September 2010

Integrated survey
Nutrition, WASH, Food Security and Livelihoods

Garbatulla District, Kenya

Funded by

USAID
FROM THE AMERICAN PEOPLE

ACKNOWLEDGEMENT

Action Against Hunger would like to thank OFDA/USAID for funding the anthropometric and mortality survey in Garbatulla district.

Much appreciation is also extended to Nairobi and Field based ACF staffs for their technical assistance and logistic contribution to undertake the survey and for their support in the survey process.

ACF would like to thank its staff members who contributed to the success of the survey and the survey team members for their hard work that contributed to the exceptionally good quality of data.

Special thanks to Garbatulla District MOH for providing vital information on population data and other secondary data.

Finally, special thanks go to all families who allowed the survey teams to measure their children and for providing their valuable time to respond to mortality and qualitative questionnaires.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS AND ACRONYMS 4
1 EXECUTIVE SUMMARY 5
1 INTRODUCTION 8
2 SURVEY OBJECTIVES 9
3 METHODOLOGY 9
3.1 Type of survey 9
3.2 Sampling Methodology 10
3.3 Data Collection and Field Work 11
a. Anthropometric survey 11
b. Mortality survey 12
c. Food Security, Livelihoods and Water, Sanitation and Hygiene 12
3.4 Data Quality Control and Assurance 12
3.5 Pilot Survey 12
3.6 Data Entry and Analysis 12
4 INDICATORS, GUIDELINES AND FORMULAS USED 13
5 SURVEY CONSTRAINTS 14
6 RESULTS 14
6.1 Child Nutrition and Health 14
6.1.1. Distribution by age and sex 14
6.1.2. Anthropometry 15
a. Distribution of Acute Malnutrition in Z-score, WHO and NCHS references 15
b. Distribution of Acute Malnutrition in Percentage of the Median, NCHS reference 17
c. Distribution of Middle Upper Arm Circumference 17
6.1.3. Mortality 17
6.1.4. Other Causal Factors 18
a. Measles Vaccination Coverage 18
b. Vitamin A Coverage 18
c. Breastfeeding and Complementary Feeding Practices 19
d. Child Morbidity and Treatment Seeking 19
e. Mosquito Net Coverage 20
6.2 Households' Background Characteristics 20
6.3 Water Sanitation and Hygiene 21
6.3.1. Water Access, Availability, Safety and Use 21
6.3.2. Water Treatment Practices 23
6.3.3. Latrine Use 23
6.3.4. Hand washing Practices 24
6.4 Food Security and Livelihoods 24
6.4.1. Main Occupation of Household Head 24
6.4.2. Livestock Ownership and Milk Production 25
6.4.3. Sources of food 26
6.4.4. Income Sources 26
6.4.5. Expenditure 27
6.4.6. Household Dietary Diversity 28
6.4.7. Coping Strategies 28
7 DISCUSSION AND CONCLUSIONS 29
8 RECOMMENDATIONS 32
9 ANNEX 34
9.1. Sample Size and Cluster Determination 34
9.2. Anthropometric Survey Questionnaire 37
9.3. Calendar of Events 38
9.4. Household Mortality data form (One sheet per Household) 39
9.5. Household Mortality data form (One sheet per Cluster) 40
9.6. Map of Study Areas in Garbatulla District 41
9.7. Household questionnaire 42
9.8. Market Assessment Data 49
9.9. Plausibility report 1

LIST OF ABBREVIATIONS AND ACRONYMS

ACF-USA	Action Contre la Faim- USA (Action Against Hunger-USA)
ALRMP	Arid Lands Resource Management Project
ASAL	Arid and Semi-Arid Land
CMR	Crude Mortality Rate
CDC	Centre for Disease Control
CTC	Community based Therapeutic Care
DC	District Commissionaire
ENA	Emergency Nutrition Assessment
EPI	Expanded Program on Immunization
GAM	Global Acute Malnutrition
GBT	Garbatulla
GFD	General Food Distribution
GoK	Government of kenya
IMAM	Integrated Management of Acute Malnutrition
INGO	International Non Governmental Organization
IYCFP	Infant and Young Child Feeding Practice
L/p/d	Liter per person per day
KBS	Kenya Bureau of Statistics
KFSSG	Kenya Food Security Steering Group
MAM	Moderate Acute Malnutrition
MoA	Ministry of Agriculture
MoH	Ministry of Health
MoLD	Ministry of Livestock Development
MUAC	Mid Upper Arm Circumference
NCHS	National Center for Health Statistic
OFDA	Office of Foreign Disaster Assistance
OTP	Outpatient Therapeutic Program
PPS	Population Proportion to Size
SAM	Severe Acute Malnutrition
SFP	Supplementary Feeding Program
SMART	Standardized Monitoring and Assessment of Relief and Transitions
TFP	Therapeutic Feeding Program/Center
UNICEF	United Nations Children's Fund
U5MR	Under Five Mortality Rate
WFH	Weight for Height
WFP	World Food Program
WHO	World Health Organization
VIP	Ventilated Improved Pipe

1 EXECUTIVE SUMMARY

In September 2010, to assess and determine the extent of acute malnutrition in the area, ACF-USA and the District Ministry of Health (MOH) conducted an integrated nutrition survey in selected areas within the Garbatulla District, Kenya. The nutrition survey was implemented using the SMART methodology. It covered 56 rural villages in ten locations within three divisions (Garbatulla, Kinna and Sericho) of Garbatulla District and was implemented in collaboration with the Ministry of Health and Arid Lands Resources Management Project (ALRMP). The survey was preceded by training of staff from local partners on the SMART methodology from the 11th to 15th of September 2010. The survey was then conducted from 16th to 26th of September 2010. Its main objective was to determine the level of acute malnutrition among children aged 6-59 months and to estimate mortality levels within the community including the analysis of the possible factors contributing to acute malnutrition such as illnesses, care practices, water, sanitation & hygiene (WASH) factors and food security and livelihood factors.

The SMART methodology was employed to determine the sample size for the anthropometric measurements and mortality assessment. Two stage cluster sampling was used. A total of 56 clusters were randomly selected on a probability to population size (PPS) basis using ENA software. All clusters were sampled in the survey and the EPI-random of double spin method was used to select households in the second stage of sampling. Thirteen households per cluster were selected for a household interview to gather information on household food security, water access and selected health practices.

A total of 861 children (457 boys and 404 girls) aged 6-59 months were surveyed for measuring the rates of acute malnutrition and 3,201 people from 718 households were surveyed for retrospective mortality and household data. The mean household size per household was 5 persons. In the final nutrition analysis, 857 children (455 boys and 402 girls) were included (four children were flagged out of the range and excluded).

The results of the Garbatulla district September 2010 survey on anthropometrics, mortality, and other underlying casual factors of malnutrition are summarized in the Table 1 below.

Table 1: Results Summary of SMART Survey, Garbatulla District, September 2010

Index	Indicator		Results
WHO 2005 (N=857)	*Z-scores*	**Global Acute Malnutrition** *W/H< -2 z and/or edema*	14.2% [11.9 – 16.9]
		Severe Acute Malnutrition *W/H < -3 z and/or edema*	1.5% [0.8 – 2.8]
NCHS 1977 (N= 857)	*Z-scores*	**Global Acute Malnutrition** *W/H< -2 z and/or edema*	13.4% [11.3 – 15.9]
		Severe Acute Malnutrition *W/H < -3 z and/or edema*	0.2% [0.1 – 1.0]
	% Median	**Global Acute Malnutrition** *W/H < 80% and/or edema*	6.5% [4.9 - 8.6]
		Severe Acute Malnutrition *W/H < 70% and/or edema*	0.2% [0.1 - 1.0]
MUAC (N= 850)	*Children 65cm to 110 cm*	**Global acute malnutrition** MUAC < 125 mm	1.4 % [0.6 – 2.2]
		Severe acute malnutrition MUAC < 115 mm	0.0 % [0.0 –0.2]

Total crude retrospective mortality /10,000/day		2.31 [1.84 – 2.90]
Under five crude retrospective mortality /10,000/day		2.34 [1.49 – 3.67]
Measles immunization coverage (children >=9 months old, N= 823)	By card	58.6% [55.1 – 61.9]
	According to caretaker	35.7% [32.5 – 39.1]
	Not immunized	5.7% [4.3 – 7.6]
Measles immunization coverage by Card (N=823 children 9-59 months old)		58.6% [55.1 – 61.9]
Children who received vitamin A supplementation at least once in last one year (N=857)		30.0% [27.0 – 33.2]
Proportion of children 0-59 months of age who were sick in the 2 weeks prior to the survey, with diarrhea (N=56)		9.0%
Proportion of children 0-59 months of age who were sick in the 2 weeks prior to the survey, with chills like malaria (N=196)		51.3%
Proportion of children 0-59 months of age who were sick in the 2 weeks prior to the survey, with fever & difficulty in breathing (N=287)		75.1%
Proportion of households with a family latrine within their compound (N=225)		31.3%
Proportion of households with mosquito nets, who reported that all family member slept under a mosquito net the night before the survey (N=408)		56.8%
Proportion of households who access safe water source (N=115)		16.0%
Proportion of households whose water consumption is below the sphere standards <15 liters per person per day (N=379)		52.8%
Proportion of households who did not practice any form of water treatment (N=637)		88.7%
Proportion of households whose primary source of food is purchase (N=373)		51.9%
Proportion of households whose main expenditure is food (N=689)		96%
Mean household dietary diversity score (N=718)		6.6
Proportion of households consuming less than 3 food groups (N=718)		7.7%

The global and severe acute malnutrition rates range between poor and serious set up by WHO thresholds.

The Crude Death Rate (CDR) is above the emergency threshold of 1/10,000/day, while under five death rate is below the emergency threshold of 4/10,000/day.

The survey coincided with the dry season with no rains. Water situation as indicated in the response from the community is becoming worse and priority for the community is to get water regardless of quality. The survey revealed that there was a decrease in water consumption, increased physical distances to water sources, low hand washing practice with soap and low latrine coverage. More than 84% of the local community access drinking water from unsafe sources, this rate is considerably higher than the national standard of 24%[1]. Additionally, more than half of sampled households (52.8%) do not meet the Sphere Standard of 15l/p/d. Majority of households (88.7%) did not practice any type of water treatment. With regard to hand washing practices, majority of the households wash their hands before eating, after visiting latrines and before cooking. However, less than half (48.9%) of the

[1] The 2008/09 Kenya Demographic & Health Survey Report page, 46.

households use soap for hand washing. Less than one –third of households use a family latrine in their compound, and this is considered to be below the National coverage[2]. About 63.6% do share latrines. More than one-third (36.5%) defecate in the bush.

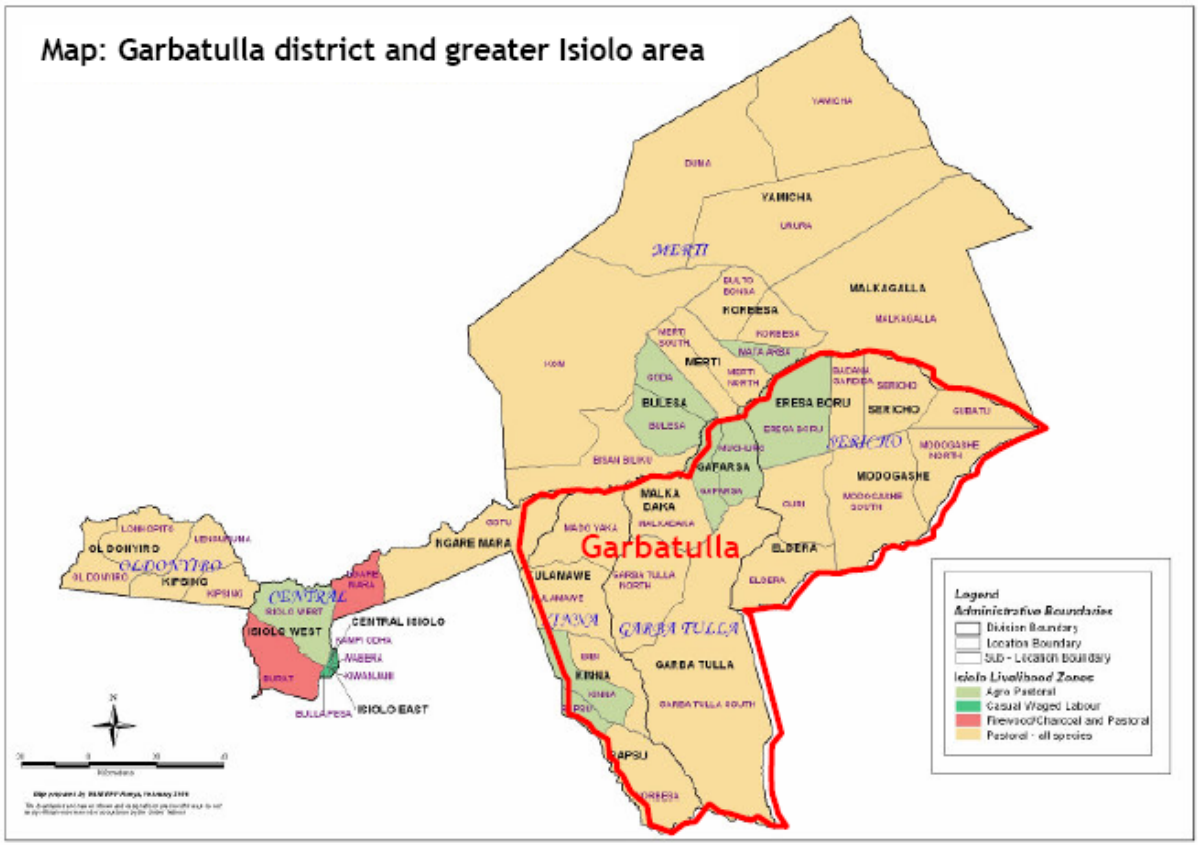
The main sources of food in the 30 days preceding the survey were purchase and food aid, at a time when market prices for staple foods were increasing. Food forms the single largest area of household expenditure by a significant margin; as such households could be vulnerable to increasing food insecurity should prices continue to rise. In terms of income, the main sources overall were livestock sales, small business/petty trade and daily labour. Analysis of household income revealed average income per person per day of only 48 KSH, less than half the recognized poverty threshold of 1.25 USD (104 KSH), indicating limited household purchasing power. Livestock prices during the survey period remained well above the five year average, representing favourable terms of trade for livestock producers. However, although Garbatulla district is identified as largely pastoralist and agro-pastoralist, nearly 40% of those surveyed reported owning no livestock. The extent to which households were utilizing coping strategies, with reducing meal size, skipping meals and purchase of food on credit being the most common, indicates widespread food insecurity, particularly as the use of coping strategies appeared to have increased since May 2010. However, an average household dietary diversity score of 6.6 demonstrates reasonable diversity in consumption, although further analysis shows more limited consumption of some nutritionally significant food groups including fruits, vegetables, fish, meat and eggs. Overall the situation gives cause for concern, with demonstrable poverty and food insecurity amongst many households who are also vulnerable to shocks. If the area is subject to increasing food prices and/or poor rainfall that undermines livestock and crop production, there are likely to be significant impacts for many in the district.

