INTEGRATED SURVEY

MERTI DISTRICT, ISIOLO COUNTY

DONOR: UNICEF

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ACKNOWLEDGEMENT

Action Against Hunger/ACF-USA would like to recognize efforts made by various key stakeholders towards the successful implementation of the integrated nutrition survey in Merti district in May 2013.

- UNICEF for the financial support.
- The relevant government ministries; Ministry of Health (MOPHS and MOMS), National Drought Management Authority (NDMA) and Ministry of Livestock (MOL) for their active role during the entire survey process.
- The entire survey team for their effortless commitment and hard work during data collection and data entry.
- The household respondents for their unconditional cooperation and dedication in providing information and making their children available for anthropometric measurements.
- ACF Kenya Nairobi and ACF Merti team for their technical, administrative and logistical support.

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ABBREVIATIONS

ACF-USA	Action Contre la Faim- USA (Action Against Hunger-USA)
ANC	Antenatal care
ASAL	Arid and Semi-Arid Land
CHW	Community health worker
CI	Confidence Interval
CM	Centimetre
CLTS	Community Led Total Sanitation
DHIS	District health information system
DHMT	District health management team
DHRIO	District health and records information officer
DPHN	District public health nurse
DNO	District nutrition officer
EBF	Exclusive Breastfeeding
ECD	Early child development
ENA	Emergency Nutrition Assessment
EWS	Early Warning System
FGD	Focus Group Discussion
GAM	Global Acute Malnutrition
HINI	High Impact Nutrition Interventions
HDDS	Household Dietary Diversity Score
HHCC	Household to hospital continuum of care
IYCN	Infant and Young Child Nutrition
KDHS	Kenya demographic health survey
KEMSA	Kenya Medical Supply Agency
KRCS	Kenya Red Cross society
LRA	Long rain assessment
IMAM	Integrated management of Acute Malnutrition
MCH	Mother Child Health
MM	Millimetre
MIYCN	Maternal infant and young child nutrition
MOH	Ministry of Health
MOL	Ministry of livestock
MTMSGs	Mother to Mother Support Groups
MUAC	Mid-Upper Arm Circumference
NDMA	National Drought Management Authority
OJT	On-job training
OD	Open defecation
OPV	Oral Polio Vaccine
PHAST	Participatory hygiene and sanitation
PPS	Probability Proportional to Size
SAM	Severe Acute Malnutrition
SRA	Short rain assessment
SSS	small scale survey
SMART	Standardized Monitoring and Assessment of Relief and Transitions
UNICEF	United Nations Children's Fund
WASH	Water, sanitation and hygiene
WFH	Weight for Height
WHO	World Health Organization

1. EXECUTIVE SUMMARY

Merti district is one of the three districts in larger Isiolo County mainly inhabited by Borana community. It consists of three administrative divisions namely; Merti, Cherab and Kom/ Chari and was curved out of Isiolo district in 2010. The integrated health and nutrition SMART survey was conducted by ACF, government (MOH, MOL and NDMA) and UNICEF between 20th to 29thof May 2013. The district has been an operational area for ACF-USA since May 2012; however, this was the first integrated nutrition and health SMART survey to be conducted in Merti district.

1.1 OBJECTIVES

The main objective of the survey was to estimate the prevalence of acute and chronic malnutrition amongst children aged 6-59 months with following specific objectives:

- To determine the morbidity rates amongst children aged 0-59 months over a two week recall period.
- To estimate the coverage of immunization (measles, OPV1 and OPV3), micronutrient supplementation (Vitamin A, therapeutic zinc), deworming amongst children aged 0-59 months.
- To estimate the nutritional status of female caregivers (aged 15-49 years) using MUAC measurements, and estimate coverage of iron folic acid supplementation for 90 days during pregnancy in women of reproductive age.
- To assess possible underlying causes of malnutrition such as household food security, maternal and child health care practices, and water sanitation and hygiene practices affecting the nutritional status of the population in Merti district.

1.2 METHODOLOGY

SMART methodology was employed in the entire anthropometric survey process to include planning, training, data entry and analysis. Other data sets on underlying causes of malnutrition were also gathered during this survey to include data on infant and young child nutrition (IYCN) as well as health, water, sanitation and hygiene (WASH) and food security and livelihood (FSL). 34 clusters of 12 households each were sampled. Anthropometric data was entered and analysed by ENA for SMART software November 2012 version, household data on FSL and WASH in addition to IYCN were entered and analysed by Microsoft excel and SPSS version 19 respectively.

1.3 RESULTS

A total of 403 households were sampled with 423 children aged 6-59 months assessed for nutritional status (of which 4 children were excluded by ENA for SMART software due to Z-scores being out of range).

Table 1: Summary of key findings in Merti District

			SMART SURVEY ISIOLO, CHERAB AND MERTI DISTRICTS	SMALL SCALE SURVEY MERTI DISTRICT	SMART SURVEY MERTI DISTRICT
INDEX	**INDICATOR**		**MAY 2012**	**FEBRUARY 2013**	**MAY 2013**
WHO 2006	*WHZ- scores*	**Global Acute Malnutrition** *Weight for height< -2 z and/or oedema*	11.0 % (8.5 - 14.2 95% C.I.)	17.0% (13.0 - 22.0 95%C.I)	10.5% (7.5-14.4 95%C.I)
		Severe Acute Malnutrition; *Weight for height < -3 z and/or oedema*	3.4 % (2.2 - 5.3 95% C.I.)	2.8% (0.3 - 4.3 95%C.I)	1.2% (0.3 - 4.3 95%C.I)
	HAZ- scores	**Prevalence of stunting** *Height for age <-2 z-score*	17.1 % (14.7 - 19.9 95% C.I.)	27.6% (22.1-33.9 95%C.I)	25.1% (20.3-30.7 95%C.I)
	WAZ-scores	**Prevalence of underweight** *Weight for age <-2 z-score*	16.7 % (13.7 - 20.2 95% C.I.)	29.2% (23.8 -35.2 95%C.I)	23.7% (17.8-30.7 95%C.I)
	MUAC	**Prevalence of global acute malnutrition:** *MUAC <125 mm or edema*		3.1% (1.6- 5.8 95% CI)	2.1% (1.2- 3.8 95% CI)
		Prevalence of severe acute malnutrition: *MUAC <115 mm or edema (<115mm)*		0.0% (0.0- 0.0 95% CI)	0.5% (0.1- 1.9 95% CI)
Measles immunization coverage by card (>9 months)					76.1%
Vitamin A coverage		6-11 months ; at least once			91.8%
		12-59 months; once			41.4%
		12- 59 months; at least twice			45.2%
Deworming rate		12-59 months			31.5%

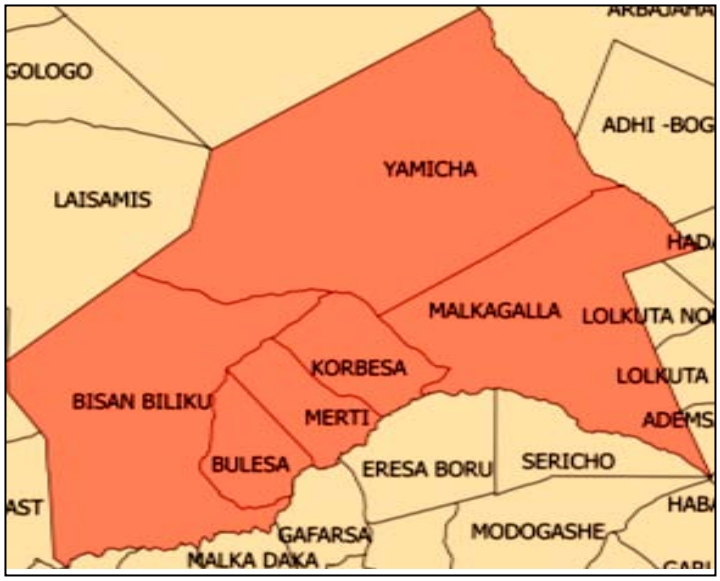
Table 2: Analysis of quality of data collected

Criteria	Missing/ flagged data	Overall sex ratio	Overall age ratio	Digit preference score Weight	Digit preference score Height	Standard dev WFH	*Skewness* WFH	Kurtosis WFZ	Poisson distrib WFH	Overall score WFH
Score	0 (0.9%)	0 (p=0.662)	0 (p=0.162)	0 (3)	2(6)	0 (0.94)	0 (0.23)	0 (-0.07)	0 (p=0.09)	2%
Interpretation	Excellent	Excellent	Excellent	Excellent	Good	Excellent	Excellent	Excellent	Excellent	Excellent

