO. of Households (569)	Frequency score (0-7)	Severity score (1-3)	Weighted score=Frequency*weight
Rely on less preferred & less expensive food	348	1.9	1	1.9
Borrow food	287	1.8	2	3.6
Limit portion sizes	288	1.5	1	1.5
Restrict consumption of food by adults for young children to eat	**213**	**1.6**	**3**	**4.8**
Reduced number of meals	**271**	3.6	1	3.6
Total weighted Coping Strategy Score				**15.4**

4.0 Conclusion

Malnutrition rates in Garissa County slightly increased from 12.0% in April 2013 to 14.6% to June 2014, however the change may not be not statistically significant. The results might not be comparable due to seasonal variations. The results however strongly inform on the performance of long rain with regards to food intake and disease prevalence. Mortality rates remained stable for both CDR and U5DR at 0.48 and 0.43 respectively. This could be attributed to a number of factors triangulated from both primary and secondary data:

- Increased child illnesses namely; ARI, malaria and watery diarrhea were at 27.4%, 59.3% and 14.7% respectively. This is attributed to poor health seeking behavior, poor water, sanitation and hygiene practices, low utilization of mosquito nets, low coverage for immunization and supplementation coverage below national set thresholds and low IMAM coverage for moderately and severely malnourished children.
- The poor performance of long rains (Mid-March to May, 2014) has resulted in the increased in-migration as livestock herders search pasture and water across counties. Low recharge of water bodies (water pans/dam) has thus resulted in water scarcity in various parts of the County namely; Latho and Hagabul of Dadaab sub County. Conflict over water resources was reported in areas of Balambala and Dadaab sub Counties. Peace building initiatives led by the administration has been scaled up to avert insecurity among communities living in pastoral livelihood zones. Minimum indicators for WASH were below SPHERE standards.
- Food security situation is currently stable though it is deteriorating, which is attributed to the poor performance of long rains. More than half (61.5%) of households are embracing one or more coping mechanisms as result of compromised household food security. The most severe coping strategy of restricting the food consumption by adults for young children to eat had a weighted score of 4.8 with 213 households embracing the strategy. Minimal diversification of livelihood zones has also contributed to increased households obtaining food through purchase at 87.2%. Food prices are expected to increase which is attributed to the limitation of agro-pastoral communities relying on long rains for food production. The increased cost of food can also be linked to the closure of the Somalia border, forcing petty traders to source for food from other markets including Nairobi, Thika and Mwingi. The additional costs attributed to V.A.T and transports costs incurred have forced most households to embrace coping strategies to avert the looming food prices. Food prices increase was also attributed to inter-annual inflation rate which increased from 4.05% in May, 2013 to 7.3% in May, 2014.

5.0 Recommendations

Immediate

	Recommendation	Actor
Nutrition and health	• On-job training on newly recruited health workers and CHEWs • Active case finding to facilitate early treatment,referral and admissions • Improve RUTF/RUSF commodity distribution at the facility and outreach sites • Need to integrate health services in order to improved coverage of health and nutrition services are administered to the child, ie. Growth monitoring, immunization and supplementation. • Improve documentation of child health card; ensure child health and nutrition card is updated whenever a child visits a health facility • Promote daily health and nutrition talks at facility and outreach sites to trigger awareness at the community on need to visit a public health facility for treatment of illnesses • Promote maternal screening at the village by MUAC and linkage to the facility; this shortens the gap of malnutrition with early triage of pregnant and lactating mothers and linking nutrition support for those below <21.0cm by MUAC, ANC pregnant mothers counselling, iron-folate supplementation) and PNC (lactating mothers). • Revive ORT "corners" at facility/outreach sites to ensure treatment modalities for diarrhoea cases are administered promptly • Support pneumococcal pcv10 vaccination as advocated in IMCI to lower the incidences of pneumonia illnesses among under-fives	Garissa County and partners
Food security and livelihood	• Integrate NDMA early warning bulletins in planning process; ensuring that food security activities are encompassed at all levels	Garissa County and partners
Water, sanitation and hygiene	• Public health education at outreach and facility level on simple water treatment techniques such as boiling to improve safety of drinking water at the household level • Promote critical handwashing practices compulsory with soap and water	Garissa County and partners

On going

Nutrition and health	• Individual/group counselling of mothers at facility and community levels; strengthen ANC and PNC services	Garissa County and partners

	• Up scaling HiNi	
Water, sanitation and hygiene	• Increase awareness on sanitation use thus triggering community led total sanitation	Garissa County and partners
Food security and livelihood	• Promote income generating activities to diversify livelihoods; Dertu irrigation scheme is ongoing with communities empowered through irrigation schemes to produce their own foods	Garissa County

Long-term

Nutrition and health	• Up scaling micronutrient programmes at facility/outreach site	Garissa County/WFP
Water, sanitation and hygiene	• Construction of water pan/dam to supply water for livestock use	Garissa County and partners
Food security and livelihood	• Support market for sale of livestock and livestock products through livestock off-take to ensure herders can obtain cash income and food before the lean season where there is limitation of pasture and browse. • Promote livestock husbandry to improve quality and quantity of livestock produce;	Garissa County and partners