[2] Ibid: Page 47.

1 INTRODUCTION

Garbatulla District is one of the 28 districts in Eastern Province of Kenya. Its borders include Isiolo District to the West, Merti Division of Isiolo District to the North, Garissa district to the East and Nyambene district to the South. The district covers an area of 10,605 km^2 and has an estimated population of about 43,118 persons[3]. The district has hot and dry climate, with erratic and unreliable rainfall patterns. It is predominantly inhabited by the Borana ethnic community, whose main economic activity is rearing of livestock with small scale farming mainly in Kinna and Gafarsa locations. Administratively, the district is subdivided into 3 divisions, namely; Garbatulla, Kinna and Sericho divisions.

Graph 1: Map of Garbatulla district and greater Isiolo area



Garbatulla district falls within the Arid and Semi Arid Land (ASALs) region of Kenya which occupies over 80% of the country and hosts about 10 million people. According to the Kenya National Policy for Sustainable Development in ASALs, these areas have the lowest development indicators and the highest incidence of poverty. Over 60% of ASAL inhabitants live below the poverty line (subsisting on one dollar per day). The ratio of livestock to human population continues to decline; droughts, conflicts and household food insecurity are common features. This region frequently experiences recurrent droughts and high rates of acute malnutrition.

[3] 2009 Population and Housing Census Result, August 2010.

As part of its surveillance activities, ACF-USA conducted two small sample surveys[4] in February and May 2010, and a SMART survey in September 2010, in Garbatulla district. The results are mentioned in the table below:

Table 2: Summary of the results of Small scale surveys, Garbatulla district (WHO references, with confidence interval at 95%)

	Prevalence of Global Acute Malnutrition	Prevalence of Severe Acute Malnutrition
February 2010	17.2% (12.4% - 23.2%)	3.8% (1.2% - 6.1)
May 2010	14.0% (10.4% - 18.7)	1.4% (0.6% - 3.2%)

ACF-USA has been supporting the implementation and running of the Nutrition program integrated in heath structures in Garbatulla district since May 2010. As of end of September 2010, 49 and 609 cases have been admitted and treated respectively in the therapeutic and the supplementary programs.

2 SURVEY OBJECTIVES

The main objective of the survey was to determine the level of acute malnutrition among children aged 6-59 months and level of mortality in the population, as well as to analyze the possible factors contributing to malnutrition such as illnesses and care practices, water and sanitation and the food security situation. The specific objectives of the nutritional survey, in addition to providing capacity building training on SMART, included assessing or estimating:

- Prevalence of acute malnutrition in children aged 6-59 months;
- Crude and under five mortality rates;
- Coverage of measles vaccination and vitamin A distribution among targeted children;
- Exclusive breastfeeding and child feeding practices;
- Illnesses in children aged 6-59 months;
- Water, sanitation and hygiene (WASH) coverage, knowledge and practice; and
- Food security situation and livelihood sources

3 METHODOLOGY

3.1 Type of survey

Standardized Monitoring and Assessment of Relief and Transition (SMART) methodology was employed to undertake the anthropometric and retrospective mortality survey. Both the anthropometric measurements and mortality assessment were undertaken simultaneously.

Household data was collected using structured questionnaire on food security and livelihood, water and sanitation and selected health practices to understand the causes of malnutrition. Market assessment and direct observations were also used to triangulate findings.

[4] Note that: The 2 small sample surveys covered only two divisions of Garbatulla district (Kinna and Garbatulla divisions) while the SMART survey covered all the three divisions in Garbatulla district (Kinna, Garbatulla and Sericho divisions).

3.2 Sampling Methodology

A two stage cluster sampling methodology was used to collect both anthropometric and retrospective mortality data.

- **First stage**

The sample size for both anthropometric and retrospective mortality surveys were determined by using ENA for SMART November 2008 version. The data entered to the software included estimated prevalence of malnutrition and mortality rate, desired precision, recall period in days, design effect, average household size, percentage of under five children 3% for households without eligible children and 10% contingency to overcome unforeseen circumstances. Prevalence of malnutrition and mortality was estimated using previous survey conducted in the district (May 2010) (See table 2).

Table 3: Sample size calculation for anthropometric and retrospective mortality survey

Data entered on ENA software	Anthropometric survey	Retrospective mortality survey
Estimated prevalence	14.0	0.9
Desired precision	4	0.4
Design effect	2	1.5
Recall period		90 days
Average household size	5.18	5.18
Percent of under five children	20	
Percent of non-respondent	3	3
Sample sizes	**578**	**3,601**

Anthropometric survey: using the above indicated data, sample size of 578 children was generated for anthropometric survey.

Mortality survey: a sample size of 3,601 was obtained. As the average household size was estimated at 5.18, 718 households (3.601/5.18) were needed to be visited to attain required sample size. Considering the need to survey five clusters per day, it was determined to visit only 13 households for both mortality data and to measure 13 children per cluster, which resulted in selection of 56 clusters.

All children in all households were measured regardless of the required number of children per cluster for the last household. All randomly selected clusters were surveyed.

Clusters were randomly selected by assigning probability to population size (PPS) using the same software. Six clusters were excluded from sampling as they were found to be inaccessible due to insecurity. (Annex 9.1).

- **Second stage**

At the second stage, selection of households to be visited in each cluster was done using EPI method. Teams were led to the centre of the cluster by a village representative randomly choosing the direction to head to by spinning a pen. The team then walked in the direction indicated by the pen till the edge of the village or cluster boundary was reached. At the edge of the village/cluster the pen was spun again, until it pointed into the body of the village/cluster. The team then walked along this second line counting each house on the way. Using a random number table, the first house to be visited was selected at random by drawing a number between one and the number of households counted when walking along the second line. The second house and each following were taken by proximity, always choosing the houses on the right hand when standing with the back to the main door. If several

families[5] were found to be living in the same compound, all families were counted and families then randomly chosen by random number table.

In the selected household, all children aged 6-59 months were included in the anthropometric nutritional survey. If there was more than one wife/caretaker in the household, each wife was considered separately. If there were no children in a household, the house remained a part of the sample that contributed zero children to the nutritional part of the survey. The household was recorded on the nutritional data sheet as having no eligible children. The age of the children was determined using either vaccination card or a local calendar of events; child height and birth record if available. The mortality questionnaire was administered to all households that were selected with the above mentioned methodology.

Household data was collected via a pre-structured questionnaire. It was collected from the same households where anthropometric and mortality data was collected.

Market assessment, key informant interview with local leaders and observation were also used to supplement findings.

3.3 Data Collection and Field Work

Five survey teams comprising of 1 team leader, 2 data collectors and 2 measurers were involved in the anthropometric and retrospective mortality survey. The teams were trained for 3 days on anthropometric measurement, survey methodology, interviewing skills and other practical aspects. A standardization test was also conducted to evaluate the capacity of enumerators and a pilot test was undertaken which helped them practice taking of measurements and to familiarize with the forms.

6.4.1. Anthropometric survey

Anthropometric data was collected from all children within the eligible age range (6-59 months) using anthropometric questionnaire (Annex 9.2**).** The data that was collected include:

- **Age:** Recorded with the help of local calendar of events (Annex 9.3)
- **Sex:** recorded as 'm' for male and 'f' for female
- **Weight:** Children were weighed to the nearest 100 g with a Salter Hanging Scale of 25 kg. All scales were checked daily by using a standard weight of 5 kg and adjusted (to "0" with an empty weighing pant for boys or empty weighing pant plus standard dress for girls) before each measurement. Boys were measured undressed. Girls were undressed and redressed with a standard dress before measuring the weight. If the caretaker refused to have the child weighed by the above described methodology, child's own cloth was used to adjust the scale to zero. The child was then redressed to be weighed.
- **Height:** children were measured on a measuring board (precision of 0.1cm). Children less than 85cm were measured lying down, while those greater than or equal to 85cm were measured standing up.
- **Mid-Upper Arm Circumference:** MUAC was measured in cm at mid-point of left upper arm to the nearest 0.1 cm with a non-stretchable MUAC tape.
- **Bilateral Oedema:** assessed by the application of moderate thumb pressure for at least 3 seconds to both feet (upper side). Only children with bilateral oedema were recorded as having nutritional oedema.
- **Measles vaccination:** Measles vaccination status for children aged 9-59 months was confirmed from their vaccination cards. If no card was available at the time of the survey, the caretaker was asked if the child had been immunized against measles or not. For children with confirmed

[5] A family was defined as persons living together and eating from the same cooking pot. Each family represented 1 household.

immunization (by date) on the vaccination card, the status was recorded as "1" (Card) otherwise as "0" (No). Oral confirmation from the mother without proof of card was recorded as "2" (Mother confirmed). If the child was less than 9 months old, he or she was excluded from the analysis.

- **Illness in the last 2 weeks:** Assessed to see whether children were suffering from common childhood diseases. This was used to see if they had malaria, diarrhea, skin infections, worms or respiratory infections.
- **Vitamin A coverage:** A capsule of vitamin A was shown to the mother while asking her if the child received the content of that capsule in the past. The answer was then recorded as Y for yes or N for no.

All the team members were given a referral form and all children found to be severely acutely malnourished were referred to OTP sites while those moderately acutely malnourished were referred to SFP sites.

6.4.2. Mortality survey

Mortality data was collected from all 13 households per cluster regardless of whether the children in these households were eligible for anthropometric component of the survey. Ninety days recall period was used to collect data. Standard questionnaire was used to collect the data (Annex 9.3 & 9.4)

6.4.3. Food Security, Livelihoods and Water, Sanitation and Hygiene

Food security & livelihoods, health, water, sanitation and hygiene data was collected from the same sampled population for mortality and anthropometric survey. A pre-structured questionnaire was used to collect the household data (Annex 9.7)

3.4 Data Quality Control and Assurance

The use of an anthropometric standardization and cluster control sheet, thorough enumerator training, close supervision during the actual survey for consistency, completeness and clarity of the questionnaires ensured that the collected data was of good quality. Common historical events listed in the seasonal calendar were used to clarify the dates of childbirth in cases where the mother or the caretakers were not certain about the information. The plausibility and validity check up for the quality of raw data is presented in Annex 9.9.

3.5 Pilot Survey

The training was followed by a pilot survey in a cluster not selected for the survey. The methodology was tested; the precision and the accuracy of the data collection, and the measurement techniques were assessed. All the data collection forms were successfully tested during the exercise. The pilot survey was successful and the actual survey took place starting the following day. It gave an opportunity for all team members to practice measurement techniques and to familiarize with the tools. Feedback was given based on the gaps observed.

3.6 Data Entry and Analysis

ENA for SMART software November 2008 version was used to enter and analyze anthropometric and mortality data. Data with extreme values identified by the software were excluded from analysis using SMART flags. Data entry and analysis of household survey was done using SPSS/PC+ Version 13.0 and EPI info 3.5version.

4 INDICATORS, GUIDELINES AND FORMULAS USED

- **Acute Malnutrition**

Weight for Height Index

Weight for height index was used to identify wasted children. It measures short term effect either from lack of food intake or illness, which reflects the recent past and current situation of the area. It is useful particularly when it becomes difficult to determine the exact age of the child as the case in most rural past of developing countries.

Acute malnutrition rates are estimated from the weight for height (WFH) index values combined with the presence of bilateral edemas. The WFH indices are expressed in both Z-scores (standard deviation or SD score) and percentage of the median, according to both NCHS and WHO references. The complete analysis is however done with the NCHS reference. The expression in Z-scores has true statistical value and allows inter-study comparison. The percentage of the median, on the other hand, is commonly used to identify children eligible for admission to feeding programmes.

The following guidelines were thus used in expression of results in z-score and percentage of median

Guideline for results expressed in Z-score

SAM is defined by WFH <-3SD and/or existing bilateral edema
MAM is defined by WFH <-2SD and >=-3 SD and no edema
GAM is defined by <-2 SD and/or existing of bilateral pitting edema

Guideline for results expressed in percentage of median

SAM is defined by WFH < 70% and/or existing bilateral edema
MAM is defined by WFH < 80% and >= 70% and no edema
GAM is defined by < 80% and/or existing of bilateral pitting edema

Mid Upper Arm Circumference

It is not a good indicator to define the problem at population level. However, it is a good indicator of mortality in emergency situation.

Table 4: Definition of MUAC

MUAC Guideline	Interpretation
MUAC<115mm and/or bilateral pitting edema	SAM with high risk of malnutrition
MUAC >=115mm and <125mm	MAM with risk of mortality
MUAC >=125mm and <135mm	Risk of malnutrition
MUAC > 135mm	Adequate nutritional status

- **Mortality**

Ninety days recall period was used to collect mortality data. SMART methodology was utilized in data entry and calculation of crude and under five mortality rates. The result is expressed per 10,000 people per day. It is calculated using the following formula.

Crude Mortality Rate (CMR) = 10,000/a*f/ (b+f/2-e/2+d/2-c/2), where:
a = Number of recall days (90)
b = Number of current household residents
c = Number of people who joined household
d = Number of people who left household
e = Number of births during recall
f = Number of deaths during recall period

Crude Mortality Rate (CMR):

Alert level: 1/10,000 persons/day
Emergency level: 2/10,000 persons/day

Under five Mortality Rate (U5MR):

Alert level: 2/10,000 persons/day
Emergency level: 4/10,000 persons/day

5 SURVEY CONSTRAINTS

Conflict Prone Areas: as per the information gathered from the ground, Garbatulla District six sampled clusters were excluded from sampling at planning stage due to insecurity as well as being conflict sensitive prone areas (Annex 9.8).

6 RESULTS

This section presents the results and discussions based on the data on nutrition status of children aged 6-59 months, mortality with 90 days recall period and the immediate and underlying causes of malnutrition including morbidity, water and sanitation, and food security and livelihoods related indicators. Quantitative results are presented in the tables and graphs.

6.1 Child Nutrition and Health

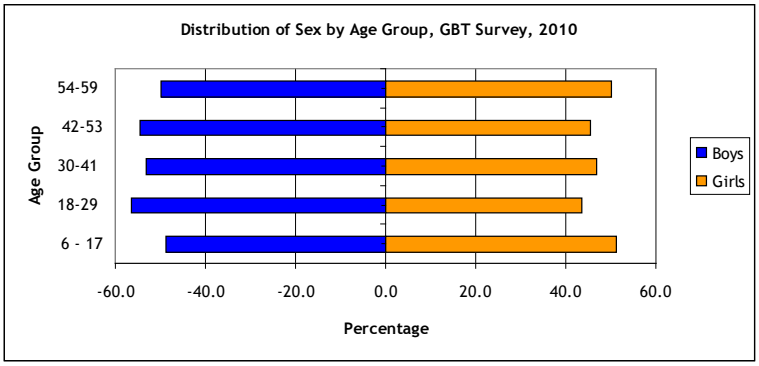
6.4.4. Distribution by age and sex

The distribution of the nutrition survey sample by sex and age group shows that the total boy/girl sex ratio of the survey was within the normal limits (0.8 - 1.2). Similarly, sex ratio within the age groups indicates a normal distribution.