Table 3: Summary of survey findings and recommendations

SECTOR	SURVEY FINDINGS	RECOMMENDATIONS
NUTRITION	GAM prevalence of 10.5% (7.5-14.4 95% C.I above WHO thresholds of 10% (situation classified "serious")	▪ Early detection through MUAC screening and active case finding of defaulters ▪ Strengthen MIYCN through support of MTMSG's
	Vitamin A supplementation twice a year for 12 to 59 months is 45.2% and deworming is 31.5% both below the national target of 80%	▪ Strengthen efforts in proper documentation of all children supplemented with vitamin A by updating all reporting tools. ▪ Improve supply of mother and child health booklet ▪ Improve dissemination process of health and nutrition cards at health facilities, community outreaches and mobile clinics ▪ Strengthen On-the-Job Training (OJT) of health care professionals
	Zinc supplementation is 34.3% by card below national target of 50%. Inconsistent supplies reported	▪ Emphasize protocol procedures in administration of Zinc through Joint Support Supervision ▪ Strengthen PULL system for drugs at the County level through Kenya medical supply authority (KEMSA) ▪ Provide continuous health education on importance of zinc in management of diarrhoea
	Poor documentation of immunization and micronutrient supplementation	▪ Health staff and community sensitization on importance of documentation ▪ Advocate for supplies of the MCH booklets at Isiolo County level
WASH	Poor water treatment and handling practices; 66.7% of households do not treat water for their consumption; only 17% and 8% of sampled household used boiling and pot filters respectively to treat their water for drinking. Hand washing at the four critical times high, though not absolute measure of hand washing behaviour	▪ Continued hygiene promotion with emphasize on local acceptable water treatment methods ▪ Review of data collection tool to incorporate hand washing techniques(Use of clean water, use of soap and ash, wash both hands, rub hands together at least three times and dries hands hygienically using a clean cloth)
	Open defecation (OD) still significant; 37.6% of Household practice OD, while 39.2% share with neighbours' improved/traditional pit. KRCS assisted in provision of iron sheets to mitigate efforts of improving sanitation in flood-stricken areas in Basa location during the March to May 2013 long rain season; this was through partners resilience programs to improve WASH	▪ Continue with rigorous latrine promotion to trigger utilization ▪ Promotion of open defecation free zones through promotion of latrines made from locally available materials ▪ Strengthen participatory hygiene and sanitation
FSL	Low crops production due to destruction of small scale farms during the floods in April 2013 Household dietary diversity of 7.1 with low consumption of organ meat among other food groups. Coping strategy index of 22.0,with adults restricting to feed in order for children to eat ,at a weighted score of 7.8 indicating the severity of situation	▪ Promote continuous health and nutrition education of households on consumption of variety of food groups ▪ Strengthen mechanism to improve household food security a number of households still embracing the severe coping strategy index

2. INTRODUCTION



Merti District is one of the three districts in the larger Isiolo County. This district has an estimated population of 21,878[1].

This was the first integrated nutrition and health SMART survey to be conducted in Merti district. It took place between 20th and 29th May 2013. It was conducted after the long rain season that started in March and ended in early May 2013. The report will provide a platform to monitor the trends in the nutrition and health situation as well as provide baseline information for indicators which were not assessed during the last round of nutrition surveillance[2] in February 2013.

Figure 1: Map of Merti district

2.1 Overall survey objective

This overall objective was to estimate the prevalence of acute malnutrition among children aged 6-59 months in Merti District.

2.1.1 Specific survey objectives

The specific objectives of the nutrition survey were:

1. To determine the prevalence of acute and chronic malnutrition in children aged 6-59 months.
2. To determine the coverage of measles, OPV1/OPV3 vaccination and vitamin A supplementation in children aged 6-59 months; deworming amongst children aged 6-59 months.
3. To determine the nutritional status (MUAC measurements) and to estimate coverage of iron folic acid supplementation for 90 days during pregnancy in women of reproductive age.
4. To assess possible underlying causes of malnutrition such as household food security, Infant and Young Child Feeding (IYCF) practices, and water, sanitation and hygiene practices (WASH).

[1]Census report 2009- KNBS.
[2]ACF- Nutrition surveillance system based on small-scale survey (SSS), round of Feb 2013.

3. METHODOLOGY

3.1 Type of Survey and target population

The integrated health and nutrition survey was undertaken in Merti district using the SMART methodology in May 2013. It was a cross-sectional survey using cluster sampling, comprising of data collection by anthropometric measurements and by questionnaire. Secondary data review of various existing data (LRA[3], SRA[4], NDMA[5] monthly bulletins, DHIS[6] and SSS February 2013 results[2]) was undertaken prior to the survey. Only relevant data was gathered during the actual data collection exercise as per the national survey guidelines. The target population for the anthropometric survey was children 6-59 months of age.

The SMART methodology was employed during the anthropometric survey in planning, training, data entry and analysis. Other data sets were also gathered concurrently during this survey to include data on WASH, IYCF, food security and livelihoods (FSL).

3.2 Data collected

- Anthropometric data (sex, age, weight, height, MUAC, bilateral nutritional oedema)
- Vaccination *(measles, OPV1 and OPV3)*, deworming and micronutrient supplementation (*iron-folate, Zinc and Vitamin A supplementation)*.
- Incidences of childhood illnesses in the last 2 weeks prior to the survey.
- Food security and livelihoods data at household level.
- Water, sanitation and hygiene data at household level.
- Infant young child nutrition (IYCN) data was gathered amongst children aged 0-23 months aggregated into 0-5 months and 6-23 months respectively.

3.3 Sampling procedures

A two stage sampling methodology was employed for the survey. 34 clusters were randomly sampled selected from sampling frame. Probability proportional to size (PPS) was applied for the entire survey in the first stage with population data projections obtained from Kenya national bureau of statistics[1]. ENA for SMART software, November 2012 version was used with rationale for use is indicated in table 4.

The second stage involved obtaining an updated and complete list of households from village guide prior to data collection process of which 22 households were selected using simple random sampling. All the eligible households sampled were interviewed for IYCN questionnaire. Children aged 6-59 months were targeted for the anthropometric survey in the first 12 households. The data was obtained through structured questionnaires, observations and informal interviews.

[3] Long rain assessment
[4] Short Rain assessment
[5] National Drought Management Authority
[6] District health information system

Table 4 : Description of the method used to calculate sample size for Merti district integrated nutrition and health survey

Data entered on ENA software	Anthropometric Survey	Rationale
Estimated prevalence of GAM	22.0	Highest GAM confidence interval 17.0% (13.0%-22.0%) in February 2013 small scale survey
Desired precision	4.4	High malnutrition prevalence the lower the precision as well as objectives
Design effect (DEFF)	1.07	Obtained from February 2013 SSS (indicated a relative homogenous group)
Average household size	6	September 2012 SMART in Garbatulla district
Percent of under five children	18.4	Population estimate from DHIS and Census 2009 report
Percent of non-respondent	1	To cater for any unforeseen/anticipated circumstances example: insecurity , Population migrations to look for pasture for their livestock
Households to be included	**403**	**34 clusters**

Infant and young child nutrition(IYCN)								
Indicator	Estimated prevalence	desired precision	DEFF	Sample size	Average HH size	%children under 5	% non-response HHs	HHs to be included
Exclusive breastfeeding	67.7	8	1.5	208	6			
Timely initiation of breastfeeding	58.4	8	1.5	239	6	18.4	1	560
Minimum dietary diversity	57.1	8	1.5	222	6	18.4	1	732
Minimum meal frequency	55.2	8	1.5	198	6	18.4	1	739

3.4 Training framework

The SMART training package included an intense exercise of 4 days at the *Macci catholic training hall*, Merti town as from 20th to 23rd May 2013. A total of 32 persons were trained that is; 24 enumerators and 2 data clerks from the community, 6 team leaders from various ministries and key sectors including MOH[7] (DPHN[8], Ag.MOH[9], DNO[10], and DHRIO[11]), NDMA[12], MOL[13]and three key trainers from ACF. Pre and post test was used to assess enumerators' level of knowledge and guide on topics that required much emphasis during the SMART training (*see appendix 6*). The average score increased from 58% in pre-test (before training) to 75% (after training) post-test on SMART methodology training for enumerators and data clerks. The topics taught during SMART training mainly covered the survey procedures, how to conduct anthropometric measurements and sampling procedures. Standardization test was performed on 10 children, who followed with pilot test a day prior to actual survey where each teams were required to visit 4 households per team).

3.5 Survey teams and Supervision

The survey team was composed of 6 team leaders, 24 enumerators and 2 data entry clerks

[7]Ministry of Health
[8]District Public Health Nurse
[9] Acting Medical Officer of Health
[10] District Nutrition Officer
[11] District Records Health Information Officer
[12] National Drought Management Authority
[13] Ministry of Livestock

eventually forming 6 teams. The team leaders were obtained from relevant GOK[8] partners and ACF staff where else the enumerators and data entry clerks were recruited from the community (with C+ Grade and above KCSE[14] results). Coordination and supervision of the entire process was led by the District nutrition officer under technical support from ACF Staff.

3.6 Analysis of quality of data collected

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

- Validation of the survey planning and 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.

3.6.1 Important considerations when selecting eligible subjects

There may be special cases in the field during data collection such as disabled children, absent children, empty households with no eligible children.

Households with no children: Survey teams should record the household with no eligible subject on the nutritional data sheet as having no eligible children and proceed to the next house according to the rules.

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

Absent children: If a child lives in the house but is not present at the time of the survey, this child is recorded on the datasheet when the house is visited. The team should inform the mother that they will come back to the house later in the day, after all the other houses have been visited in the cluster. The team should go back to the house to find the child. The team should continue to look for missing children until they leave the survey area.

Disabled children: Disabled children that would otherwise be eligible should be included where possible. If it is not possible to measure height and weight due to deformity an identity number and the data was recorded as missing and a note taken by the team leader.

Child in a hospital: If a child has been admitted to a health or feeding centre, the team must go to the centre and measure the child. If it is impossible to visit the centre, the child should be included in the datasheet and a note added that the child was in a feeding centre and probably severely malnourished.

3.7 Case definitions and inclusion criteria

Primary data was gathered from the sampled clusters to make inferences with regard to the survey objectives between 24th and 29th May 2013. The following information was gathered:

3.7.1 Anthropometric Indicators

The following information was gathered from all eligible children aged 6-59 months.

- **Age**: The child's immunization card, birth certificate or birth notification was the primary source for this information. In the absence of these documents, a local calendar of events was

[14] Kenya Certificate of Secondary Education

developed from discussions with community members, enumerators and key informants and was used to estimate the child age in months.

- **Sex:** This was recorded as either '**f**' for female or '**m**' for male.