Annex 1 Plausibility test

Criteria	Flags	* Unit	Excel.	Good	Accept	Problematic	Score
Missing/Flagged data (% of in-range subjects)	Included	%	0-2.5	>2.5-5.0	>5.0-7.5	>7.5	
			0	5	10	20	0(0.5%)
Overall Sex ratio ***(Significant chi square)***	Included	p	>0.1	>0.05	>0.001	<=0.000	
			0	2	4	10	0(p=0.140)
Overall Age distribution ***(Significant chi square)***	Included	p	>0.1	>0.05	>0.001	<=0.000	
			0	2	4	10	4(p=0.011)
Dig preference score - WEIGHT	Included	#	0-7	8-12	13-20	>20	
			0	2	4	10	0(4)
Dig preference score - HEIGHT	Included	#	0-7	8-12	13-20	>20	
			0	2	4	10	0(6)
Digit preference score-MUAC	Included	#	0-7	8-12	13-20	>20	
			0	2	4	10	0(5)
Standard Deviation WHZ	Excluded	SD	<1.1and >0.9	<1.15 and >0.85	<1.20 and>0.80	>=1.20and<0.80	
			0	2	6	20	0(1.09)
Skewness WHZ	Excluded	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	0(0.06)
Kurtosis WHZ	Excluded	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	0(-0.18)
Poisson Distribution WHZ-2	Excluded	p	>0.05	>0.01	>0.001	<=0.001	
			0	1	3	5	1(p=0.048)
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	5%

Annex 2: Standardization report

Weight:

	Precision: Sum of Square [W1-W2]	Accuracy: Sum of Square [Enum.(W1+W2)-(Superv.(W1+W2)]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.03		1/2	
Enumerator 1	0.01 OK	0.08 OK	1/0	3/2
Enumerator 2	0.04 OK	0.07 OK	1/3	3/1
Enumerator 3	0.01 OK	0.10 POOR	0/1	3/1
Enumerator 4	0.04 OK	0.03 OK	0/4	2/1

Height:

	Precision: Sum of Square [H1-H2]	Accuracy: Sum of Square [Enum.(H1+H2)-Superv.(H1+H2)]	No. +/- Precision	No. +/- Accuracy
Supervisor	84.85		4/1	
Enumerator 1	4.58 OK	95.07 OK	4/1	2/6
Enumerator 2	5.40 OK	1713.49 POOR	4/3	2/6
Enumerator 3	0.30 OK	59.75 OK	1/2	3/5
Enumerator 4	221.63 POOR	147.40 OK	4/3	3/5

MUAC:

	Precision: Sum of Square [MUAC1-MUAC2]	Accuracy: Sum of Square [Enum.(MUAC1+MUAC2)-Superv.(MUAC1+MUAC2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.68		3/3	
Enumerator 1	0.40 OK	1.92 OK	4/1	7/0
Enumerator 2	1.19 OK	1.05 OK	3/4	5/1
Enumerator 3	0.91 OK	2.73 POOR	3/3	4/4
Enumerator 4	0.84 OK	0.98 OK	2/4	4/4

Annex 3 List of Participants

	Name	Role	Organization
1	Ahmed Omar	Enumerator	NDMA
2	Ali Ismail Abdullahi	Enumerator	Mercy USA
3	Aden Ali Mohamed	Enumerator	NDMA
4	Abdullahi Orre	Enumerator	NDMA
5	Mohamed Suber	Enumerator	NDMA
6	Mohamed Ali	Enumerator	NDMA
7	Abdibashir Sirat	Enumerator	NDMA
8	Abdullahi Aden	Enumerator	Mercy USA
9	Guled Aden	Enumerator	Mercy USA
10	Adan Dagane	Enumerator	Mercy USA
11	Ahmed Abdikadir	Enumerator	NDMA
12	Abdullahi Mohamed	Enumerator	Mercy USA
13	Florence Njambi	Team leader	MOH
14	Vivian Kenduiywa	Team leader	MOH
15	Madaraka victor Kiptoo	Team leader	MOH
16	Abdirahman Idle	Team leader	MOH
17	Esther Kariuki	Team Leader	MOH
18	Onesmus Mutie	Team Leader	MOH
19	Abdimalik Ibrahim	Supervisor	MOH
20	Elizabeth Ndungu	Supervisor	MOH
21	Shahmat Yussuf	Supervisor	MOH
22	Mohamud Osman	Supervisor	Mercy USA
23	Abdi sheikh	Survey coordinator	MOH
24	Abdihmid Weli Muhumed	Enumerator	Dadaab community
25	Raha Abdullahi Issa	Enumerator	Dadaab community
26	Abdi Muhumed Mohamed	Enumerator	Dadaab community
27	Abdikhadir Abdalla	Enumerator	Dadaab community
28	Farhiya Hassan Farah	Enumerator	Dadaab community
29	Zakaria Mohamed Salat	Enumerator	Dadaab community
30	Souda Maalim Barre	Data clerk	Dadaab community
31	Abdiweli Ahmed Maah	Team leader	MOH
32	Iftin Hussein Mahamed	Enumerator	NDMA
33	Ragow Gabow	Team leader	TDH
34	Luisalba Mwende	Team leader	KRCS
35	Yussuf Ali	Supervisor	ACF
36	Evans Bett	Supervisor	ACF
37	Kevin Mutegi	SMART trainer and survey coordinator	ACF
38	Hassan Ali Ahmed	SMART trainer and survey coordinator	Mercy USA
39	Stanley Macharia	Supervisor	ACF
40	Ali Bille Ahmed	Team leader	ACF