Table 5: Distribution of age and sex of sample

Age Group in Months	Boys		Girls		Total		Ratio
	No.	%	No.	%	No.	%	Boy: Girl
6-17	92	48.9	96	51.1	188	21.9	1.0
18-29	117	56.5	90	43.5	207	24.2	1.3
30-41	128	53.1	113	46.9	241	28.1	1.1
42-53	90	54.5	75	45.5	165	19.3	1.2
54-59	28	50.0	28	50.0	56	6.5	1.0
Total	**455**	**53.1**	**402**	**46.9**	**857**	**100.0**	**1.1**

Graph 2: Distribution of sex by age group



6.4.5. Anthropometry

6.4.6. Distribution of Acute Malnutrition in Z-score, WHO and NCHS references

The distribution of acute malnutrition by age group in z-score is presented below (Table 5). In the entire sample, the prevalence of Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM) reached 14.2% [11.9 - 16.9 95% CI] and 1.5% [0.8 - 2.8 95% CI] respectively (WHO standard).

Table 6: Prevalence of acute malnutrition by age based on weight-for-height z-scores and/or oedema, WHO references

Age groups in months	Total No.	Severe wasting (<-3 z-scores)		Moderate wasting (>= -3 and <-2 z-scores)		Normal (> = -2 z scores)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	188	0	0.0	12	6.4	174	92.6	2	1.1
18-29	207	1	0.5	20	9.7	186	89.9	0	0.0
30-41	241	4	1.7	27	11.2	210	87.1	0	0.0
42-53	165	4	2.4	36	21.8	125	75.8	0	0.0
54-59	56	2	3.6	14	25.0	40	71.4	0	0.0
Total	**857**	**11**	**1.3**	**109**	**12.7**	**735**	**85.8**	**2**	**0.2**

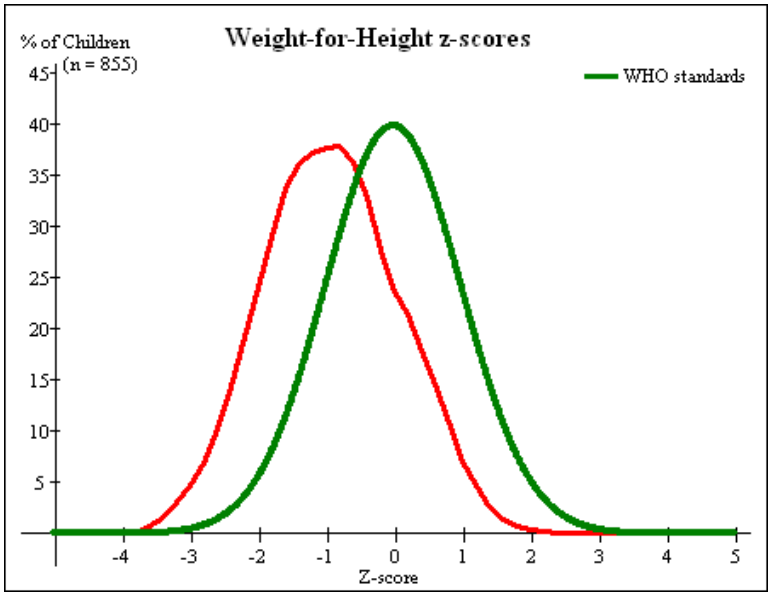
Among the 861 children measured, four children were excluded from analysis using SMART flag as they were found to be out of range. There were two children presenting with bilateral oedema (0.2%). Children who were found with SAM and MAM case during data collection were referred to OTP and SFP centers respectively.

Table 7: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

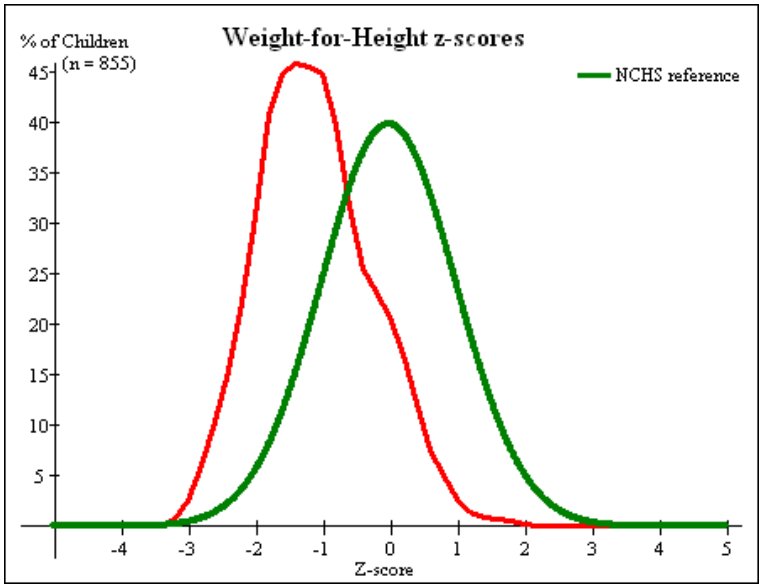
	<-3 z-scores	>=-3 z-scores
Oedema present	Marasmic kwashiorkor No = 0 (0.0 %)	Kwashiorkor No = 2 (0.2 %)
Oedema absent	Marasmic No = 11 (1.3 %)	Not severely malnourished No = 844 (98.5 %)

The figures below show the weight-for-height distribution curve of anthropometric survey result using Z-score for comparison with both the WHO standard and the NCHS reference populations. The curve shifted to the left with mean z-score of -0.93 and standard deviation of 0.98, which exhibits that the surveyed population's nutritional status is very poor as compared to the WHO standard. The standard deviation is within acceptable range. The design effect showed at 1.08, which shows little intra cluster variations. The ENA software plausibility check characterized the survey data as "good" (Annex 9.9).

Graph 3: Weight for Height distribution in Z-score compared to the WHO standard



Graph 4: Weight for Height distribution in Z-score compared to the NCHS references



As pointed out on the table below, the GAM rate both for WHO and NCHS reference is below emergency threshold (15%), while the SAM rate is also below the emergency cut-off points (4%). According to the CDC probability calculator, the surveyed population has 85% probability to reach 13.0% for GAM and 1.1% for SAM in September 2010.

Table 8: Global and Severe Acute Malnutrition in Z-score

	WHO Reference	NCHS Reference	CDC calculator at 85%
Prevalence of global acute malnutrition	14.2 % [11.9 - 16.9]	13.4 % [11.4 - 15.8]	13.0%
Prevalence of severe acute malnutrition	1.5 % [0.8 - 2.8]	0.2 % [0.1 - 0.91]	1.1%

6.4.7. Distribution of Acute Malnutrition in Percentage of the Median, NCHS reference

In the entire sample, the prevalence of GAM and SAM in percentage of median were found to be 6.5 % [4.9 - 8.6 95% CI] and 0.2% [0.1 - 0.9 95% C.I] respectively. The results expressed in percentage of the median are much lower than when expressed in Z-score for both global and severe acute malnutrition.

Table 9: Prevalence of malnutrition by age, based on weight-for-height percentage of the median and oedema

Age group in months	Total No.	Severe wasting (<70%)		Moderate wasting (>=70% and <80%)		Normal (> =80%)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	188	0	0.0	8	4.3	178	94.7	2	1.1
18-29	207	0	0.0	9	4.3	198	95.7	0	0.0
30-41	241	0	0.0	11	4.6	230	95.4	0	0.0
42-53	165	0	0.0	18	10.9	147	89.1	0	0.0
54-59	56	0	0.0	8	14.3	48	85.7	0	0.0
Total	**857**	**0**	**0.0**	**54**	**6.3**	**801**	**93.5**	**2**	**0.2**

6.4.8. Distribution of Middle Upper Arm Circumference

All children measured who had a height >=65 cm were included in the MUAC analysis. As shown in the following table, the rates of acute malnutrition according to the MUAC status of the children were extremely low, with severe acute malnutrition rate of 0.0% and global acute malnutrition rate of 1.4%.

Table 10: MUAC distribution

MUAC in mm	>=65 cm to < 75 cm height		>=75 cm to < 90 cm height		>= 90 cm height		Total	
	N	%	N	%	N	%	N	%
MUAC < 115	0	0.0%	0	0.0%	0	0.0%	0	0.0%
115 = MUAC < 125	6	5.0%	6	1.7%	0	0.0	12	1.4%
125 <= MUAC < 135	24	20.2%	45	12.9%	26	6.8%	95	11.2%
MUAC.>= 135	89	74.8%	298	85.4%	358	93.2%	745	87.4%
Total	**119**	**100.0%**	**349**	**100.0%**	**384**	**100.0%**	**852**	**100.0%**

6.4.9. Mortality

The retrospective mortality rate was calculated based on the data collected using a 90 day recall period. Data was collected from 718 households (13 households per cluster) and summary of the result is presented in table 10.

Crude and under five mortality rate were found to be 2.31 [1.84 – 2.90] and 2.34 [1.49 – 3.67] death per 10,000 respectively, which is above the cut-off points for emergency 2/10,000/day for CMR and below the emergency threshold of 4/10,000/day for U5MR.

Table 11: Crude and Under Five Mortality Rate

Demographic Data	Results
Current resident at household	3,601
Current resident under five in household	850
People who joined the household	376
Under five who joined the household	52
People who left the household during recall period	70
Under five children who left the household during recall period	53
Birth	70
Death	80
Under five death	20
Recall period in days	90
CMR [Death/10,000 people/day]	**2.31 [1.84 - 2.90]**
USMR [death in under five children/10,000/day]	**2.34 [1.49 - 3.67]**

6.4.10. Other Causal Factors

6.4.11. Measles Vaccination Coverage

Table 11 presents the measles vaccination coverage among the 9-59 months children in the surveyed population. The source of information on immunization was either from the child's health card or the mother's recall. Measles immunization is used as proxy indicator for completion of immunization as it is the final vaccination to be taken by children in routine EPI program. Of the sampled population 823 children were aged above 9 months hence were considered for the analysis. The findings are shown in the table below:

Table 12: Measles Vaccination Coverage

Response	N	%
Immunized by card	482	58.6% [55.1 - 61.9]
Immunized by recall	294	35.7% [32.5 - 39.1]
Not immunized	47	5.7% [4.3 - 7.6]
Total population >=9 months	**823**	**100.0%**

If the vaccination without card is real, then the coverage is satisfactory according to the 80% WHO recommended coverage in order to avoid epidemic.

6.4.12. Vitamin A Coverage

Vitamin A coverage was assessed by first describing what a Vitamin A capsule looked like then asking the mother if the child received the content of that capsule in the past one year. The rates of supplementation for the children who had received at least twice which is the target in Kenya, was slightly below 50%. The results are summarized in the table below:

Table 13: Vitamin Coverage

	N	%
Once	257	30.0 % [27.0 - 33.2]
Twice or more	419	48.9% [45.5 - 52.3]
None	181	21.1% [18.5 - 24.0]
Total	**857**	**100.0%**

6.4.13. Breastfeeding and Complementary Feeding Practices

To assess exclusive breastfeeding and timing of complementary food introduction, mothers with children under two years old were interviewed in regard to their breastfeeding practices. 81% of mothers interviewed had initiated breastfeeding within an hour after birth, as recommended by WHO, followed by "Within a day but more than an hour" accounting to 17.1% and less than 2% initiated after one day. In regard to the introduction of complementary food, 47.3 % of mothers interviewed introduced complementary foods less than 4 months, 34.8 % within 4-6 months and only 17.9 % of mothers introduced complementary feeding after six months. Overall, there are good practices in regard to initiation of breastfeeding, though this needs to be strengthened. Exclusive breastfeeding and weaning practices are inadequate and need to be promoted at both health facility and community level.

Table 14: Initiation of breastfeeding and introduction of complementary food (Target group is mothers with child <2 Years)

Initiation of Breastfeeding	N	%
Immediately (within 1 hour)	384	81.0%
More than 1 hour/within a day	81	17.1%
More than a day	9	1.9%
Total	474	100.0
Introduction of Complementary Feeding	N	%
Less than 4 months	224	47.3%
4-6 months	165	34.8%
After 6 months	85	17.9%
Total	**474**	**100.0**

6.4.14. Child Morbidity and Treatment Seeking

This was assessed by asking each caretaker in the households with children less than 5 years, whether any of the children aged less than 5 years was sick in the two weeks prior to the date of the survey date. Overall, 60.7% of children aged < 5years were reported to be sick in the two weeks prior to the survey.

Table 15: Morbidity by type among <5years children who were sick two weeks prior to the survey (382)

Morbidity type	**N**	**%**
Fever, cough, difficulty in breathing	287	75.1%
Fever with chills like malaria	196	51.3%
Others(Ringworms, stomachache ,skin infections)	66	17.3%
Diarrhea	56	14.7%
Vomiting	18	4.7%

Note: due to multiple responses, percentage don't add up to 100%

Mothers with sick children were further asked on the type of sickness. The result indicates that fever with difficulty in breathing (RTI) was the most prevalent illness among the surveyed children (75.1%).

This was followed by fever with chills like malaria (51.3 %), other type of illnesses (such as like ring worms, skin infection, and stomach ache) accounted for 17.3 % and diarrhea (14.7 %).

Caretakers with sick children were further asked whether they sought any treatment service, 80.6% (N=314) reported that they had sought assistance. The distribution of respondents by the type of assistance sought is indicated in Table 15. Most of the households (75.2%), reported to have sought medical assistance from the public clinic, followed by shop/kiosk (17.2%), private clinic or pharmacy (10.6%) and mobile clinic and CHWs accounted for less than 7.7%.

Table 16: Mothers with sick children <5 by type of medical assistance Sought (N=314)

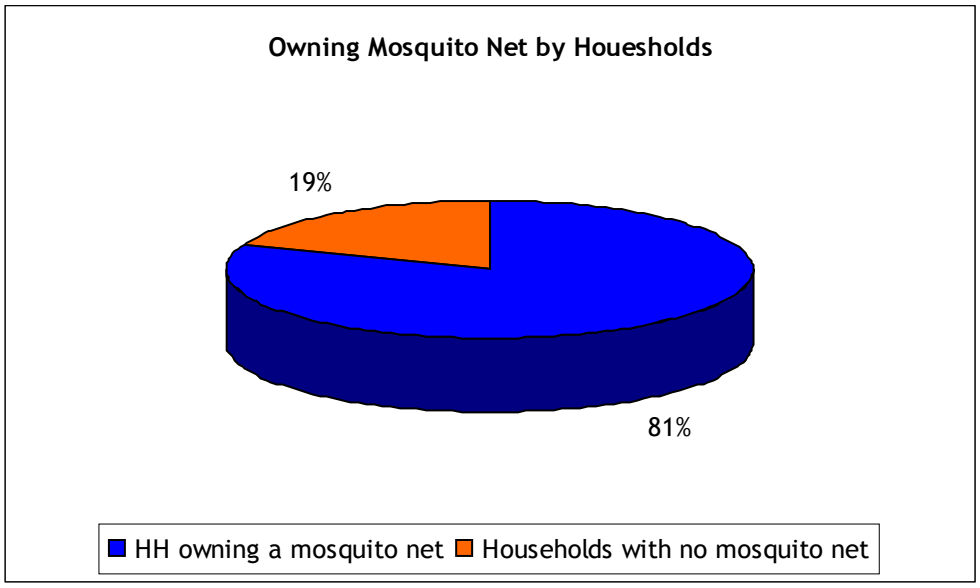
Assistance Sought from	N	%
Public clinic	236	75.2%
Shop/kiosk	54	17.2%
Private clinic/ pharmacy	33	10.6%
Mobile clinic	24	7.7%
CHWs	20	6.4%
Others (NGO/FBO and Traditional healer	9	2.9%

Note: due to multiple responses, percentage don't add to 100%

6.4.15. Mosquito Net Coverage

Out of the 718 interviewed households, 80.9 % (N=581) reported having mosquito nets. Out of the households with mosquito nets, 56.8% (N=408) reported that all the members of the household had slept under a mosquito net the night before the survey date. Almost 43.2% of household members did not use mosquito nets the night before the survey date. This highlights how people that own mosquito nets are not necessarily using them properly and other interventions should be pursued such as environmental activities like destroying mosquitoes breeding sites.