- **Weight:** A seca electronic bathroom scale was used to measure the children's weight. On daily basis the teams checked and calibrated the electronic scale using a standard weight to ensure accuracy was maintained. The survey team ensured that scale was placed on hard flat surface and that there was minimal or no movement and measurements were recorded to the nearest 0.1kg.Children were weighed wearing light clothing (vests, pants), the mother weight alone was taken, then recorded followed by the weight of the mother and child the difference between the weight of mother and child combined and the weight of mother alone was the resultant weight of the child (SECA double weighing was done).Older children able to stand firm on the scale with minimal movement were weighed and their weight recorded to the nearest 0.1kg.

- **Height:** A wooden 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 ideal placement of cursor as per instructions on height measurements (SMART/IMAM[15] guideline) ensuring minimal or no movement of the child and maintaining height readings at eye level to the nearest 0.1cm.

- **MUAC:** This was measured on the left arm with the arm at right-angle, the middle point between the tip of the elbow and the tip of the shoulder bone was identified as the measurement spot. MUAC was then measured at this spot with the measurements of the arm hanging by the body's side. MUAC was measured in mm and to the nearest mm. In the event of a disability the right arm was used or for those who are left-handed, MUAC was taken on the right arm. Teams placed emphasis on the correct identification of the arm mid-point and correct placement of the MUAC tape on the 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 3 seconds on both feet recorded as "Yes" if it was positive and "No" if it was negative for nutritional bilateral Oedema.

3.7.2 Health, morbidity and other Indicators

Measles vaccination: The child's vaccination card was used as a source of verification. In circumstances where this was not available, the caregiver was probed to determine whether the child had been immunized against measles or not (done subcutaneously on the right upper arm). 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). Only children greater than or equal to 9 months were used to determine coverage of this in the final analysis.

Oral Polio Vaccine (OPV): OPV type 1 (1st dose at 6 weeks) **and OPV type 3** (3rd dose at 14 weeks) was tabulated for all children aged 0-59 months.

Deworming: Determined by whether the child had received drugs for intestinal worms in the last 6 months. This was recorded as "0" for No, "1" for Yes by card, ''2'' for Yes by recall and ''3'' for Do

[15] Integrated Management of Acute Malnutrition

not know.

Vitamin A coverage: This was determined by the number of times the eligible child had received vitamin A in the past year. The response received (number of times) was probed and eventually recorded on the anthropometric questionnaire.

Morbidity: This was gathered over a two week recall period by interviewing/probing the mothers/caretakers of the target child and eventually determined based on the respondent's recall. This information was however not verified by a clinician.

Other data sets: included HINI[16], WASH, FSL indicators.

3.7.3 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 was respected. Privacy and confidentiality of survey respondent and data was protected.

Referrals
Referrals for survey participants and eligible subjects who showed signs or symptoms that require immediate clinical attention was mitigated by issue referral letters and assisting the very sick reach the health or feeding centre.

3.8 Data Entry and Analysis

Anthropometric data was analysed in ENA for SMART software November 2012 version. Daily data entry was undertaken for all data sets so as to ensure close supervision and quality of data as the survey progressed. All data sets were entered and analysed using Microsoft excel and SPSS version 19.

3.9 Nutrition indices and thresholds used

3.9.1 Anthropometric indices

Weight for height (WFH) 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 (HFA) 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 (WFA) 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. The reference values used are WHO standards 2006.The indices are expressed in Z-scores, according to WHO 2006 reference standards (Table 5).

[16] High Impact Nutrition Interventions

Table 5: Threshold values for weight for height, height for age and weight for age indices according to WHO 2006 reference standards

	Acute malnutrition (Weight for height)	Chronic malnutrition (height for age)	Underweight (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

Mid upper arm circumference (MUAC): MUAC is a best anthropometric predictor of mortality. MUAC measurements were undertaken to determine the nutrition status of children and of their mothers (or caretakers) of reproductive age (15-49) years in the sampled household. During the survey, all severe and moderately malnourished children as per MUAC cut offs (Table 6) were referred to nearby facilities.

Table 6: Threshold values of the anthropometric measurements of MUAC

MUAC Guideline	Interpretation
MUAC<115mm and/or bilateral Oedema	Severe acute malnutrition(SAM)
MUAC >=115mm and <125mm *(no bilateral oedema)*	Moderate acute malnutrition(MAM)
MUAC >=125mm and <135mm *(no bilateral Oedema)*	At risk of acute malnutrition
Maternal MUAC Cut-Offs	
MUAC < 21cm	Malnourished
MUAC ≥21cm≤21.5cm	At risk
MUAC >21.5cm	Normal

3.9.2 Infant and young child nutrition (IYCN)

1. Timely initiation of breast feeding: proportion of children born in the last 24 months who were put to the breast within one hour of birth.
2. Exclusive breastfeeding rates: Proportion of children less than 6 months exclusively fed on breast milk in 24 hour recall period.
3. Minimum Dietary Diversity: proportion of children 6-23 months of age who receive foods from 4 or more food groups.
4. Minimum meal frequency: Proportion of breastfed and non-breastfed children 6-23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more: 2 for breastfed infants 6-8 months, 3 breastfed children for 9-23 months and 4 for non-breastfed children aged 6-23 months.
5. Minimum acceptable diet: proportion of children 6-23 months of age who had both minimum frequency and dietary diversity (in both breastfed and non-breastfed children).

4. SURVEY FINDINGS

Data quality analysis
The data quality analysis is tabulated in appendix 1 (plausibility check on anthropometric results). The design effect for this survey was 1.26 (DEFF=1.26) indicating a relative homogeneous group.

4.1 Health and Nutrition

4.1.1 Age and sex composition of children
Anthropometric data was collected from 423 sampled children aged 6-59 months. The overall boy to girl ratio was 1.04 indicating that sampling was unbiased and within expected range values of (0.8 – 1.2). The age distribution was within the acceptable range.

Table 7: Distribution by age and sex

	BOYS		GIRLS		TOTAL		RATIO
Age in months	**n**	**%**	**n**	**%**	**n**	**%**	**Boy: girl**
06-17	48	45.7	57	54.3	105	24.8	0.8
18-29	54	48.6	57	51.4	111	26.2	0.9
30-41	44	55.7	35	44.3	79	18.7	1.3
42-53	41	51.3	39	48.7	80	18.9	1.1
54-59	29	60.4	19	39.6	48	11.3	1.5
Total	216	51.1	207	48.9	423	100.0	1.0

4.1.2 Prevalence of global acute malnutrition (GAM)
The table below indicates prevalence of GAM based on WHZ at 10.5% (7.5-14.4 95% C.I), the SPHERE[17] standards interpretation of these results indicates that the malnutrition level is at serious.

Table 8: Prevalence of acute malnutrition by sex according to weight for height index expressed in Z-scores (and/or oedema) according to WHO 2006 standards. Results in bracket are expressed with 95% confidence intervals (CI).

	All n = 419	**Boys** n = 214	**Girls** n = 205
Prevalence of GAM **(<-2 z-score and/or oedema)**	10.5 % (7.5 - 14.4)	12.6 % (8.8 - 17.8)	8.3 % (5.0 - 13.5)
Prevalence of MAM **(<-2 z-score and >=-3 z-score, no oedema)**	9.3 % (6.9 - 12.4)	11.2 % (8.0 - 15.5)	7.3 % (4.4 - 12.0)
Prevalence of SAM **(<-3 z-score and/or oedema)**	1.2 % (0.3 - 4.3)	1.4 % (0.3 - 5.9)	1.0 % (0.2 - 3.9)

No oedematous cases were reported during this survey.

[17]Humanitarian charter and minimum standards set forth for disaster response

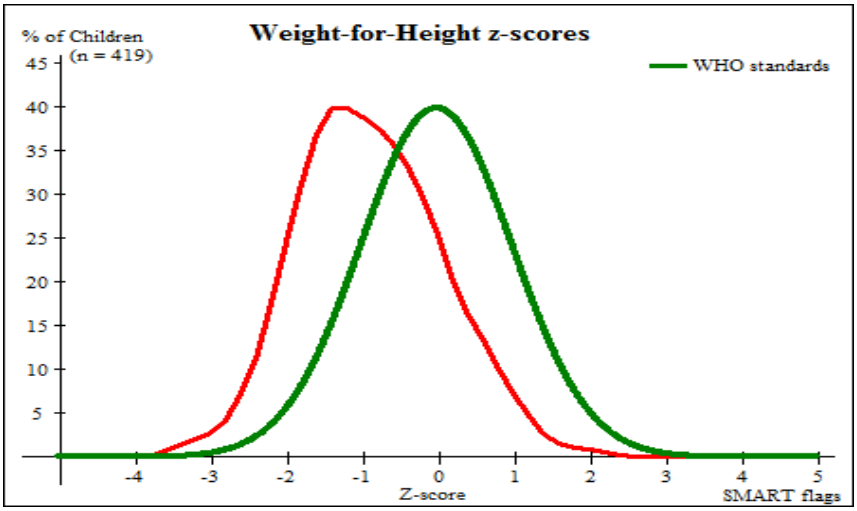


Figure 2 on shows Gaussian curve with exclusion of Z-scores based on SMART flags.
The curve of surveyed children (red curve) lies to the left of the reference curve (WHO standards; in green) indicating that the surveyed population is characterised by more malnutrition than the reference population.

Figure 2: Distribution of weight for height index in z-score compared to the WHO reference population 2006

As illustrated in table 9, there were no cases of marasmic-kwashiokor or kwashiorkor within the total number of children surveyed.

Table 9 : Prevalence of severe acute malnutrition and oedema according to weight for height index (expressed in Z-scores and oedema)

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor (0.0 %) n=0	Kwashiorkor (0.0 %) n=1
Oedema absent	Marasmic (0.2 %) n=1	Not severely malnourished (99.8 %) n=422

4.1.3 Prevalence of acute malnutrition based on MUAC

The prevalence of acute malnutrition based on mid upper arm circumference captures less children hence lower than global acute malnutrition based on weight for height Z-scores (Table 10).

Table 10: Prevalence of global, moderate and severe acute malnutrition according to MUAC cut off. Results in bracket are expressed with 95% confidence intervals (CI).

	All n = 423	Boys n = 216	Girls n = 207
Prevalence of GAM (< 125 mm and/or oedema)	2.1% (1.2 - 3.8)	0.5 % (0.1 - 3.4)	3.9 % (2.1 - 7.0)
Prevalence of MAM (< 125 mm and >= 115 mm, no oedema)	1.7 % (0.8 - 3.3)	0.0 % (0.0 - 0.0)	3.4 % (1.8 - 6.4)
Prevalence of SAM (< 115 mm and/or oedema)	0.5 % (0.1 - 1.9)	0.5 % (0.1 - 3.4)	0.5 % (0.1 - 3.7)

4.1.4 Prevalence of underweight

Low weight-for-age arises from insufficient weight gain relative to age. Based on the findings of the survey, the prevalence of global underweight was 23.7% (17.8-30.7, 95% C.I.) and severe underweight 2.8% (1.4-5.6, 95% C.I., Table 11).

Table 11: Prevalence of underweight according to weight-for-age index expressed in z-scores by sex according to WHO 2006 standards. Results in bracket are expressed with 95% confidence intervals (CI).

	All n = 422	Boys n = 215	Girls n = 207
Prevalence of underweight (<-2 z-score)	23.7 % (17.8 - 30.7)	25.6 % (19.0 - 33.6)	21.7 % (14.8 - 30.7)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	20.9 % (15.9 - 26.9)	22.3 % (16.8 - 29.0)	19.3 % (12.6 - 28.5)
Prevalence of severe underweight (<-3 z-score)	2.8 % (1.4 - 5.6)	3.3 % (1.2 - 8.3)	2.4 % (0.9 - 6.6)

4.1.5 Prevalence of stunting

Stunting (low height-for-age), results from a prolonged duration of inadequate food intake, poor dietary quality, increased morbidity, or a combination of these factors. The prevalence of stunting in Merti district in May 2013 is 25.1% (20.3-30.7 95% C.I.) and severe stunting is 5.4% (3.3-8.6 95% C.I., Table12).

Table 12: Prevalence of stunting according to weight-for-age index expressed in z-scores by sex according to WHO 2006 standards. Results in bracket are expressed with 95% confidence intervals (CI).

	All n = 410	Boys n = 207	Girls n = 203
Prevalence of stunting (<-2 z-score)	25.1 % (20.3 - 30.7)	26.6 % (20.2 - 34.1)	23.6 % (17.0 - 31.8)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	19.8 % (15.8 - 24.4)	21.3 % (15.9 - 27.8)	18.2 % (12.2 - 26.3)
Prevalence of severe stunting (<-3 z-score)	5.4 % (3.3 - 8.6)	5.3 % (3.0 - 9.2)	5.4 % (2.7 - 10.7)

4.1.6 Infant and Young Child Nutrition (IYCN)

There was no trend analysis for IYCN for Merti district since this was the first integrated survey that captured IYCN indicators. The following core indicators were assessed; timely initiation of breastfeeding, exclusive breastfeeding, minimum acceptable diet, minimum meal frequency and minimum dietary diversity (among both breastfed and non-breastfed children).

Table 13: Summary of IYCN indicators

IYCN INDICATOR	Percentage (%)
Timely initiation of breastfeeding (within one hour of delivery)	**71.5**
Exclusive breastfeeding(EBF for infants aged 0-5 months)	**82.2**
Dietary Diversity	
Proportion of breastfed children 6-23 months consuming ≥3 food groups	**19.2**
Proportion of non-breastfed children 6-23 months consuming ≥4 food groups	**2.3**
Proportion of both breastfed and non-breastfed children 6-23 months consuming ≥ 3 or ≥4 food groups respectively	**16.0**
Minimum Meal Frequency	
Proportion of breastfed children 6-8 months and 9- 23 months having at least 2 meals and≥ 3 meals a day respectively	**49.2**
Proportion of non-breastfed children 6-23 months having ≥4 meals a day	**34.1**
Proportion of breastfed children 6-8 months, 6-23 months and non-breastfed 6-23 months having ≥2, ≥3 and≥4 meals a day respectively	**46.4**
Minimum Acceptable diet	**31.2**

4.1.7 Vitamin A supplementation and deworming coverage

The Kenya high impact nutrition interventions (HiNi) recommends that a child should be supplemented at-least twice a year (every six months) beginning at six months for children 6-59 months. The dosage offers protection against common childhood infections and substantially reduces mortality.

Table 14: Vitamin A supplementation by age group in May 2013

	No of times/year	percentage
6-11 months	Once	91.8%
12-59 months	Once	41.4%
12-59 months	Twice	45.2%

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. The survey unveiled a very low rate of deworming amongst children 12-59 months, which is 3.5%, a proportion far from reaching the national target of 80%.

4.1.8 Child morbidity

A two week recall period was used to determine morbidity amongst children less than five years of age. 44.6% of the sampled households reported to have children sick in the two weeks prior to survey. Also, there was a decreased prevalence of three major illnesses that is fever/malaria, ARI/cough and watery diarrhoea in May 2013 as compared to February 2013 (Figure 3), however a slight increase in other illnesses such as multiple infections, eye and skin infections) was reported.

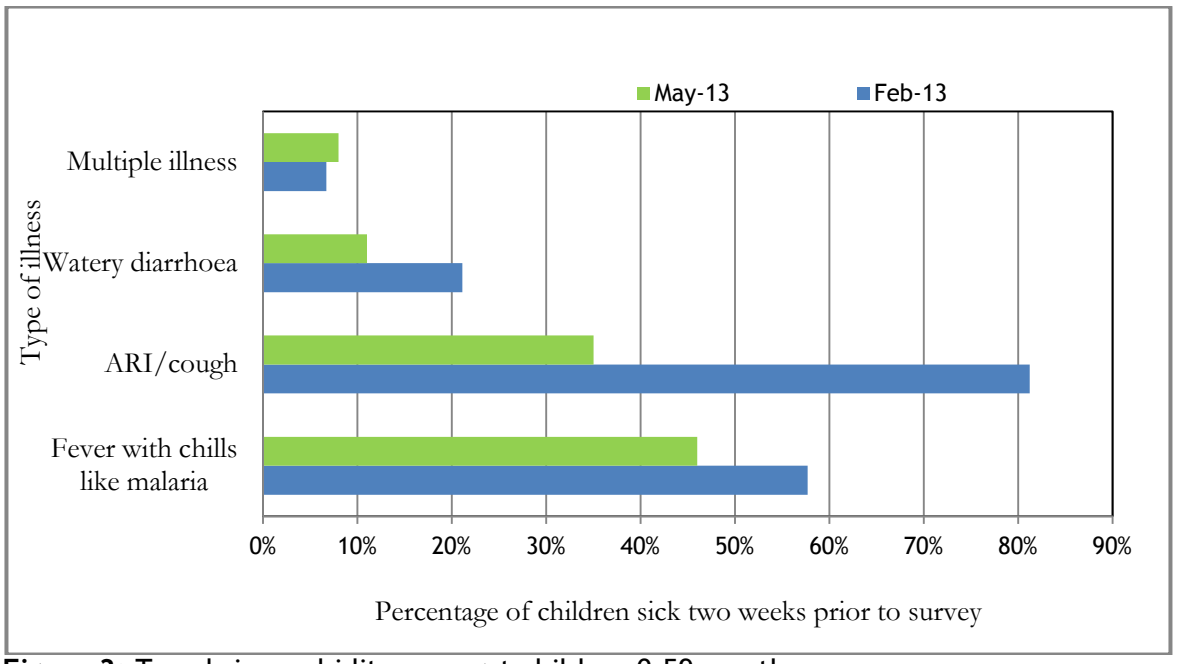


Figure 3: Trends in morbidity amongst children 0-59 months

The findings presented in figure 3 can be summarized as follows:
Fever with chills like malaria: was the most reported illness among children (0-59 months) at 46% slightly lower than previous SSS results at 57.7% (February 2013).This improvement was attributed to distribution and utilization of ITN mosquito nets by households with 80.4% of household owning a mosquito net.

ARI/cough (any episode with severe, persistent cough or difficult breathing): The prevalence of acute respiratory infections/cough in children 0-59 months had decreased to 35% in May 2013 as compared to 81.2% in February 2013. This was attributed to improved health seeking behaviour by caregivers through continuous health education at the health facilities, availability of mobile clinics at the village level and triage of ARI/cough cases by clinicians at the health centres

Watery diarrhoea (any episode of three or more watery stools per day):
There was a slight decrease in the prevalence of watery diarrhoea reported at 11% in May 2013 compared to 21.1% in February 2013. Of reported cases of watery diarrhoea only 34.3% of children sick from watery diarrhea two weeks prior to the survey had been supplemented with therapeutic zinc, a low proportion compared to national targets of 50%. The low coverage in zinc supplementation was attributed to a shortage of therapeutic zinc in Merti district between the months of January to early May 2013. Continuous On-the-Job Training (OJT) of health care professionals within the facility has been embraced, along with sensitizing caregivers on the benefits of zinc supplementation in the treatment of diarrhea cases.