Graph 5: Owning mosquito net by households



6.2 Households' Background Characteristics

A household questionnaire was administered at household level to collect information on food security, livelihoods, water & sanitation and health practices. Market assessment and observations were employed to supplement the data collected via household interview and anthropometric measurement.

The demographic characteristics of households include sex of household head, household size, educational status and major occupation of the household heads. A household was defined as a person or group of persons related or unrelated by blood, residing in the same compound, having one household head and eating from the same pot. The total number of households that were interviewed was 718. According to the sample survey finding, the average household size was 5.14 persons. The data on household heads disaggregated by gender and the finding indicated that 89.7% of the households were headed by men while 10.3% of the households were headed by women.

The educational status of household head indicate that about 51% had never attended school; followed by 28.3% attended primary level, 11.3% secondary school and less than five percent attended above secondary level of education.(See Table 16).

Table 17: Household Background Characteristics

Sex of HHH	N	%
Male	644	89.7
Female	74	10.3
Total	**718**	**100.0%**
Education Level	**N**	**%**
None	366	51.0
Non-formal	35	4.9
Primary	203	28.3
Secondary	81	11.3
Above Secondary	30	4.2
Others	3	0.4
Total	**718**	**100.0%**

6.3 Water Sanitation and Hygiene

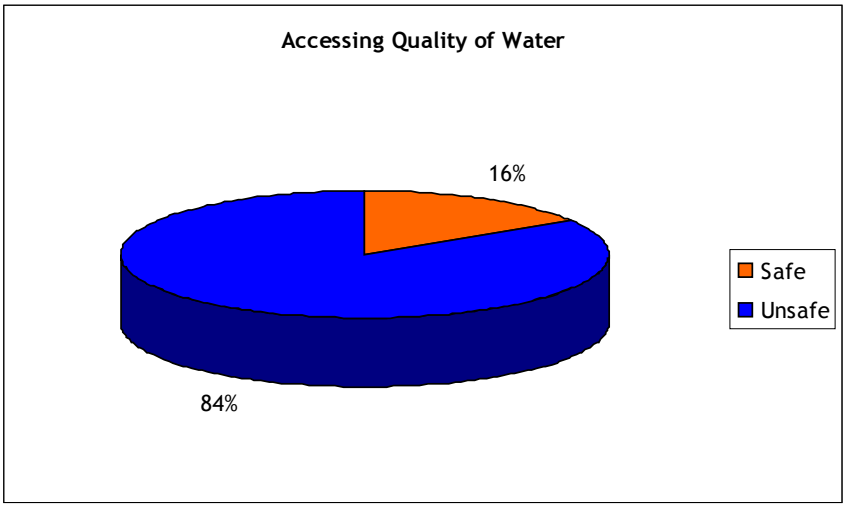
6.4.16. Water Access, Availability, Safety and Use

The majority of the households (84%) use unsafe water from unprotected shallow wells. In the table below a breakdown of the water sources used by the population is given. During the dry season, water availability becomes a major challenge for the population and therefore the percentage of unsafe water that is being used increases. Therefore, also if quality is still a major issue in this area, quantity is often a bigger problem during the dry season.

Table 18: Water accessibility

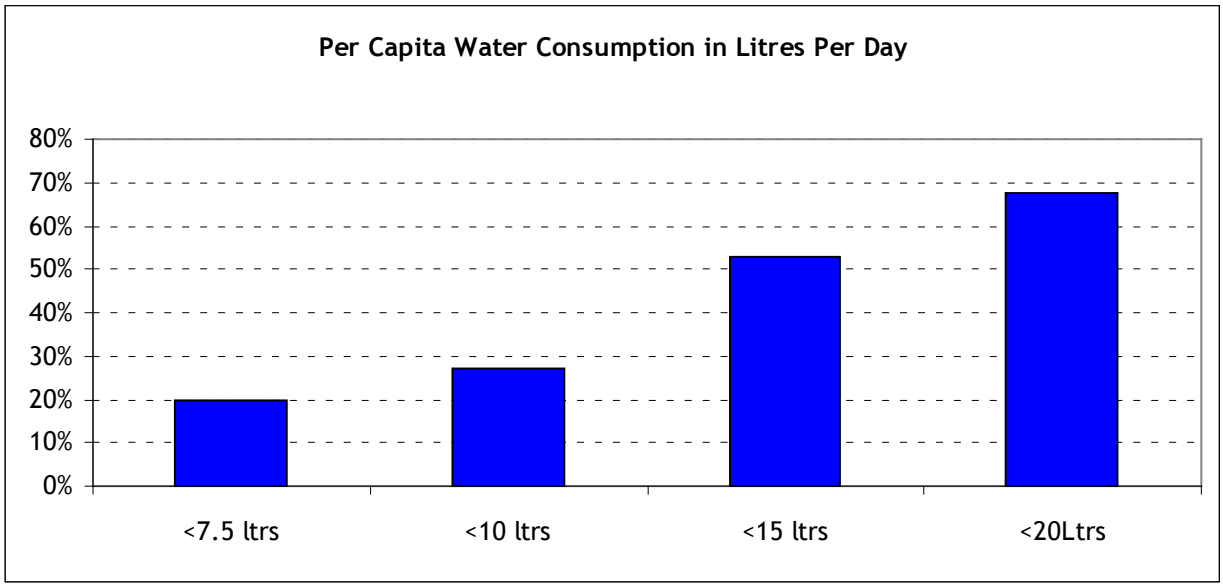
Main sources of Water	N	%
Piped water system from borehole-(Safe)	81	11.3%
Piped water system from spring-_(Safe)	5	0.7%
Unprotected shallow well in a laga or scooping into laga (Unsafe)	25	3.5%
Unprotected shallow well (NOT in laga)-(Unsafe)	396	52.2%
Earth pan –Unsafe source	24	3.3%
Earth pan/dam with infiltration well-(Safe)	29	4.0%
River flowing-(Unsafe)	56	7.8%
Dry river bed /Laga-(Unsafe)	61	8.5%
Other	41	5.7%
Total	**718**	**100.0**

Graph 6: Quality of water accessed



Access to adequate and safe water is an important determinant of nutritional outcome. Accordingly, sample households were required to indicate the daily water consumption at the time of the survey. Taking an average household size of 5 persons, the average daily water use per person per day in liters (for drinking, cooking and washing collectively) at the time of the survey was 15.2 liters [95% CI: 14.50 – 15.91]. That said, it should be noted that almost 19.6% of household use less than 7.5 liters per day which indicates an emergency level threshold, and 52.8% of households do not meet the Sphere Standard indicators of 15 liter per person per day. About 67.7% of households are below the Kenyan national Standard of 20 l/p/d. These findings can be attributed to general scarcity of water with no rains received yet.

Graph 7: Accessed water quantity (Per capita water consumption)



In terms of trekking distance to water point (for one way travel time), about 80% of the population travel for more than 15 minutes to an hour to get drinking water, which is higher than the national coverage of 39% of rural households travel at least 30 minutes to obtain drinking water[6]. Moreover, 17%

[6] 2008/9 Kenyan DHS Report, page 47

of households travel 15 minutes or less and about 3.5% travels more than an hour. These results confirmed by other similar assessment findings such as the environmental related indicators including pasture, browse and water availability were seasonally declining in most parts of pastoral areas including the larger Isiolo district[7].

6.4.17. Water Treatment Practices

Safe drinking water is highly affected on how water is handled at the household level. Sample households were required to indicate if any water treatment practices were employed. About 11.3% sample household reported practicing some type of water treatment with the bulk of the households reporting boiling and chlorination. The majority of the households do not practice any type of water treatment (88.7%). Considering that the majority of the water comes from an unsafe source this means that the majority of the population does drink unsafe water.

Table 19: Water Treatment Practice

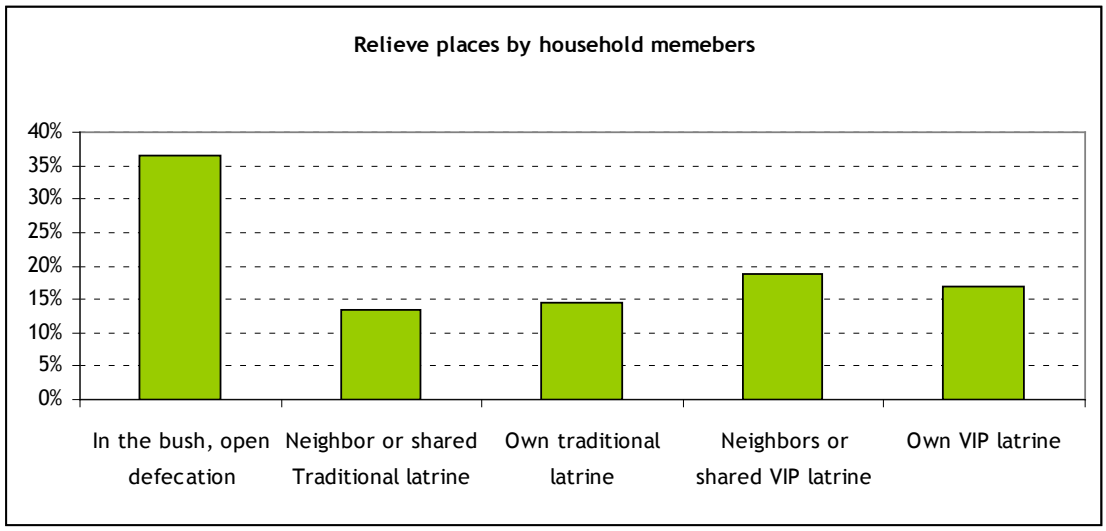
Response	N	%
Nothing	637	88.7%
Boiling	36	5.5%
Chlorination	70	9.7%
Alumni stone	17	2.4%
Silting to settle	21	2.9%
Other (Passing through clothes and use of traditional tree)	16	2.2%

Note; Multiple responses, percentage do not add up to 100%

6.4.18. Latrine Use

Sanitation and hygiene are critical to health, survival, and development. Lack of basic sanitation facilities coupled with the poor hygiene practices and lack of access to improved drinking water sources leave communities vulnerable to diseases. Accordingly, the survey collected data on relieve places, which indicates that more than one-third of households reported defecating in the bush. On the other hand, 18.7% of households used shared VIP latrine, while 16.9% own VIP latrine and 14.5% used their own traditional latrine. It was widely noted that majority of households are sharing latrine with 32.2% relying on their neighbors' latrines.

Graph 8: Relieve places by household member



[7] Kenya Food Security Outlook Update, FEWS.NET Report, September 2010.

Table 20: Type of slabs

Type of slab	N	%
Cement	86	19.4%
Traditional	359	80.6%
Total	**443**	**100.0**

Observations on type of slab (those who own latrines) indicate 80.6% have cement slabs, which is easier to clean.

6.4.19. Hand washing Practices

In order to assess hygiene and sanitation, the survey looked at hand washing practices before and after particular events. Hands washing before eating and after toilet use were the two most reported events, respectively by 97.6% and 95.4% of households, showing very good knowledge of when to wash hands. When asked about use of soap, 24.4% of caretakers reported using soap for hand washing. Promotion of use of soap as an integral component of hygiene promotion, which contributes to improved hygiene and nutritional outcomes.

Graph 9: Distribution of households by hand washing practices (%)

6.4 Food Security and Livelihoods

6.4.20. Main Occupation of Household Head

The two main occupations reported, each accounting for one quarter of the respondents, are livestock herding and daily labor. Small business/petty trade and salaried employment are also significant sources of livelihood. In terms of sex disaggregation, there was a significant gender differences observed in of the main livelihoods system. For example, livestock herding, farming/own farm labor, small business/petty trade, and salary employment, are the main occupations for proportionally far more men than women. Moreover, daily wage labor, petty trade, firewood/charcoal making and mining/gypsum extracting are the main occupations of female headed households, indicating that they may have more difficulties than men in accessing the more reliable and lucrative sources of income.

Table 21: Main occupation of household heads

Main Occupation	Male		Female		Total	
	N	%	N	%	N	%
Livestock herding	167	92.8%	13	7.2%	180	100.0%
Farming/Own farm labor	25	86.2%	4	13.8%	29	100.0%
Small business/petty trade	106	99.2%	24	0.8%	130	100.0%
Salary Employment	123	93.5%	1	6.5%	124	100.0%
Daily labor/wage labor	173	81.5%	12	18.5%	185	100.0%
Firewood/charcoal making	16	66.7%	8	33.3%	24	100.0%
Other (gypsum and mining extracting)	34	73.9%	12	26.1%	46	100.0%
Total	**644**	**89.7%**	**74**	**10.3%**	**718**	100.0%

6.4.21. Livestock Ownership and Milk Production

In Garbatulla district, livestock ownership is a significant indicator of wealth. Livestock is not only a saleable asset, but provides income and food in the form of milk, meat, hides and skins. The survey reveals that 61.7% of the households own livestock; this means that nearly 40% of the households, a significant proportion, do not own any livestock. Goats are the most commonly owned animals, both in terms of the number of households owning (50.4%) and numbers of goats owned. Camel ownership is relatively low, although these animals are the best adapted to dry conditions.

The mean and median numbers owned per household (see table below) incorporate only those households that own livestock. Variations between mean and median ownership, with median ownership generally being notably lower, also demonstrates that there are relatively fewer households with larger herds, with the mean skewed upwards as a result.

Table 22: Average household livestock holding

Livestock	No of HHs	%	Mean No. Owned per HH	Median No. Owned per HH
Cattle	162	22.6%	10	5
Camel	66	9.2%	11	10
Goat	362	50.4%	24	15
Sheep	333	46.4%	15	10
Chicken	223	31.1%	6	5
Donkey	226	31.5%	2	2

21.7 % of households reported that they milked the day before the survey date. With regards to utilization of milk by households, an average of 2.8 liters was sold and 1.7 liters consumed per day. It should be noted that this data relates only to households who own milking livestock; it does not reflect overall milk consumption patterns. Households without livestock rely on purchase and many are likely to consume significantly less milk than indicated for those above.