Other illnesses: There was a slight increase in the prevalence of multiple infections from 6.7% in February 2013 to 8% in May 2013. Multiple infections comprised children sick from more than one illness: fever/malaria and ARI/cough, fever/malaria and watery diarrhoea or combination of both. Also included in this category were eye, ear and skin infections.

4.1.9 Immunization coverage

The survey used three antigens as proxies for immunization coverage. These are Oral Polio Vaccine (OPV 1 and 3) and measles vaccine. Table 14 illustrates immunization coverage in May 2013.

Table 15: Immunisation coverage May 2013

Immunization	Verification by	MAY 2013
OPV1 (1st dose at 6 weeks)	Card	84.2%
	Recall	12.6%
OPV3 (2nd dose at 10 weeks)	Card	82.7%
	Recall	12.9%
Measles vaccine (9 months of age)	Card	76.1%
	Recall	14.3%

All children that were not immunized were referred to the nearest health service centre. The caregiver received a referral letter and was linked with the health care provider or community health worker. Informal interviews cited a lack of consistency and interrupted electricity supply in health centres in the Merti district, which hindered the storage of the vaccines within the cold chain system.

Lack of proper documentation and failure to follow-up on defaulters contributed to a low coverage in measles immunization, with verification by card at 76.1% which is below the WHO benchmark of 80%.There were no previous reports on immunization coverage to provide insight on trend analysis.

4.2 MATERNAL NUTRITION

7.8% of caretakers in the sampled households were pregnant mothers while 45.2% were lactating. The threshold for maternal malnutrition in pregnant and lactating mothers based on MUAC cut-off of < 21.0 cm was 6.7%, a decline compared to February 2013 when the prevalence of maternal malnutrition was 13.5% (Table 16).

Table 16: Maternal malnutrition trend analysis

Category of mothers	MUAC cut off point < 21.0 cm	
	February 2013	May 2013
Pregnant and lactating	13.5%	6.7%

4.2.1 Iron-folate supplementation

From the survey results, 55.1% of mothers had received iron-folate supplementation by card during their last pregnancy for a period of 90 days. The proportion of mothers supplemented lies below the WHO benchmark targets of 80%.

4.3 Water, Sanitation and Hygiene Practices

The survey was conducted after the long rain season during the month of March to May 2013.

4.3.1 Household water sources and treatment

Approximately 44.4% of households in the district were reported to use unsafe water sources with the specific sources illustrated in figure 4.

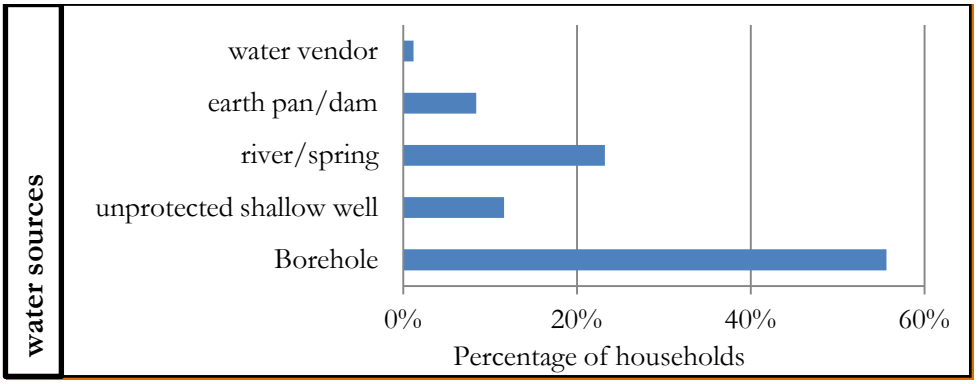


Figure 4: Main sources of drinking water in Merti District, May 2013

Piped water system from protected boreholes and shallow wells was used by 55.6% of the household. These households are connected to water meters; with the cost per month ranging between 100 and 500 Ksh. The cost of 20 liter jerican was an average 3Ksh for households purchasing water from vendors and kiosks. About 40.7% households reported to walk for more than 500 metres to the main water source with 12.5% queuing for water more than 30 minutes. Majority of households who relied on unsafe water sources, 66.7% did not treat their water before drinking. The table 17 illustrates the various types of water treatment methods.

Table 17: Water treatment methods

Type of water treatment	Number of Households	Proportion of households
Boiling	25	17%
Chemicals(PUR/chlorination)	99	67%
Pot filters	12	8%
Traditional herb	7	5%
Others(passing through cloth)	4	3%

4.3.2 Hygiene practices

Most households practice four critical hand washing times that is after toilet (98.8%), before cooking (96.3%), before eating (99.3%) and after taking children to toilet (83%) respectively.
From the sampled households only 60.9% use soap and water to wash their hands.

Table 18: Hand washing times by households in Merti district

Hand washing time	Proportion of households
Wash hands when dirty	35.4%
After toilet	98.8%
Before cooking	96.3%
Before eating	99.3%
After taking children to toilet	83.0%
Other(before prayers)	13.2%

60.9% of households reported to wash hands with soap and water.

4.3.3 Sanitation

Analysis undertaken indicates that approximately 37.6% (146) of households practice open defecation, while 39.2% (152) households relieve themselves in neighbour traditional or improved latrine. Informal interviews during the surveys indicated that there was destruction of traditional pit or improved latrines by floods in Basa location during the long rain season in April to May, 2013.

4.4 Food Security and Livelihoods

4.4.1 Demographic information

Most (82.6%) households in Merti district are male headed with their main sources of livelihood being livestock herding (47.7%), farming (13.3%), daily labour wage (16.9%), salaried (9.1%) and petty trade (6.5%).

There was a slight decrease in small scale farming at 13.3% along river Ewaso Nyiro in May 2013 as compared to February 2013 (15.3%). This could probably be attributed to flooding of the river that eventually swept away crops planted along the river banks during the short rain seasons of April to May 2013.

4.4.2 Sources of food

The survey findings indicate that 76.7% and 16% of food consumed at households in Merti district was obtained through purchase and own production respectively. Other sources included; gifts from friends, food aid, borrowing and gathering from the wild which accounted for 7.3 %. Over dependence of households on market for food purchases may contribute to food shortages incase market are destabilized by shocks such as high food prices, inflation, conflicts, unpredictable climate etc.

4.4.3 Household and individual dietary diversity

Household dietary diversity was assessed using 7 day recall period and individual dietary diversity using 24 hour recall for the young children (6-59 months). It indicated that oils and fats, milk and milk products, sweets; sugar and honey, condiments and cereals were food most consumed. Vitamin-A rich fruits, flesh meat and offal's, eggs, fish and dark green vegetables were not frequently consumed as shown in table 19 and 20 below. Eggs on the other hand are less consumed though available at the household level because they are sold in order to purchase other food items like sugar and cooking oil. The household dietary diversity score was 7.1 but some food groups are not frequently consumed as mentioned above.

Tables 19 and 20 show foods consumed by >50% of household by dietary diversity tercile. Cereals, oils & fat, dairy products and condiments are food mostly consumed in a week.

Table 19: Food groups consumed by >50% of households by dietary diversity tercile

Lowest dietary diversity (=< 3 food groups) 0.5%	Medium dietary diversity (4 and 5 food groups)7.1%	High dietary diversity (=> 6 food groups) 92.3%
Cereals	Cereals	Cereals
Condiments, spices &beverage	Milk and Milk products	Milk and Milk products
	Sweets; sugar, honey	Pulses and legumes
	Oils/Fats	Oils/Fats
	Condiments, spices &beverage	Sweets; sugar, honey
		Condiments; spices &beverages

Table 20: 7-day recall household food frequency

Food Group	No of Households out of 401	Average number of days consumed in a week
Cereals and cereal products	390	4.9
Vitamin A rich Vegetables	90	2.8
White tubers and plantains	177	3.2
Dark green leafy vegetables	165	2.4
Other vegetables	201	3.7
Vitamin A rich fruits	50	2.0
Other fruits	18	2.4
Organ meat	92	1.9
Flesh Meat and offals	235	2.0
Eggs	135	3.1
Fish	16	3.7
Pulses and Legumes	370	4.3
Milk and milk products	359	6.3
Oil and fats	395	6.4
Sweets, sugar, honey	389	6.3
Condiments and spices, beverages	350	6.2

4.4.4 Livestock ownership

Majority of the households reported to own goats (66.4%) and sheep (57.8%) respectively with a mean number of goat(s) and sheep(s) owned per household at 8 and 6 respectively. Camel was the least livestock owned per household with a mean of 0.6. Figure 5 illustrates livestock type owned by household in Merti district.

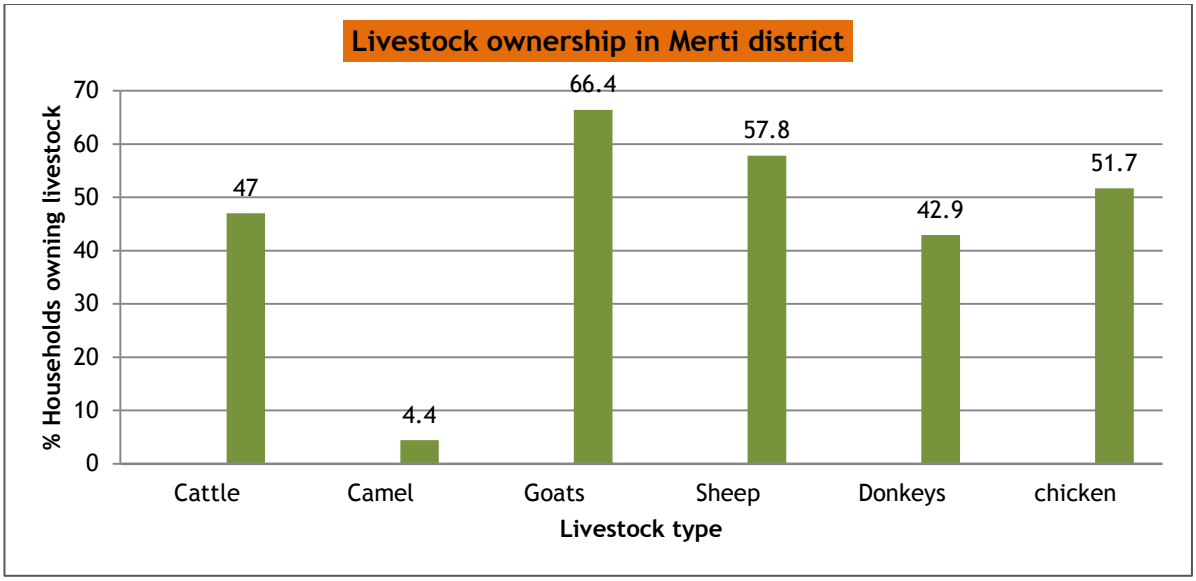


Figure 5: Livestock ownership in Merti district

Most households reported to have an increase in livestock. The increase was attributed to livestock births (95.8%); followed by gifts (2.0%) and purchases (1.8%). Livestock disease was the major cause

of livestock decrease at 28.5%. Most cattle, goats and sheep were reported to die due to bloating while goats suffered from black quarter disease. An almost same portion (26.9%) of livestock decreased in household due to sale of these so as to cater for household goods. Of emphasis was livestock decline due to attack by wild animals (17.3%) such as *mongoose* and this mainly affected chicken. Other reported cases of wildlife attack in other type of livestock were minimal. Wildlife conservancy officers in conjunction to security guards in Merti are giving due support to household within which livestock were affected due to wild animals attack of emphasis being chicken attacks by mongoose and goats/cattle by hyenas, by placing traps within areas where the incidents of attack has been reported.

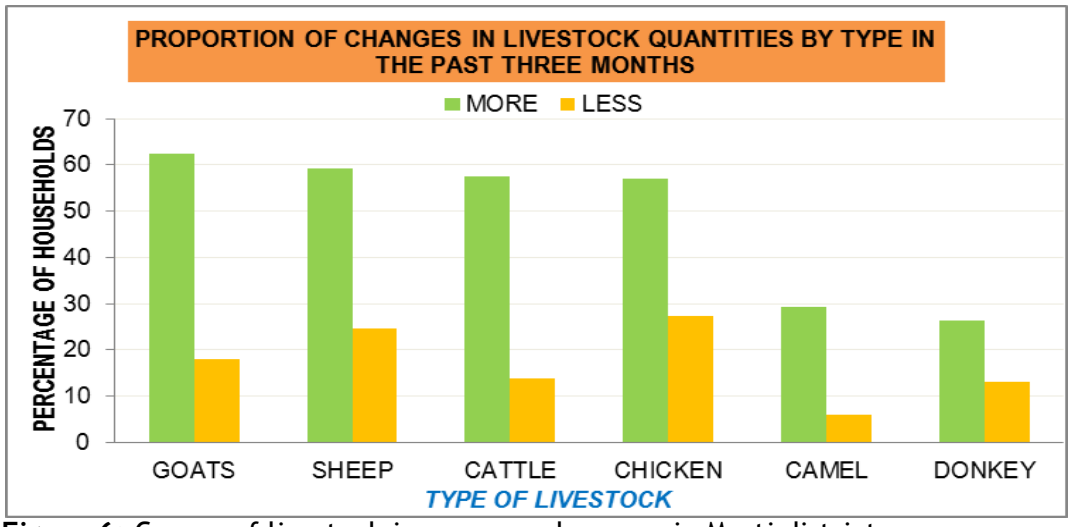


Figure 6: Causes of livestock increase or decrease in Merti district

4.4.5 Coping Strategy Index

The coping strategy score obtained was 22.0 with the weighted analysis tabulated in table 21. The most severe coping strategy of adults restricting from consumption of food in order for young child to eat had a score of 7.8. An indication that if measures to stabilize the food security at household level are not embraced this might worsen the situation. The coping strategy index has slightly declined when compared to the month of February (SSS, 2013) which was 24.4. However this does not reflect seasonal comparability due to the fact there was no survey conducted in 2012 same period.

Table 21: Coping strategy weighted analysis in Merti district

Coping strategy	Number of household employing the strategy	Frequency score (0-7)	Severity score (1-3)	Weighted score=frequency *weight
Rely on less preferred food	285	3.1	1	3.1
Borrow food	237	2.4	2	4.8
Limit portion sizes	259	2.9	1	2.9
Restrict consumption of food by adults for young children to eat	224	2.6	3	7.8
Reduced number of meals	257	3.4	1	3.4
Total household score				**22.0**

The most severe *coping strategy score* embraced by 224 households

5. CONCLUSION AND RECOMMENDATIONS

Table 22 summarizes key findings from the survey as well as possible recommendations.

Table 22: Recommendations

Sector	Key issue	Recommendation
Health and nutrition	**High Malnutrition level** in children 6-59 months at alert phase with GAM at 10.5%; SAM at 1.2%. This indicates that the nutritional situation might worsen if there is no continuum of feasible and sustainable solutions towards embracing HINI interventions. The proportion of pregnant and lactating mothers with MUAC <21.0cm is 6.7%	▪ Triage of children at household level by CHWs both severe and moderate acute malnourished for early detection and treatment. ▪ Feasible strategies to on-going activities that can improve maternal health and nutrition such as strengthening MIYCN through support of existing and new MTMSGs and continuous group health and nutrition talks at health facilities and community outreaches ▪ Foster household to hospital continuum of care through the engagement of community members ▪ Appropriate early treatment of diseases to minimize their resultant effect on the status of the child
	Supplementation; Vitamin A coverage at least twice a year, verifiable by card is 45.2% (which is below national target of 80%).This was attributed to a lack of proper documentation, erratic supply of Vitamin A from KEMSA and a lack of strengthened mechanisms on capacity building for health staff and community.	▪ Strengthen efforts to properly document all children supplemented with vitamin A by updating all reporting tools.
	1. Zinc supplementation for children diagnosed with watery diarrhoea cases was low at 34.3% which is below the national target of 80%	▪ Improve supply of therapeutic zinc with strengthened efforts from KEMSA at national to county level. ▪ Continuous health education of caregivers at the clinics and community outreaches.
	2. Deworming rates(for children 12-59months) was at 31.5% by card indicating a low coverage due to lack of proper documentation	▪ Integration of deworming among children (12-59 months) in school health program. ▪ Strengthen efforts on proper documentation

	3. Iron-folate supplementation of pregnant mothers is 55.1% which is below the national coverage of 80%	▪ Strengthen mechanisms on supply and proper documentation of mother to child booklets ▪ Health and nutrition education of pregnant mothers during ANC-visits ▪ Focus on home-deliveries since they are out-of reach of Iron-folate supplementation (establish direct link with reproductive health workers (TBAs)
Sector	**Key issue**	**Recommendation**
	Morbidity rates Prevalence of diseases was lower in May 2013 SMART survey compared to earlier Small scale survey in February 2013. Malaria was the most frequent reported disease that affected children (0-59 months) at 46%. ARI in children 0-59 months had declined to 35% in May 2013 as compared to February 2013 results at 81.2%.	▪ Continuous community health education at the health facility and community outreaches on prevention and treatment of common childhood illness. ▪ Triage of early signs and symptoms by clinicians to provide most appropriate treatment options. ▪ Enhancing household to hospital continuum of care by strengthening efforts of caregivers health seeking behaviour
	Measles immunization by card still low at 76.1% below WHO benchmark of 80%.	▪ Lack of/ inconsistency and interrupted supply of electricity connectivity in all health centres in Merti district which resulted to inadequacy in storage of the vaccines within the cold chain system. ▪ Lack of proper documentation to support children immunized contributed to low coverage in measles immunization ▪ Active case finding and referral links of children termed as defaulters or not immunised to health facilities by CHWs
Water, hygiene and sanitation	**Water** 44.4% of households reported to use unsafe water sources. 66.7% of households did not treat their water before drinking Water connectivity issues common in Cherab division.	▪ To improve safe water access by increasing the number of water access points for piped water schemes and reduce the queuing time. ▪ Support development of safe water sources such as protected wells along Ewaso nyiro River ▪ Strengthen efforts on community sensitization on adopting to feasible and sustainable water treatment methods.
	Hygiene Hand washing at four critical times remains high	▪ Review of data collection tool to incorporate hand washing techniques(Use of clean water, use of soap and ash, wash both hands, rub hands together at least three

	though it's not relative to hand washing behaviour (the component on hand washing techniques)	times and dries hands hygienically using a clean cloth) ▪ Promotion of health education on best hygienic practice focussing on health centres, schools and community outreaches
	Sanitation 37.6% of households practice ODF, while 39.2% of households share toilets with their neighbours Destruction of latrines during the floods in Basra area in April and May 2013	▪ Strengthening efforts on CLTS activities at the household level ▪ Mitigation efforts to assist communities affected to reconstruct latrines
Sector	**Key issue**	**Recommendation**
Food security and livelihoods	*Farming*: Slight decrease in small scale farming at 13.3% along river Ewaso nyiro in May 2013 as compared to February 2013 rate of 15.3%. *Household and individual dietary diversity:* Household dietary diversity score is 7.1 with low consumption of vegetables and fruits, organ meat, eggs and fish *Source of food:* This was mainly obtained by purchase (76.7%). This might be distracted by shocks on market equilibrium No food aid/ distributions have been undertaken since February 2013. *(Coping strategy index)* 22.0 is still high and if appropriate FSL interventions are not maintained the situation might worsen with emphasis that the most severe coping strategy of restricting adults in consumption of food for small children to eat with an index of 2.6 is considered high. *Livestock:* increase in livestock may be relative to long rain seasons due to availability of pasture and browse for the livestock. The slight decrease is within the seasonal norms.	▪ Continuous health and nutrition education in consumption of variety foods sources such as organ meat should be embraced at household level. ▪ Develop flood mitigation efforts on drainage of flood water from river Ewaso nyiro in order to encourage establishment of sustainable small scale farms that could supply locals with fresh vegetables and fruits. ▪ Encourage consumption of organ meat, eggs, fish which are rarely consumed yet they are available. ▪ Ministry of Agriculture and partners to strengthen efforts to ensure that own production of food is encompassed example capacity building of livestock herders to be able to maximise production of livestock products through improving vaccination of common livestock diseases and also encourage mixed farmers especially communities living adjacent to river Ewaso nyiro where they can cultivate crops to meet their dietary needs. ▪ Strategic food assessment by national development authority to monitor food and nutrition security at the household level ▪ Government and partners should strengthen structures within which livestock herders can market animal products such as milk, beef, skin and eggs.