Table 23: Percentage of households who milked a day before the survey date by livestock type (N=156)

Livestock type milked a day before the survey's date	N	%
Cow	16	10.3%
Camel	37	23.7%
Goat	115	73.7%
Sheep	58	37.2%

Note: due to multiple responses, percentage don't add up to 100%

6.4.22. Sources of food

Households were required to identify and rank their household's sources of food in the 30 days prior to the survey. Sources are ranked from the most to the least important according to each responding household. Among four common sources of food (purchase, own production, food aid, gift) in Garbatulla District, purchase of food continued to be the most important source for the majority of households (51.9%), followed by food aid (40.0%). The table below illustrates the food sources reported by households as the most important.

Table 24: Proportion of Households by Ranking of Food Sources (N=718)

Sources of Food	Ranking (%)			
	1st	2nd	3rd	4th
Purchase	51.9%	30.4%	14.5%	3.2%
Production	7.2%	24.1%	33.7%	35.0%
Food Aid	40.0%	31.2%	22.1%	6.7%
Gift	1.5%	14.1%	29.7%	54.7%

Given the importance of market purchases for household food availability, price changes can have significant impacts on food security. Overall the period from May to September saw price increases for staples: maize flour increased by 63%, dry maize prices by 25%, and milk prices by 20-35%. These changes were also confirmed by the ALRMP monitoring data[8]. Livestock prices remain high, with cattle and camel prices increasing by up to 25% between May and September. The price of sheep and goats fell by 12-14% in the same period, but still remain well above February 2010 prices (see Annex 9.8 for full market price data).

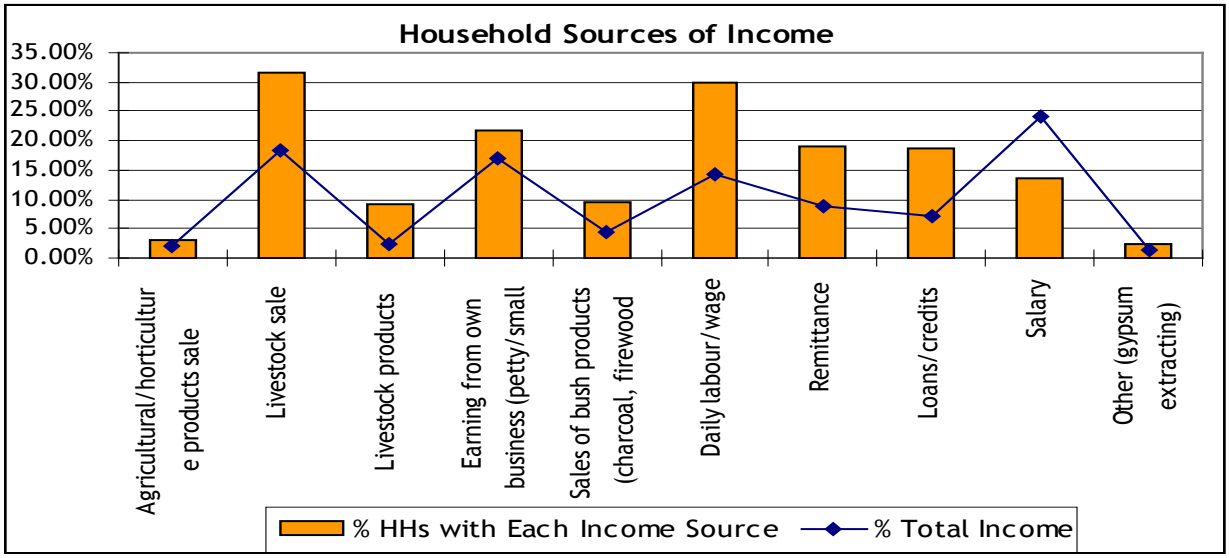
6.4.23. Income Sources

Respondents were asked to indicate their household's income sources in the 30 days preceding the survey date. This reveals some diversity in income sources across the surveyed households, with livestock sales, daily labor and small businesses accounting for largest numbers of households. The graph below represents both the percentage of households with each income source, along with the percentage of the total income to all respondents produced from each respective source. This demonstrates that salaries are the biggest single source of income overall, followed by livestock sales, petty trade/small businesses and daily labor.

The average household income for the reference period was KSH 6400 and median income was KSH 5,000. These calculations also include loans/credits, which would ultimately need to be paid back by the households. Considering the high income from salaried employment which skewed the average income, analysis excluding the households with salaried income results in a mean income of KSH 2949, which is KSH 3451 less than the mean including households with salaried incomes. Overall, taking an average household size of 5 persons, the daily per capita income for the reference period was only KSH 48 per day which is less than half the poverty threshold of 1.25USD (104 KSH).

[8] Drought Bulletin, Isiolo and Garbatulla Districts, page 6, August 2010

Graph 10: Household Sources of Income

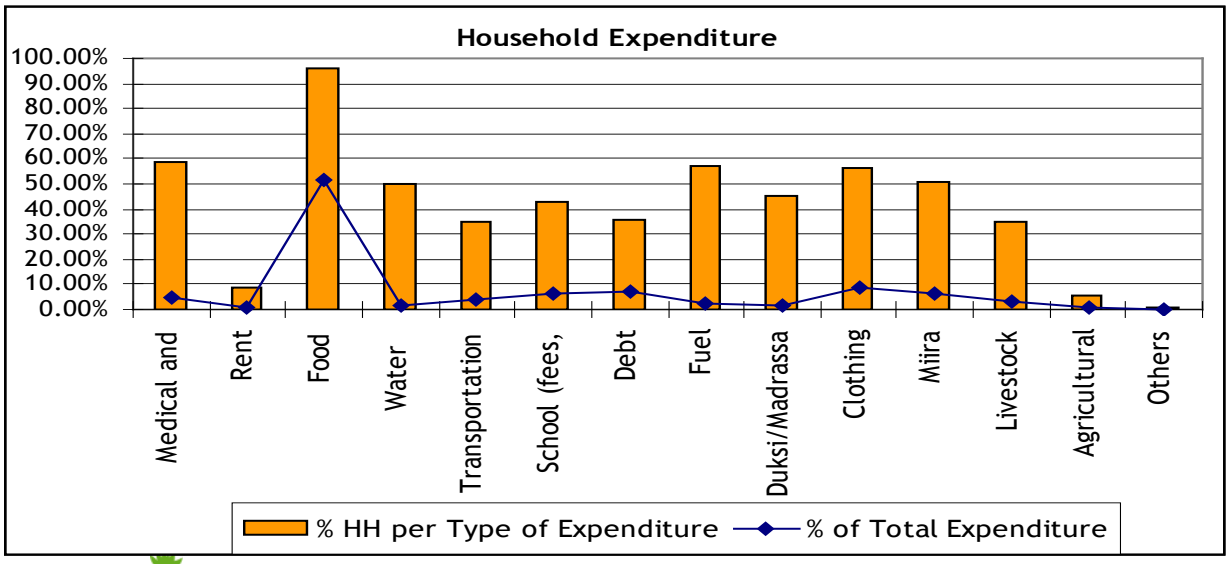


6.4.24. Expenditure

Food is the most significant source of expenditure by some distance; 96% of households spent money on food, accounting for 51.4% of total expenditure across the surveyed households. Medical expenses, water, fuel, clothing and mira were sources of expenditure for at least 50% of the households. However, other than food, each of the other reported types of expense account for relatively small percentages of the total expenditure. This indicates that households in the district are vulnerable to increases in food prices as this would push up food expenditure even further relative to other items. This could potentially undermine household's ability to manage other important costs such as medical fees and education.

Overall, the average monthly expenditure per household was 9132KSH. This is significantly more than the average income of 6400 KSH (see above), indicating some disparity between average cash income and expenditure. Further investigation would be required to determine the extent to which this disparity is reflected at individual households' level, and how gaps between monthly income and expenditure are managed.

Graph 11: Household Expenditure Patterns

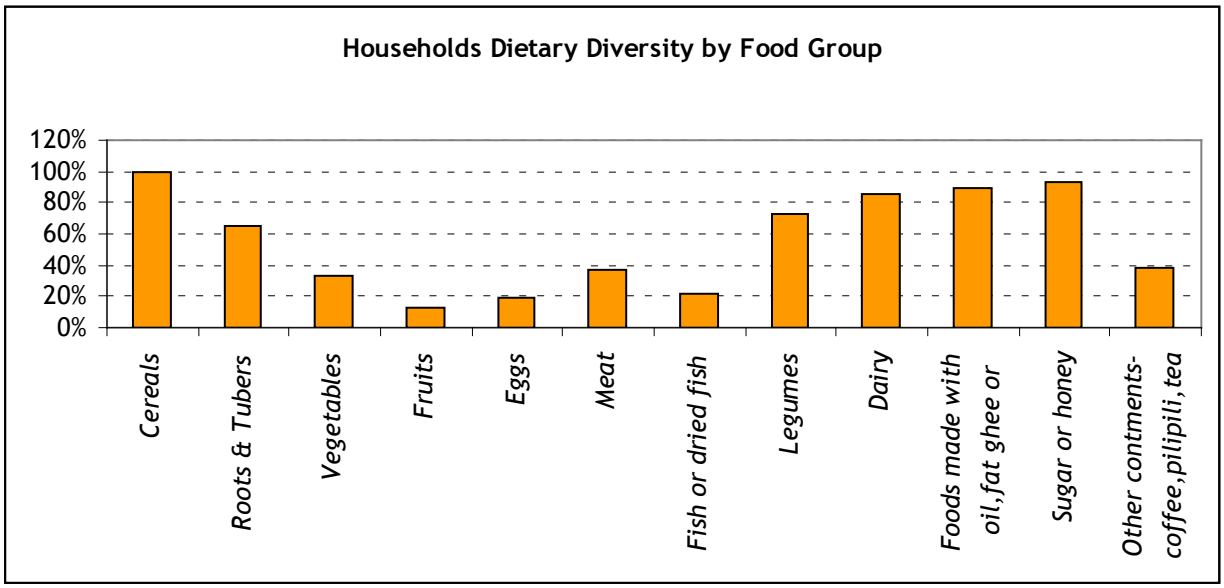


6.4.25. Household Dietary Diversity

Dietary diversity is a measure of household food access and food consumption. It can be triangulated with other food related information to contribute towards providing a holistic picture of the nutrition and food security status in a community or broader location. Improved dietary diversity over time is directly associated with improved economic status of the household. Dietary diversity was measured using the Household Dietary Diversity Score (HDDS), measuring the 12 main food groups consumed in the 24 hours prior to the survey.

The survey result revealed that cereals like ugali, rice and porridge lead in consumption (99.0%), followed by sugar or honey (93.3%), fats (89.8%), dairy (85.4%) and pulses (72.8%).

Graph 12: Household Dietary Diversity by Food Groups, GBT, September 2010



The table below shows the distribution of the households according to HDDS category, revealing that the majority fall within the higher dietary diversity group (6 or more food groups consumed), due to a more consumption of sugar or honey, condiments, dairy and fats. At the same time some nutritionally significant food groups such as vegetables, fruits, eggs, meat and fish continue to be consumed by relatively few of the households.

Table 25: Food Dietary Diversity Group

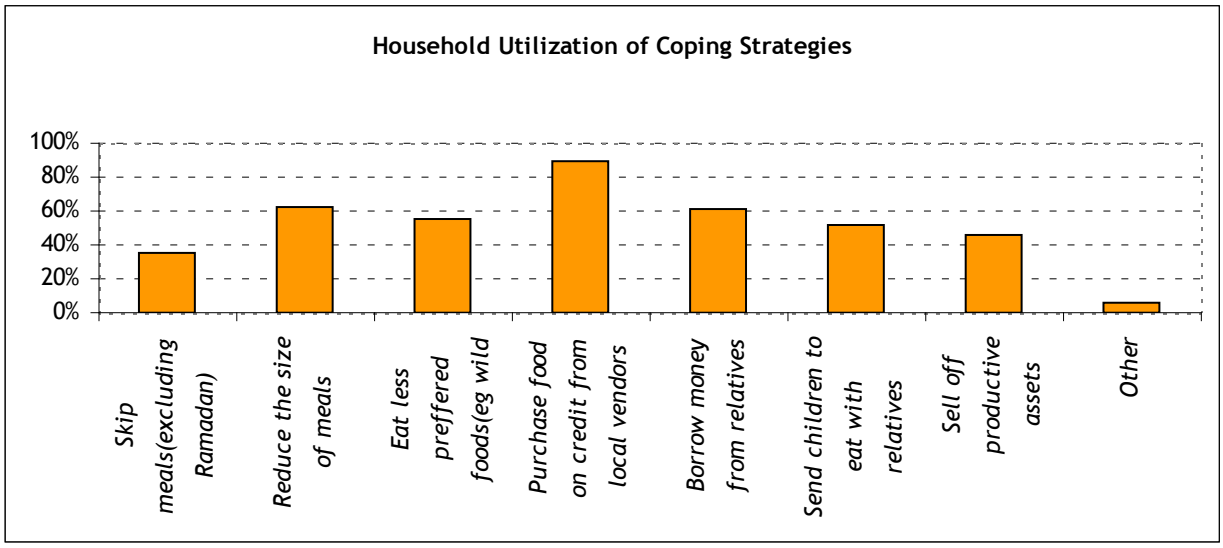
Food Dietary Diversity	N	%
Low Dietary Diversity (= 3 Food Groups)	55	7.7%
Medium Dietary Diversity (4 – 5 Food Groups)	94	13.1%
High Dietary Diversity (6+ Food Groups)	569	79.2%
Total	**718**	**100.0**

6.4.26. Coping Strategies

Households were asked to report which coping strategies they had utilized during the previous thirty days, excluding the Ramadan month; practices during Ramadan would not give a true picture of household status and coping. The results show that various coping strategies were being widely practiced. Nearly 90% of those surveyed reported purchasing food on credit from local vendors. Over 60% of the households also reported reducing meal sizes and borrowing money from relatives, whilst

over 40% had sent children to eat with relatives, eaten less preferred foods or sold productive assets in the previous month.

Graph 13: Household utilization of coping Strategies

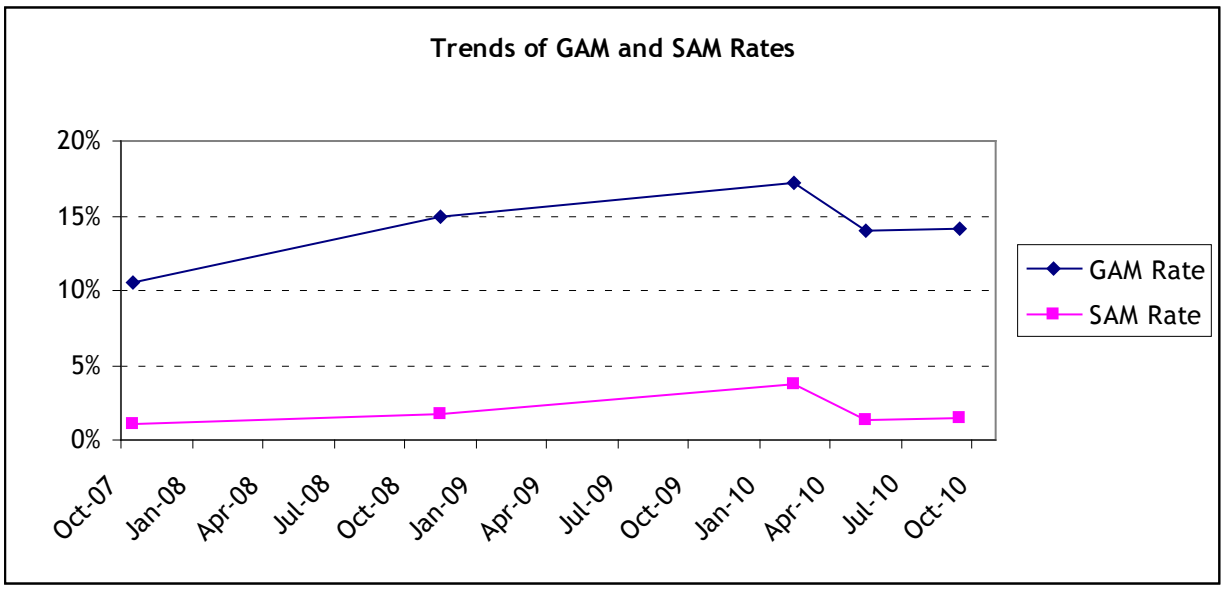


7 DISCUSSION AND CONCLUSIONS

The nutritional assessment provided information on nutritional status specifically on the prevalence of acute malnutrition and on the immediate underlying contributing factors to acute malnutrition.