Appendix1: Plausibility check for Merti SMART 2013

Overall data quality

Criteria	Flags	* Unit	Excel.	Good	Accept	Problematic	Score
Missing/Flagged data (% of in-range subjects)	Included	%	0-2.5	>2.5-5.0	>5.0-10	>10	
			0	5	10	20	0 (0.9 %)
Overall Sex ratio *(Significant chi square)*	Included	p	>0.1	>0.05	>0.001	<0.000	
			0	2	4	10	0 (p=0.662)
Overall Age distribution *(Significant chi square)*	Included	p	>0.1	>0.05	>0.001	<0.000	
			0	2	4	10	0 (p=0.162)
Dig preference score - WEIGHT	Included	#	0-5	5-10	10-20	>20	
			0	2	4	10	0 (3)
Dig preference score - HEIGHT	Included	#	0-5	5-10	10-20	>20	
			0	2	4	10	2 (6)
Standard Deviation WHZ	Excluded	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	0 (0.94)
Skewness WHZ	Excluded	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	0 (0.23)
Kurtosis WHZ	Excluded	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	0 (-0.07)
Poisson Distribution WHZ-2	Excluded	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	0 (p=0.052)
OVERALL SCORE WHZ =			0-5	5-10	10-15	>15	2.0%

Overall score of this survey is 2 %, this is excellent.
There were no duplicate entries detected.

Appendix 2: Roles of different members of a survey team

Survey team	Role
Survey manager	▪ Responsible for training survey teams ▪ supervision of survey teams during the data collection process (at the field level) ▪ ensures that households are selected properly ▪ ensures the equipment is functioning and calibrated well ▪ ensures measurements are taken and recorded accurately ▪ ensures questionnaires are fully recorded and correctly filled to ease with data entry ▪ provides feedback to the team on data quality (e.g. based on plausibility check)
Team leader	▪ Responsible for the quality and reliability of the data collected, ▪ ensures that he or she uses appropriate sampling procedure (guides the survey team to locate the sampled households) ▪ ensures that teams interact well with households ensuring ethical considerations are observed ▪ ensures the right procedures on nutritional anthropometry are followed ▪ coordinates with survey manager on issues that might emerge at the field level
enumerators	▪ responsible for taking anthropometric measurements ▪ ensures proper recording of anthropometric measurements is done ▪ ensures that questions administered are understood by the household members interviewed
Village guide	▪ Responsible for guiding the survey team to the village ▪ He or she introduces the survey team to the household

Appendix 3: List of sampled villages

Geographical unit	Population size	Cluster	Geographical unit	Population size	Cluster
Biliko Marara 'A'	136		Manyatta Dawa	378	24
Biliko Marara 'B'	186		Malkagalla Town A	456	
Dimaadho	198	1	Malkagalla Town B	606	25
Manyatta Mosque	442		Badana	540	26
Orotin	282	2	Lafe	294	
Bisika	359		Biliqi B	334	27
Skuli	267	3	Biliqi Centre	307	
Bulesa Box	360		Central A North	177	
Kura	332	4	Central A East	373	28
Mosque	595		Central B	313	
Walote Malkadaka	314	5	Rigga	303	29
Badolo	134		Kampicha	123	
Goda 'A'	374	6	Mata Arba	241	
Goda 'B'	414		Kula	139	
Goda 'C' & Goda 'DA'	124		Saleti A	192	RC
Awarsitu 'A & 'B'	247	7	Saleti B	188	
Dogo Micha	330		Saleti Abukol Boru	185	
Lakole	200		Tasefayo	201	
Mlanda Noor	350	RC	Taqwa A&B	1495	30,31,32
Burat I&II	65		Boji	152	
Sakuye 1	1000	8	Hospital	367	
Sakuye 2	800	9	Dololo Dakiye	356	33
Town 'A'	850	10,11	Central A	731	RC
Town 'B' /Shambole	750	12	Central B	454	
Shauri yako 1	350		Lafe (bore hole)	360	34
Shauri yako 2	370	13			
Taqwa 1	950	14			
Taqwa 2	900	15			
Manyatta Ganna	1100	16,17			
Kambi Juu	700	RC			
Manyatta Fugicha	1200	18,19			
Manyatta Duba	650				
Manyatta Funan	550	20			
Guyo Sekena	500	21			
Biliqi A	1020	22			
Malkagalla Central	480	23			

Appendix4: Calendar of events

Month	Season	2008	2009	2010	2011	2012	2013
January	BIRRA,HOT AND DRY SEASON		51	39	27	16	4 Party nomination of candidate for general elections, campaign.
February			50	38	26	15 Beginning of Borana/ Meru conflict	3 Campaigns
March			48 Cholera outbreak in Basa	37	25	14 End of Borana and Meru conflict	2 General Election March 4th. Start of floods Basa
April	**GAIN,LONG RAINS**		48 Samburu/Borana Conflict	36 Kibaki Visits Merti	24	13	1 Floods in Basa
May		59	47	35 Electronic Voter register	23	12	0 Death and Burial of Mutula Kilonzo
June	**HAGAY,ADOLES , COLD SEASON**	58	6	34 Electronic Voter register	22	11	
July		57	45	33 Referendum Campaigns	21	10 Air Crush(Saitoti & Ojode died)	
August		56	44 Census	32 Referendum Ganna accident Ramadan	20 Ramadan	9	
Septembe r	**BON,DRY SEASON**	55 Beginning of Ramadan	43 Ramadan	31 Id al Fitri	19 Gotu Accident Id al Fitri	8	
October	**AGAY,SHORT RAINS**	54 End of ramadhan	42 Id Al Fitri	30	18	7	
November		53 Obama Elected	41	29	17	6 Biometric voter registration Campaigns	
December		52	40	28	15	5 Biometric Voter Registration	

Appendix 5: Questionnaires

Household questionnaire

IDENTIFICATION Data Collector_____ Team Leader_____								
1.1 District	1.2 Division	1.3 Location	1.4 Sub-Location	1.5 Village	1.6 Cluster No	1.7 HH No	1.8 Team No.	1.9 Date

HOUSEHOLD STRUCTURE	
2.1	Sex of household head Male |_____| Female
2.2	What is the main occupation of the household head 1. Livestock herding |_____| 2. Farmer/own farm labor Employed (salaried) Daily labor/Wage labor Small business/Petty trade Other (Specify _____
2.3	How many household members are currently present Male |_____| Female |_____|

CHILD HEALTH AND NUTRITION (CHILDREN 0-59 MONTHS OF AGE) Instructions: The mother or caretaker of the child should be the main respondent for this section	
3.1	Does the household have children 0-59 months old? 1. Yes |____| 2. No (if No, skip to question 3.7)
3.2	CHILD ANTHROPOMETRY If child is aged 6-59 months please fill in ALL REQUIRED details below. If less than 6 months; please skip to question 3.3

Child No.	SEX F/m	Exact Birth Date or Age in months	Weight (KG)	Height (CM)	Oedema Y= Yes N= No	MUAC (mm)	How many times has child received VITAMIN A in the past year?	Where did you get vitamin A Capsules 1= Health facility 2= Outreach 3=mass campaigns 4= others (specify)	If Vitamin A received verified by 1 = Card 2 = Recall	Has child received drug for worms in th Past year? 0 = No 1 = Yes, Card 2 = Yes, Recall 3= Do not know
01										
02										
03										
04										

ILLNESS AMONGST CHILDREN AGED 0-59 MONTHS	
3.3	Did any of your children AGED 0-59 months old have any sickness during the past 2 weeks? (Instructions: Please indicate the appropriate number in the space provided) Yes No (If No, skip to Question # 3.4C.) |____|

3.4 If yes to question 3.3; what sicknesses did the child suffer from in the past 2 weeks?
Instructions: Multiple responses are possible for PART A ONLY, please indicate the appropriate number in the space provided

	A	B	C	D	E
Child No.	Has your child (NAME) been ill in the past two weeks? If No, please skip part B and proceed to C) If YES, what type of illness (multiple responses possible) 1 = Fever/Malaria 2 = ARI /Cough 3 = Watery diarrhoea 4 = Bloody diarrhoea 5 = Other (specify) See case definitions below	If the child had diarrhoea in the last TWO (2) WEEKS, did the child the child get THERAPEUTIC zinc supplementation? Show sample and probe further for this component 1 = Yes 2 = No 3 = Do not know	Has child received OPV1 vaccination? 1 = Yes, Card 2 = Yes, Recall 3 = No 4 = Do not know	Has child received OPV3 vaccination? 1 = Yes, Card 2 = Yes, Recall 3 = No 4 = Do not know	Has child received measles vaccination (On the upper right shoulder)? 1 = Yes, Card 2 = Yes, Recall 3 = No 4 = Do not know
01					
02					
03					
04					