With WHO Growth Standards 2005, the GAM rate was 14.2% [11.9% - 16.9%]. Although this rate is below the 15% WHO emergency threshold, the prevalence remains between poor and serious, requiring adequate attention.

Graph 14: Trends in GAM and SAM rates in Garbatulla District, 2007-2010[9].



[9] Nutritional Anthropometric and Mortality Survey Report, GBT, Oldonyro and Mert, ACF & UNICEF November 2008.

Analysis of the data and comparison with the past findings in the same area revealed that there was no significant improvement in the overall nutritional status of the population at the time of the survey. Specifically, trend analysis in both GAM and SAM rates for the period from November 2007 to February 2010, show that there was a significant increase in acute malnutrition. This was probably due to poor rains as well as the lack of a nutrition program in the area. However, for the period between February and May 2010, the malnutrition rate has slightly declined due to better rain performance, which contributes to pasture availability and milk production at household level complemented by the general food distribution made through the District Commissioner's office and WFP. Moreover, ACF interventions' on integrated nutrition in Garbatulla district has also significantly contributed towards reducing the acute malnutrition rate. The main activities under this project started in February 2010 and are: building the capacity of MoH health facility staff (skilled and unskilled) on management of acute malnutrition through theoretical and on the job mentoring on IMAM, training of community health volunteers on detection and referral of acutely malnourished beneficiaries, promoting of nutrition education and behavioral change through community health groups and monitoring of the nutrition situation through survey and surveillance activities. So far a total of 741 children under five years of age have benefited from the nutrition program[10].

On the other hand, for the period between May to September 2010, the result shows that there was slight increase in both GAM and SAM rates. This may be related to the dry season. Therefore, the current nutrition situation can be summarized by the following factors:

- Breastfeeding and weaning practices are important determinants of growth and development not only in infancy but also later in life. Poor infant-feeding practices can lead to stunted growth, immune incompetence's and increased risk of infectious diseases. This would lead to increased risk of morbidity and under nutrition. The benefits of breast feeding, especially exclusive breast feeding, has a paramount importance in terms of reducing the risks of pathogen contamination and over dilution of milk. The survey revealed that 81% of the mothers introduced breast feeding immediately after birth as per recommended by the WHO and 17.9% introduced complementary feeding after the recommended six months. Therefore, exclusive and weaning practices are inadequate and need to be promoted at both health facility and community level so as to improve the nutritional status of children under two years of age.
- High rates of morbidity, poor access to health care and child care practices, low level of dietary diversity are some of the main factors contributing to the high rates of acute malnutrition in Garbatulla district. The major childhood illnesses were fever like malaria, respiratory diseases and diarrhea/vomiting. The survey result revealed that almost 61% of children under five years of age had illnesses two weeks preceding the survey date. Among the sick children, respiratory diseases account for 75.1%, followed by malaria 51.3% and other diseases like ringworms, stomach ache 17.3%, while diarrhea and vomiting accounted for 19.4%. Therefore, there is a clear need for an immediate improvement of the health situation of the targeted population in general and children under five in particular.
- Immunization against childhood diseases is known to be one of the most important components to improve children's health and reduce mortality, morbidity and permanent disability among children. Thus, measles coverage is a good indicator for the coverage of complete immunization services. Additionally, Vitamin A supplementation plays an important role in strengthening the body's resistance of the children. The survey result shows that measles vaccination was found to be high (94.3%) as per recommended by WHO and above the National coverage of 85%[11]. However, the vitamin A supplementation coverage of at least once per year was only 30%. More efforts need to be done in order to reach the children in Garbatulla District.
- Majority of the study population access water from unprotected shallow well (not in dry river bed or not-Laga) sources (52.2%) in Garbatulla district. Moreover, only 16% of households access drinking water from safe sources which is far below the National coverage standard of

[10] ACF Nutrition Program Report, Garbatulla District 2010.
[11] The 2008/09 Kenya DHS report.

60%[12]. About 52.8% households reported that their water consumption is below the sphere standards of 15 liters per person per day. Almost 20% of the population in Garbatulla district is living at an emergency level of less than 15 liters per person day and 68% of the population lives with less then 20 liters per day per person which is below the National Standard. About 88.7% of households do not practice any form of water treatment. Lack of basic sanitation facilities coupled with the poor hygiene practices and lack of access to improved drinking water sources leave the communities vulnerable to diseases. Therefore, improved access to safe water and promotion of hygiene and sanitation activities is a main intervention to be implemented in Garbatulla District in order to improve the nutritional and health status of children.

- The survey results show that market purchase is the most important source of food overall, followed by food aid. Food was also shown to be the most significant area of household expenditure, whilst staple food prices had increased over the months prior to the survey. Many households relying on market purchases and with high rates of food expenditure relative to income will be vulnerable to increasing food insecurity if food prices continue to increase. The Kenyan Government has already warned of possible food shortages next year, with La Nina conditions and volatility in global food markets likely to contribute to rising staple and vegetable prices.
- Pastoralists will be especially vulnerable to increasing cereal prices if this coincides with declining livestock prices which are likely to result if predictions of poor rainfall and deteriorating water and pasture availability are borne out. Livestock prices were high at the time of the survey, indicating an optimum time for pastoralists to cash in on their livestock and de-stock to reduce herd sizes. However, it is often the case that pastoralists are reluctant to sell their livestock when health and body condition are good and concomitantly prices are high.
- Levels of food aid distribution in the district are high, with the majority of households receiving assistance. Moreover the significance of food aid as a food source increased from May to September 2010, with 40% of households citing food aid as their main source in September as compared to 10% in May 2010. Continuing targeted food distribution in the short term will likely be necessary in order to address immediate food needs, particular if livelihoods are affected by poor rainfall and concomitant impacts on livestock and crop production. However, in the medium to long term it would be beneficial to reduce dependency on food aid and focus on appropriate livelihoods and disaster risk reduction programming which support the vulnerable to exit the cycle of seasonal hunger and malnutrition.
- The survey results indicate a drop in milk production with 15% fewer households reporting having milked an animal in September as compared to May 2010. Reduced availability of and access to milk is generally associated with deteriorating food and nutrition security in pastoralist areas. Although dietary diversity in the district is at a reasonable level with the majority of households consuming at least 6 food groups, it is notable that consumption of some nutritionally significant foods such as fruits, vegetables, eggs, meat and fish is relatively low.
- The extent to which coping strategies such as purchase on credit, reduction in meal size, borrowing from relatives and selling of productive assets are being utilized indicates that many households in Garbatulla are experiencing increasing food insecurity. This is particularly so given that the percentage of households using coping strategies has increased comparative to May 2010. Increased use of coping strategies, increasing food prices, increasing reliance of food aid and declining milk production are all indicative of a deteriorating food security and livelihoods situation. Poor rainfall over the coming months will require timely responses to prevent further and significant declines in food security, particularly amongst vulnerable households who have already experienced major impacts on their livelihoods during recent droughts.

[12] Ibid: page 45.

8 RECOMMENDATIONS

In order to improve the health, nutrition, water and sanitation and food security status of the population in general and children under five years of age in particular, the following are recommendations based on the survey findings.

Health and Nutrition

- The nutrition treatment activities for both severe and moderately acute malnutrition should be scaled up in Garbatulla district.
- Infant and Young Child feeding promotion campaigns, with emphasis on weaning and complementary feeding practices should be strengthened.
- Nutrition education and sensitization on the importance of more diversified foods should be emphasized so as to address the issue of limited diet diversity. This can be done in collaboration with the ministry of Agriculture and Livestock and other actors providing this services.

Water and Sanitation

- Promotion activities and campaigns focusing on improved and simple water treatment practices and on hygienic practices should be accessible to all households.
- Monitoring the water level on regular basis needs to be carried out as part of early warning system. This will help community in times of water rationing for animals and humans.
- Promotion of increased latrine coverage through subsidy approach on latrine construction while conducting hygiene promotion.
- Since the majority of the population is accessing water from unsafe shallow well sources during the dry season and this being a traditional strategy in the community, protection of shallow well should be promoted to improve water quality.
- During the next period (which will be the rainy season), surveillance of the situation at health facilities level should be given emphasis as there is a likelihood of acute watery diarrhea outbreak with the current hygiene and sanitation practice.

Food Security &Livelihoods

Overall it is recommended that stakeholders should aid and encourage strategic and complimentary interventions to increase food access and availability, support livelihoods and protect vulnerable groups. This includes promoting risk reduction, particularly in relation to drought, through programs to increase stability, resilience and planning at household and community levels. The following section details specific interventions recommended for improved food security and livelihoods in Garbatulla in the short and long term:

- Close monitoring of the food security situation, including:
  - ✓ Price monitoring in the district's major markets, including staple cereal and livestock prices, particularly in relation to the terms of trade (ACF, ALRMP, MoA, MoLD, NGOs)
  - ✓ Monitoring of pasture and water availability and related livestock movements (ACF, ALRMP, MoLD, NGOs)
  - ✓ Monitoring of food availability, access and consumption at the household level, including use of coping strategies (ACF, ALRMP, MoA, NGOs)
  - ✓ Monitoring of household income and expenditure (ACF, ALRMP)
- Support livestock producers and traders to protect pastoralist livelihoods:
  - ✓ Promote herd diversification in order to reduce susceptibility to losses due to drought and disease and depletion of household assets. This includes re-stocking with increased numbers of dry land adapted species such as camels (ACF, MoLD)

- ✓ Provide capital and technical support to and facilitate the formation of livestock producer and trading groups to enable communities to support timely off-take and re-stocking and maintain manageable herd sizes (ACF, MoLD, NGOs, and District Livestock Marketing Committee)
- ✓ Support for livestock marketing through improved market infrastructure and linking livestock producer groups to livestock marketing groups and terminal markets operators (ACF, MoLD, NGOs, Livestock Marketing Committee)
- ✓ Support for local fodder production and storage (ACF, MoLD, MoA, NGOs)
- ✓ Emergency/contingency livestock de-stocking (MoLD)
- ✓ Emergency/contingency fodder provision (MoLD)

> Increase household resilience through livelihoods diversification, increased income generating capacity and improved access to financial support:

- ✓ Provide capital support for income generating activities (groups and individuals) through cash grants and loans (ACF, Banks, Micro-Finance Institutions, NGOs)
- ✓ Support improved access to financial institutions, including loans, savings and credit facilities and facilitate group/community savings and loans structures (as above)
- ✓ Provide technical training for business development (ACF, Banks, GoK, NGOs)
- ✓ Provision of "safety net" cash transfers to high risk groups (GoK, NGOs, Banks)
- ✓ Support rehabilitation of economic infrastructure such as access roads, markets, water points
- ✓ (GoK, ACF, NGOs)

> Increase food availability in the district through improved and expanded crop production:

- ✓ Increase production of staples and vegetables in areas with access to irrigation sources (ACF, MoA, NGOs)
- ✓ Promote water saving and collection methods, including rain water harvesting at household and community levels and drip irrigation (ACF, MoA, MoWI, NGOs)
- ✓ Promote drought-tolerant and locally adapted seed varieties (ACF, MoA, KARI)
- ✓ Provide training in improved agricultural production practices and the use of related appropriate technologies (ACF, MoA, NGOs)
- ✓ Provide information and training on value chains and marketing opportunities to increase the income generating potential of crop production (ACF, MoA)

> Reduce community and household susceptibility to the impacts of hazards through disaster risk management (DRM):

- ✓ Provide training and support for the creation and implementation of community and district DRM and contingency plans (ACF, ALRMP, Red Cross, GoK)
- ✓ Support disaster mitigation activities at community level (ACF, GoK, Red Cross)
- ✓ Integration of DRM in program design and implementation (ACF, GoK, NGOs)

9 ANNEX

9.1. Sample Size and Cluster Determination

Geographical unit	Population size	Cluster
Matagari A	362	
Matagari B	356	
Koropu/Town Center A	359	
Koropu/Town Center B	507	
Talbata/D Deda	304	
Qaba Lahela	525	1
Boji South	235	
Boji North	559	2
Kuro Berata	351	
Tanna	500	3
Banane	1500	4, 5
Demo A	208	
Demo B	208	
Prison	215	
Kiwanjani	442	6, 7
Daawa	305	8, 9
Town	570	
Darer Shai I	870	10, 11
Darer Shai II	50	
Darga	272	
Madokone	657	12, 13
Escort	459	14
Elman	701	15
Derman	769	
Rahole	125	
Sikli	853	16
Basaha	1367	RC
Albati-Bashane	1022	
Bulla Hagar	1136	17, 18, 19
Kambi Samaki	1096	
Gafarsa Mkt 1	156	
Gafarsa Mkt 2	194	20
Gafarsa Mkt 3	296	
Gafarsa Mkt 4	222	
Gafarsa Mkt 5	492	21
Gafarsa Mkt 6	262	22
Gafarsa Mkt 7	268	
Gafarsa Mkt 8	236	
Belgash	300	23
Muchuro South	296	24
Muchuro North	223	
Muchuro North	311	

Geographical unit	Population size	Cluster
Muchuro South	338	25
Damicha	140	26
Bisan Dero	235	
Manyatta Punda	211	27
Shambole	140	
Kuroftu	247	
Mullo	253	
Latta	237	
Qura Qura	476	28
Danaba	250	
Madina	488	
Koticha A	393	29
Koticha B	530	30
Koticha CB	445	31
Koticha CA	249	
Koticha D	286	
Rapsu A	236	
Rapsu B	241	
Rapsu C	285	
Cherab Dicha	491	
Jillo Dima	532	RC, 32
Darajani	438	
Kinna Town	518	33
Gubadida	204	
Bibi	24	
Duse	423	RC, 34
Town/Rahima	240	
Kone Kalo/Bulla Mpya/Rapsu	235	
Korbesa/Thabala	477	
Yaq-Barasadi	395	
Shauri Yako	677	
Bulla Town	581	RC
Taqwa	426	
Bulla Hatawi	478	
Bulla S	385	
Barambate/Bulla Wara	418	35
Girisa Dam	201	
Mado-Shika	70	
Gubatu Kalkacha Hiloble	425	
Biliqi Nuru	544	
Sericho North	1153	36, 37
Sericho South	1072	
Sericho Central	453	38
Modogashe	468	39
Bulla South	97	
Didimtu	304	40
Central A	358	