Case definitions

Fever/Malaria: High temperature with shivering	Cough/ARI: Any episode with severe, persistent cough or difficulty breathing	Watery diarrhoea: Any episode of three or more watery stools per day	Bloody diarrhoea: Any episode of three or more stools with blood per day

3.5 When the child was sick did you seek assistance?
Yes |____|
No

3.6 If the response is yes to question # 3.5 where did you seek assistance? (More than one response possible- (Use 1 if Yes and 2 if No)
Traditional healer |____|
Community health worker |____|
Private clinic/ pharmacy |____|
Shop/kiosk |____|
Public clinic |____|
Mobile clinic |____|
Relative or friend |____|
Local herbs |____|
NGO/FBO |____|

WATER, SANITATION AND HYGIENE (WASH)/- Please ask the respondent and indicate the appropriate number in the space provided		
4.1	What is the main source of drinking water for the household NOW? Piped water system from borehole/ spring/protected shallow wells Unprotected shallow well Earth pan/dam Earth pan/dam with infiltration well Water trucking /Water vendor Other (Please specify)	|____|
4.2	How long does it take to walk to the main source of water (one way in minutes) NOW? less than 30 minutes(less than 500m) 30 minutes to 1 hour (more than 500m to less than 2km) More than one hour (more than 2 km)	|____|
4.2.2a	Do you queue for water? Yes No (If No skip to question 4.3)	|____|
4.2.2 b	If yes how long? Less than 30 minutes 30-60 minutes More than 1 hour	|____|
4.3	What is done now to the water before household members drink the water NOW? (MULTIPLE RESPONSES POSSIBLE- (Use 1 if YES and 2 if NO) Nothing…… Boiling…….. Chemicals (Chlorine, Pur, Water guard) …… Pot filters…… Other (specify_____)…….	|____| |____| |____| |____| |____|
4.3.1	Where do you store water for drinking? Open container / Jerrican Closed container / Jerrican	|____|
4.4	How much water did your household use YESTERDAY (excluding for animals)? (Ask the question in the number of 20 liter Jerrican and convert to liters & write down the total quantity used in liters)	|_____|
4.5	Do you pay for water? Yes No (If No skip to Question 4.6)	|____|
4.51	If yes, how much 20ltr Jerrican (per 20 liters jerrican) _____ksh/20ltrs	|____|
4.6	When do you wash your hands? (MULTIPLE RESPONSE- (Use 1 if "Yes" and 2 if "No") Does not wash hands at any special time, when they are dirty……..…… After toilet……..…… Before cooking……..…… Before eating……..…… After taking children to the toilet……..……	|____| |____| |____| |____| |____|
4.6.1	If the mother washes her hands, then probe further; what do you use to wash your hands? Only water Soap and water Soap when I can afford it traditional herb Any other specify	|____|

4.7	Where do members of your household relieve themselves? In the bushes, open defecation Neighbor or shared traditional pit/improved latrine Own traditional pit/improved latrine	|____|
4.7.1	If latrine is shared, how many other household use this latrine? Please indicate the number of households in the space provided.	|____|
4.7.2	If latrine is used, is it clean (by observing for example whether feces present on the slab or round latrine)? Yes No Refused the request for observation	|____|
4.7.3	If latrine is used, check on type of slab Traditional slab with wood or wood covered in clay or other material Cement slab	|____|

5. Livestock Ownership		
5.1	Does the household currently own livestock? 1. Yes 2. No (if No, skip to question 6)	

	5.2 How many livestock of each type does the household own?	5.3 Compared to 3 months ago do you have MORE or LESS animals? (Tick Appropriate Box)		5.4 Main cause for change (see codes on the right)
A: Cattle	|___|	Same	☐	
		More	☐	Why? |___|
		Less	☐	Why? |___|
B:Camels	|___|	Same	☐	
		More	☐	Why? |___|
		Less	☐	Why? |___|
C: Goats	|___|	Same	☐	
		More	☐	Why? |___|
		Less	☐	Why? |___|
D: Sheep	|___|	Same	☐	
		More	☐	Why? |___|
		Less	☐	Why? |___|
E: Donkey	|___|	Same	☐	
		More	☐	Why? |___|
		Less	☐	Why? |___|
F: Chickens	|___|	Same	☐	
		More	☐	Why? |___|
		Less	☐	Why? |___|

Livestock Codes
MORE
1. Newly born
2. Bought
3. Gift from a relative / friend
4. Received from an NGO / Intl. Aid
5. Other Increase (specify)
LESS
6. Sold
7. Animal died (disease)
8. Animal died (drought-related)
9. Animal died (natural causes/unknown)
10. Slaughtered for consumption
11. Gift to relative
12. Lost
13. Stolen
14. Taken by wild animal
15. Other Decrease (specify)

FOOD GROUP CONSUMED:	Did a member of your household consume any food from these food groups in the last 7 days?(food must have been cooked at the household) 1=Yes 0=No	If yes, how many dayswas the food consumed in the last 7 days?	If yes, in the last 24 hrs, did any member of your household consume any food from these food groups?	What is the main source of the dominant food item consumed? (Use codes above)? 1= Own production 2=Purchases 3=Gifts from friends/families 4=Food aid 5= traded or Bartered 6=Borrowed 7=Gathering/wild 8=Others, specify
Type of food				*Codes*
1 Cereals and cereal products (e.g. sorghum, maize, spaghetti, pasta, bread)?				
Vitamin A rich vegetables and tubers: Pumpkins, carrots, orange sweet potatoes				
White tubers roots and plantains: White potatoes, white yams, cassava, or foods made from roots, green bananas				
Dark green leafy vegetables: Dark green leafy vegetables, including wild ones + locally available vitamin A rich leaves such as traditional vegetables.				
Other vegetables (e,g, tomatoes, eggplant, onions)?				
Vitamin A rich fruits: Ripe mangoes, papayas + other locally available vitamin A rich fruits				
Other fruits				
Organ meat (iron rich): Liver, kidney, heart or other organ meats				
Flesh meats and offals: Meat, poultry, offal (e.g. goat/camel meat, beef; chicken/poultry)?				
Eggs?				
Fish: Fresh or dries fish or shellfish				
Pulses/legumes, nuts (e.g. beans, lentils, green grams, cowpeas)?				
Milk and milk products (e.g. goat/camel milk, milk powder)?				
Oils/fats (e.g. cooking fat or oil, butter, ghee, margarine)?				
Sweets: Sugar, honey, sweetened soda or sugary foods such as chocolates, sweets				
Condiments, spices and beverages:				

COPING STRATEGIES INDEX		
		Frequency score: Number of days out of the past seven (0 -7).
	In the past 7 DAYS, have there been times when you did not have enough food or money to buy food? If No; END THE INTERVIEW AND THANK THE RESPONDENT If YES, how often has your household had to: (INDICATE THE SCORE IN THE SPACE PROVIDED)	
1	Rely on less preferred and less expensive foods?	
2	Borrow food, or rely on help from a friend or relative?	
3	Limit portion size at mealtimes?	
4	Restrict consumption by adults in order for small children to eat?	
5	Reduce number of meals eaten in a day?	
	TOTAL HOUSEHOLD SCORE:	

Appendix 6: Pre-and post-test performance on SMART methodology training

Name	Division	Location	Pre-test /50marks	Post-test/50marks	Total /100
Halake Chibra Galma	Cherab	Malkagalla	31.5	36.5	68
Halkano Galgalo	Merti	Merti South	31.5	41.5	73
Mohamed Sora	Cherab	Malkagalla	29.5	40.5	70
Diram Golicha	Merti	Merti South	24.5	40.5	65
Abdia Gollo Bulle	Cherab	Dadacha basa	15	30.5	45.5
Dokato Galgalo	Merti	Bulesa	30.5	40.5	71
Sarite Adan Tadicha	Cherab	Malkagalla	33.5	42	75.5
Kalla Diba Kalla	Merti	Merti South	36	41.5	77.5
Hussein Roba Sara	Merti	Merti South	24	39	63
Barwaqo Hassan	Merti	Bisan Biliqo	30.5	41	71.5
Abdi Adan Kara	Merti	Merti South	30	33.5	63.5
Galgalo Halake Kube	Merti	Merti South	30	34.5	64.5
Asman Abdullahi	Merti	Merti North	17	43.5	60.5
Ibrahim Halkano	Kom	Bisan Biliko	38	42	80
Godana Hassan	Merti	Merti south	25	27	52
Salad Halake Molu	Merti	Merti North	34	39.5	73.5
Hawo Jarso	Merti	Bulesa	19	29	48
Gubalo Duba	Merti	Merti South	34	36	70
Ralia Wako	Merti	Merti North	33	34.5	67.5
Adan Kiya	Kom	Bisan Biliko	28	35	64
Jattani Gabarticha Abdullahi	Merti	Merti North	37	44	81
Ismail Ali Jillo	Merti	Merti North	37	39	76
Shana. S.Gollo	Cherab	Nalkagalla	28.5	37.5	66
Hussein Bidu Dida	Kom	Bisan Biliku	25.5	36	61.5
Guyatu Ollo Galgalo	Cherab	Korbesa	23	38	61
Jillo Halkano Jillo	Merti	Merti North	26	33	59

The average score increased from 58% in pre-test (before training) to 75% (after training) post-test on SMART methodology training for enumerators and data clerks