Geographical unit	Population size	Cluster
Central B	268	
Bulla North A	248	
Bulla North B	335	41, 42
Bulla Juu	306	43, 44
Burkuke	6000	45, 46, 47, 48
Matachamu	100	RC
Malkamasa	262	
Fourty Four	413	49
Siribde	669	50
Lalafto	488	51
Badana	513	52
Hadha	462	
Haradi	331	
Dadachera	391	
Hakoba	634	53, 54
Eldera TC	459	55
Harotu	545	RC
Shariffa	100	
Belgash	390	
Maqiyo	150	
Hadha	191	
Digale	100	
Quri Haroresa	165	56
Warabasa	201	

9.2. Anthropometric Survey Questionnaire

ACF/Kenya Mission: GBT SMART Survey Anthropometric Form (September 2010) 6-59 months old children

1. Identification		Data Collector_____		Team Leader_____		
1.1 Larger District	1.2 Division	1.3 Location	1.4 Sub-location	1.5 Cluster No	1.6 Team Number	1.7 Date

Child no.	HH no.	Sex (F/M)	Age in Months	Weight ##.# kg	Height ###.# cm	Weigh-for-height %	Oedema (Y/N)	MUAC ##.# cm	Measles Vaccination 0= Not immunized 1= Card 2= Mothers verification	In the last one year how many times received Vitamin A	Child in any Nutrition center? 0= No 1= OTP 2= SFP	In the past two weeks did the child suffer from any sickness? 0=No 1= Yes	If yes, which sicknesses			
													Diarrhea 0= No 1= Yes	Fever with chills like malaria 0= No 1= Yes	Fever, cough, difficult breathing 0= No 1= Yes	Other (specify) 0= No 1= Yes
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																

Minimum number of children (6-59 months) required per cluster: 13 children

9.3. Calendar of Events

MONTH	Seasons	2005	2006	2007	2008	2009	2010
JANUARY	BIRRA, HOT AND DRY SEASON		56	44	32	20	8
					Post Election Violence		
FEBRUARY			55	43	31	19	7
MARCH			54	42	30	18 cholera outbreak in Gafarsa	6
APRIL	GAN, LONG RAINS		53 Plan Crash in Marsabit	41 End of Drought	29	17 samburu/Borana conflict	5
MAY			52	40	28	16	4
JUNE	HAGAY, ADOLES, COLD SEASON		51	39	27	15	3
JULY			50	38	26	14	2
AUGUST			49	37	25	13	1 Ramadan, vote of Referendum
SEPTEMBER	BON , DRY SEASON		48	36 Ramadan	24	12	0 id al Firtri 0
OCTOBER	AGAY, SHORT RAINS	59	47 Ramadan	35 IDDul-Fitr, start of heavy rains	23	11	
NOVEMBER		58 Ramadan	46 IDDUL-Fitr& Referendum	34	22 Obama elected	10	
DECEMBER		57	45 Start of Severe Drought	33 General Election	21	9	

9.4. Household Mortality data form (One sheet per Household)

Village:_____Cluster number:_____HH number:_____Date:_____Team number:____

	1	2	3	4	5	6	7
ID	HH member	Present now	Present at beginning of recall (include those not present now and indicate which members were not present at the start of the recall period)	Sex	Date of birth/or age in years	Born during recall period?	Died during the recall period
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Tally (these data are entered into Nutrisurvey for each household):

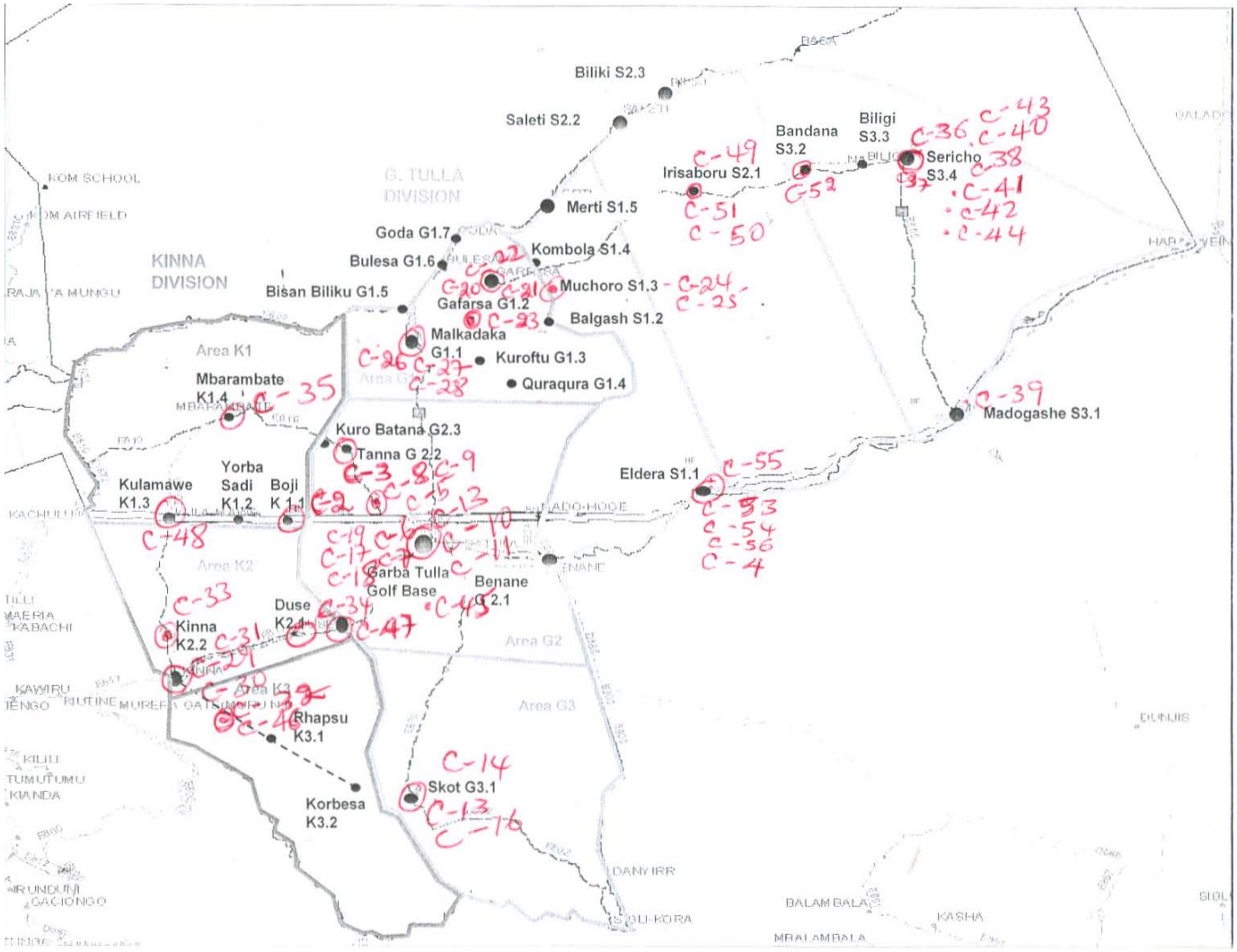
Current HH members – total		
Current HH members - < 5		
Current HH members who arrived during recall (exclude births)		
Current HH members who arrived during recall - <5		
Past HH members who left during recall (exclude deaths)		
Past HH members who left during recall - < 5		
Births during recall		
Total deaths		
Deaths < 5		

9.5. Household Mortality data form (One sheet per Cluster)

Village: _____ Date: _____ Cluster number: _____ Team number: _____

HH No.	Total people in HH	Total under 5 in HH	Join HH		Leave HH		No. of births since START DATE	Deaths since START DATE	
			Total	Under 5	Total	Under 5		Total	Under 5
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

9.6. Map of Study Areas in Garbatulla District



9.7. Household questionnaire

1. Identification Data Collector_____ Team Leader_____							
1.1 Larger District	1.2 Division	1.3 Location	1.4 Sub-location	1.5 Cluster No	1.6 HH No	1.7 Team Number	1.8 Date

2. Household Structure

2.1 Sex of household head
1. Male |____|
2. Female

2.2 What is the main occupation of the household head
1. Livestock herding |____|
2. Farmer/own farm labor
3. Employed (salaried)
4. Daily labor/Wage labor
5. Small business/Petty trade
6. Firewood/charcoal
7. Other (Specify _____

2.3 How many household members are currently present
1. Male |____|
2. Female |_____|

2.4 Highest educational status of the household head
1. None |____|
2. Non formal
3. Primary Level
4. Secondary Level
5. Above Secondary
6. Other (Specify)

3. Child Health and Nutrition (Children 0-59 months of age) –the mother/caretaker should be asked for this section

3.1 Does the household have children 0-59 months old?
0. No (if No, skip to section 4) |____|
1. Yes

3.2 Did any of your children 0-59 months old have had sickness during the past 2 weeks?
0. No |____|
1. Yes (If No, skip to Question # 3.6)

3.3 If yes to question 3.2 what type of sicknesses during the past 2 weeks (Multiple response possible)?

1. Diarrhea |____|
2. Vomiting |____|
3. Fever with chills like malaria |____|
4. Fever, cough, difficult in breathing |____|
5. Other (specify)_____ |____|

3.4 When the child was sick did you seek assistance?

0. No (If No, skip to question # 3.6) |____|
1. Yes

3.5 If the response is yes to question # 3.4 where did you seek (More than one response possible- Use 0 if no and 1 if yes)

1. Traditional healer |____|
2. Community health worker |____|
3. Private clinic/ pharmacy |____|
4. Shop/kiosk |____|
5. Public clinic |____|
6. Mobile clinic |____|
7. Relative or friend |____|
8. Local herbs |____|
9. NGO/FBO |____|

3.6 In the last 24 hours did the child (ren) who is < 5 years and is not breastfeeding receive milk?

0. No |____|
1. Yes

3.7 Ask Questions 3.7 & 3.8 if there is child <2 years in the household (otherwise skip to section 4).
When did you begin breastfeeding the youngest child after birth?

1. Less than one hour
2. More than one hour but within 24 hours |____|
3. More than one day

3.8 At what age in MONTHS did the youngest child receive food other than breast milk? (Foods includes other milk, water, fruit, juices, artificial drinks, sugar water solutions, porridge, etc.)

1. Less than 4 months |____|
2. Between 4-6 months
3. After 6 months

4. Water, Sanitation and Hygiene (WASH)/- Ask the mother/care taker

4.1 From where did you collect water for your household TODAY?

1. Piped water system from borehole |____|
2. Piped water system from spring

3. Unprotected shallow well in a laga or scooping into laga
4. Unprotected shallow well (NOT in laga), un-constructed or constructed but OPEN with no working hand pump
5. Protected shallow well with a working hand pump
6. Earth pan/dam
7. Earth pan/dam with infiltration well
8. Roof rain catchments
9. Underground tank or birkad filled by rain (Rural)
10. River, flowing
11. Water trucking to birkad or tank
12. Water seller, donkey cart or other seller
13. Other (specify)__

4.2 How long does it take to walk to the main source of water (one way in minutes) NOW?

1. 15 minutes or less (less than 500m) |____|
2. Greater than 15 minutes to 1 hour (more than 500m – 2 km)
3. More than one hour (more than 2 km)

4.3 What is (are) done now to the water before household members drink the water NOW? (MULTIPLE RESPONSES POSSIBLE- Use 0 if no and 1 if yes)

1. Nothing |____|
2. Boiling |____|
3. Alum stone |____|
4. Chlorination |____|
5. Abarmog (traditional tree) |____|
6. Sitting to settle |____|
7. Passing through cloth |____|
8. Other (specify_____) |____|

4.4 How much water did your household use YESTERDAY (excluding for animals)?
(Ask the question in the number of 20 liter Jerican and convert to liters & write down the total quantity used in liters) |_____|

4.5 When do you wash your hands? (MULTIPLE RESPONSE- Use 0 if no and 1 if yes)

1. Does not wash hands |____|
2. Does not wash hands at any special time, when they are dirty. |____|
3. Before latrine, and other times not relevant specify… |____|
4. After toilet |____|
5. Before cooking |____|
6. Before eating |____|
7. Before breastfeeding |____|
8. After taking children to the toilet |____|
9. After handling animals |____|

4.6 If the mother washes her hands, then probe: What do you use to wash your hands?
1. Only water
2. Soap
3. Soap when I can afford it |____|
4. Ashes

4.7 Where do members of your household relieve themselves?
1. In the bushes, open defecation |____|
2. Neighbor or shared traditional pit latrine
3. Own traditional pit latrine
4. Neighbors or shared ventilated improved pit latrine
5. Own ventilated improved pit latrine

4.8 If latrine used, is it clean (by observing for example whether feces present on the slab or round latrine)?
0. No |____|
1. Yes
2. Refused the request for observation

4.9 If latrine used, type of slab
1. Traditional slab with wood or wood covered in clay or other material |____|
2. Cement slab

4.10 Does this household have a mosquito net?
0. No |____|
1. Yes (if No, skip to section 5)

4.11 If the household owns mosquito net, who slept under the mosquito net last night? (Probe-enter all responses mentioned Use 0 if no and 1 if yes)
1. Children <5 years old |____|
2. Children between 5 and 18 years old. |____|
3. Adult females. |____|
4. Adult males |____|
5. Every body |____|
6. Nobody uses |____|

5. Livestock Ownership & Crop Production

5.1 Does the household currently own livestock?
0. Yes |____|
1. No (if No, skip to question #5.5)

5.2 If yes, how many?
1. Cattle |____|
2. Camels |____|
3. Goats |____|
4. Sheep |____|
5. Chickens |____|
6. Donkeys |____|

5.3 Did the household milk any animal yesterday?

0. Yes |____|
1. No

5.4 Which animal(s) was milked?
1. Cow |____|
2. Camel |____|
3. Goat |____|
4. Sheep |____|

5.5 If yes what was the total amount milk produced?
(ask in cups and covert it into liters) _____liters

5.6 How many liters of the milk was:
1. Consumed by the household? |_____|
2. Sold? |_____|

5.7 What is the average distance you have had to travel to access pasture or forage for your livestock during the last 30 days (in KM)?
|_____|

5.8 Is the household engaged in farming?
1. Yes |__ __|
2. No (if No, skip to section 6)

5.9 If YES, how much land did you cultivate during the last main cropping season in ACRES?
|____ |

5.10 Was your crop production (mark 0 for No and 1 for Yes):
1. Rain fed |_____|
2. Irrigated (riverine/earth pan etc) |_____|

5.11 Which types of staple and leguminous crops were planted in the last main cropping season and production in KILOGRAMS?
1. Maize |_____|
2. Beans |_____|
3. Sorghum |_____|
4. Sesame/simsim |_____|
5. Millet |_____|
6. Others (Specify) |_____|

5.12 Which types of vegetable and fruit crops were planted in the last cropping season and production in KILOGRAMS?

1. Tomato |_____|
2. Onion |_____|
3. Sukumawiki |_____|
4. Cabbage |_____|
5. Banana |_____|
6. Pawpaw |_____|
7. Mango |_____|
8. Watermelon |_____|

9. Orange |_____|
10. Others (specify) |_____|
|_____|

6. Dietary Diversity, Food Sources and Coping Strategies

6.1 Did the household eat the following yesterday during the day or night? (place a 1 beside the food if someone consumed it and zero if no one did)

1. Any Ugali, pasta, rice, bread, or any food made from maize, sorghum, millet, wheat? |____|
2. Any potatoes, yams, beets or other foods from roots or tubers? |____|
3. Any vegetables? |____|
4. Any fruits? |____|
5. Any eggs? |____|
6. Any meats (camel, cattle, chicken, poultry/fowl, sheep, lamb, and organ meats (heart, liver, kidney, etc)? |____|
7. Any fish or dried fish? |____|
8. Any foods made from beans, peas, lentils, or nuts? |____|
9. Any milk, yogurt, cheese, or other milk product? |____|
10. Any foods made with oil, fat, ghee, or butter? |____|
11. Any sugar or honey? |____|
12. Any other condiments (coffee, pilipili, tea)?

6.2 Rate the importance of each food source to your household food consumption in the last 30 days (Rank from most important to least important, use codes 1= 1st or most important, 2= 2nd important, 3= 3rd important, 4= 4th or least important

1. Purchase |____|
2. Own Production |____|
3. Food Aid |____|
4. Gift |____|

6.3 In the last 30 days has household members done any one of the following? (Use 1 if done and 0 if not done)

1. Skip meals (excluding Ramadan) |____|
2. Reduce the size of meals |____|
3. Eat less preferred foods (e.g. wild foods etc.) |____|
4. Purchase food on credit from local vendors |____|
5. Borrow money from relatives |____|
6. Send children to eat with relatives |____|
7. Sell off productive assets (selling livestock, farming tools, donkey cart etc.) |____|
8. Other (specify) |____|

7. Income Sources and Expenditure

7.1 What was the household's income in the last 30 days (amount in KSH)?

1. Agricultural / Horticulture products sale |_____|
2. Livestock sales |_____|
3. Livestock products sale (milk, eggs, honey, hide, skin etc) |_____|

4. Earning from own business (petty/small scale trading) |_____|
5. Sale of bush products (charcoal, firewood, etc.) |_____|
6. Daily labour/wage |_____|
7. Remittances from family/relatives |_____|
8. Loans /credit |_____|
9. Salary |_____|
10. Other (Specify)_____ _____

7.2 What was the household's expenditure in the last 30 days (amount in KSH)?

1. Medical and health (service fees, medicine, etc.) |_____|
2. Rent (house or land) |_____|
3. Food |_____|
4. Water |_____|
5. Transportation |_____|
6. School (fees, books, uniform, etc.) |_____|
7. Debt repayments |_____|
8. Fuel |_____|
9. Duksi/Madrassa fee |_____|
10. Clothing |_____|
11. Miraa |_____|
12. Livestock medication |_____|
13. Agricultural inputs |_____|
14. Other (specify)_____

9.8. Market Assessment Data

	Market Assessment					
	Months➔	**Feb-10**	**May-10**	**Sep-10**	**Price change**	
Locations	**Description of Food Items**	**Unit prices/KG/Ltr**	**Unit prices/KG/Ltr**	**Unit prices/KG/Ltr**	**Absolute Diifrence**	**% change**
Kulamawe	Maize dry	30	25	31	6.0	24%
	Maize flour	50	30	49	19.0	63%
	Rice	60	70	68	-2.0	-3%
	Wheel flour	80	70	68	-2.0	-3%
	Beans	80	100	76	-24.0	-24%
	Potatoes	80	70	56	-14.0	-20%
	Sugar	100	100	96	-4.0	-4%
	Cooking Oil/Fat	180	105	135	30.2	29%
	Cow milk	40	40	52	12.0	30%
	Camel Milk	40	40	48	8.0	20%
	Goat Milk	40	40	54	13.6	34%
	Camel Meat	170	180	158	-22.0	-12%
	Cattle Meat/Beef	170	200	180	-20.0	-10%
	Water (20 ltrs)	1	2	2	-0.4	-20%
	Market Prices					
	Cattle Male-3yrs old	7000	18,000	19400	1400.0	8%
	Cattle Female-3yrs old	8000	20,000	22800	2800.0	14%
	Camel Male-4 yrs old	10000	30,000	37600	7600.0	25%
	Camel Female-4yrs old	18000	40,000	34000	-6000.0	-15%
	Matured Goat	2500	4500	3960	-540.0	-12%
	Matured Sheep	1500	3500	3000	-500.0	-14%

9.9. Plausibility report

check for: KEN_070910_ACF_Garabtulla SEPT 2010 by MS.as

Standard/Reference used for z-score calculation: WHO standards 2006
(If it is not mentioned, flagged data is included in the evaluation. Some parts of this plausibility report are more for advanced users and can be skipped for a standard evaluation)

Overall data quality

Criteria	Flags*	Unit	Good	Accept	Poor	Unacceptable	Score
Missing/Flagged data	Incl	%	0-2.5	>2.5-5.0	>5.0-10	>10	
(% of in-range subjects)			0	5	10	20	0 (0.0 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	2 (p=0.070)
Overall Age distrib	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	10 (p=0.000)
Dig pref score - weight	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	0 (5)
Dig pref score - height	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	2 (7)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	0 (0.98)
Skewness WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	0 (0.09)
Kurtosis WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	0 (-0.36)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	0 (p=0.216)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-5	5-10	10-15	>15	14 %

At the moment the overall score of this survey is 14 %, this is poor.

There were no duplicate entries detected.

Anthropometric Indices likely to be in error (-3 to 3 for WHZ, -3 to 3 for HAZ, -3 to 3 for WAZ, from observed mean - chosen in Options panel - these values will be flagged and should be excluded from analysis):

Percentage of values flagged with SMART flags:WHZ: 0.0 %, HAZ: 0.0 %, WAZ: 0.0 %

Age distribution:

Month 6 : ############
Month 7 : ########
Month 8 : ##############
Month 9 : ##############
Month 10 : ########
Month 11 : #############
Month 12 : ##################
Month 13 : ##################
Month 14 : ###################
Month 15 : ##################
Month 16 : ##############
Month 17 : ###############################
Month 18 : ##################
Month 19 : #################
Month 20 : ################
Month 21 : #############
Month 22 : ##########
Month 23 : #############
Month 24 : ################################
Month 25 : ###################
Month 26 : ##################
Month 27 : ###########
Month 28 : ###############

Month 29 : ######################
Month 30 : ##################################
Month 31 : ###############
Month 32 : ################
Month 33 : ##########
Month 34 : ###############
Month 35 : ###################
Month 36 : ############################
Month 37 : ################
Month 38 : ##########################
Month 39 : ##################
Month 40 : ####################
Month 41 : ####################
Month 42 : ###############
Month 43 : ########
Month 44 : ################
Month 45 : ##############
Month 46 : ############
Month 47 : ##########
Month 48 : ########################
Month 49 : ################
Month 50 : #######
Month 51 : ############
Month 52 : ##############
Month 53 : ###############
Month 54 : ############
Month 55 : ####
Month 56 : ##########
Month 57 : ########
Month 58 : ############
Month 59 : ########

Age ratio of 6-29 months to 30-59 months: 0.85 (The value should be around 1.0).

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

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	92/105.6 (0.9)	96/93.3 (1.0)	188/198.8 (0.9)	0.96
18 to 29	12	117/102.9 (1.1)	90/90.9 (1.0)	207/193.9 (1.1)	1.30
30 to 41	12	128/99.8 (1.3)	113/88.1 (1.3)	241/187.9 (1.3)	1.13
42 to 53	12	90/98.2 (0.9)	75/86.7 (0.9)	165/184.9 (0.9)	1.20
54 to 59	6	28/48.6 (0.6)	28/42.9 (0.7)	56/91.5 (0.6)	1.00
6 to 59	54	455/428.5 (1.1)	402/428.5 (0.9)		1.13

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

Overall sex ratio: p = 0.070 (boys and girls equally represented)
Overall age distribution: p = 0.000 (significant difference)
Overall age distribution for boys: p = 0.000 (significant difference)
Overall age distribution for girls: p = 0.008 (significant difference)
Overall sex/age distribution: p = 0.000 (significant difference)

Digit preference Weight:

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

Digit Preference Score: 5 (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Digit preference Height:

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

Digit Preference Score: 7 (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

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

.	no exclusion	exclusion from reference mean (EPI Info 6 flags)	exclusion from observed mean (SMART flags)	
WHZ				
Standard Deviation SD:	0.98	0.98	0.98	
(The SD should be between 0.8 and 1.2)				
Prevalence (< -2)				
observed:				
calculated with current SD:				
calculated with a SD of 1:				
HAZ				
Standard Deviation SD:	1.07	1.07	1.07	
(The SD should be between 0.8 and 1.2)				
Prevalence (< -2)				
observed:	14.8%	14.8%	14.8%	
calculated with current SD:	14.9%	14.9%	14.9%	
calculated with a SD of 1:	13.4%	13.4%	13.4%	
WAZ				
Standard Deviation SD:	0.92	0.92	0.92	
(The SD should be between 0.8 and 1.2)				
Prevalence (< -2)				
observed:				
calculated with current SD:				
calculated with a SD of 1:				

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

WHZ	p= 0.083	p= 0.083	p= 0.083
HAZ	p= 0.145	p= 0.145	p= 0.145
WAZ	p= 0.229	p= 0.229	p= 0.229

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

Skewness

WHZ	0.09	0.09	0.09
HAZ	0.09	0.09	0.09
WAZ	-0.03	-0.03	-0.03

If the value is:
-below minus 2 there is a relative excess of wasted/stunted/underweight subjects in the sample
-between minus 2 and minus 1, there may be a relative excess of wasted/stunted/underweight subjects in the sample.
-between minus 1 and plus 1, the distribution can be considered as symmetrical.
-between 1 and 2, there may be an excess of obese/tall/overweight subjects in the sample.
-above 2, there is an excess of obese/tall/overweight subjects in the sample

Kurtosis

WHZ	-0.36	-0.36	-0.36
HAZ	-0.02	-0.02	-0.02
WAZ	-0.23	-0.23	-0.23

(Kurtosis characterizes the relative peakedness or flatness compared with the normal distribution, positive kurtosis indicates a relatively peaked distribution, negative kurtosis indicates a relatively flat distribution)

If the value is:
-above 2 it indicates a problem. There might have been a problem with data collection or sampling.
-between 1 and 2, the data may be affected with a problem.
-less than an absolute value of 1 the distribution can be considered as normal.

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

WHZ < -2: ID=1.14 (p=0.216)
WHZ < -3: ID=1.19 (p=0.160)
Oedema: ID=0.98 (p=0.513)
GAM: ID=1.12 (p=0.252)
SAM: ID=1.25 (p=0.099)
HAZ < -2: ID=1.43 (p=0.019)
HAZ < -3: ID=1.13 (p=0.235)
WAZ < -2: ID=1.47 (p=0.013)
WAZ < -3: ID=0.85 (p=0.770)

Subjects with SMART flags are excluded from this analysis.

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

Are the data of the same quality at the beginning and the end of the clusters?
Evaluation of the SD for WHZ depending upon the order the cases are measured within each cluster (if one cluster per day is measured then this will be related to the time of the day the measurement is made).

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 0.96 (n=56, f=0) #######
02: 1.01 (n=56, f=0) #########
03: 0.93 (n=56, f=0) ######
04: 0.96 (n=55, f=0) #######
05: 1.01 (n=56, f=0) #########
06: 1.05 (n=56, f=0) ##########
07: 0.84 (n=56, f=0) ##
08: 1.01 (n=56, f=0) #########
09: 1.02 (n=56, f=0) #########
10: 1.03 (n=55, f=0) ##########
11: 0.97 (n=55, f=0) #######
12: 1.03 (n=55, f=0) ##########
13: 0.82 (n=55, f=0) #
14: 1.00 (n=46, f=0) ########
15: 0.93 (n=36, f=0) #####
16: 1.02 (n=22, f=0) OOOOOOOOO
17: 1.12 (n=14, f=0) ~~~~~~~~~~~~~
18: 0.62 (n=06, f=0)
19: 0.73 (n=03, f=0)

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

Team	1	2	3	4	5
Percentage of values flagged with SMART flags:					
WHZ:	0.6	0.0	0.0	0.0	0.6
HAZ:	0.0	0.0	0.0	0.0	0.0
WAZ:	0.6	0.0	0.0	0.0	0.6
Age ratio of 6-29 months to 30-59 months:					
	1.00	0.89	0.61	0.98	0.83
Sex ratio (male/female):					
	1.17	1.24	1.08	1.00	1.20
Digit preference Weight (%):					

.0 :	8	10	10	13	7	
.1 :	10	9	12	9	11	
.2 :	7	10	12	10	9	
.3 :	9	11	10	9	13	
.4 :	13	9	8	10	13	
.5 :	11	12	10	12	12	
.6 :	6	5	7	5	11	
.7 :	10	11	10	14	9	
.8 :	11	11	10	4	8	
.9 :	14	13	10	15	7	
DPS:	8	7	5	11	7	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference Height (%):						
.0 :	6	14	3	15	13	
.1 :	16	15	12	8	15	
.2 :	11	11	13	9	8	
.3 :	11	8	11	18	10	
.4 :	10	10	10	8	7	
.5 :	13	4	12	11	7	
.6 :	13	16	8	7	13	
.7 :	7	4	12	11	7	
.8 :	5	7	7	4	5	
.9 :	8	12	11	8	15	
DPS:	11	14	10	13	12	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Standard deviation of WHZ:						
SD	0.90	0.98	0.95	1.06	0.97	
Prevalence (< -2) observed:						
%				19.0		
Prevalence (< -2) calculated with current SD:						
%				15.4		
Prevalence (< -2) calculated with a SD of 1:						
%				14.0		
Standard deviation of HAZ:						
SD	1.05	1.09	0.99	1.07	1.08	
observed:						
%	22.2	13.7		11.4	15.2	
calculated with current SD:						
%	21.8	15.3		11.5	16.3	
calculated with a SD of 1:						
%	20.8	13.1		9.9	14.5	

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

Team 1:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	27/22.0 (1.2)	17/18.8 (0.9)	44/40.8 (1.1)	1.59
18 to 29	12	25/21.5 (1.2)	19/18.3 (1.0)	44/39.8 (1.1)	1.32
30 to 41	12	20/20.8 (1.0)	26/17.8 (1.5)	46/38.6 (1.2)	0.77
42 to 53	12	17/20.5 (0.8)	15/17.5 (0.9)	32/38.0 (0.8)	1.13
54 to 59	6	6/10.1 (0.6)	4/8.6 (0.5)	10/18.8 (0.5)	1.50
6 to 59	54	95/88.0 (1.1)	81/88.0 (0.9)		1.17

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

Overall sex ratio: p = 0.291 (boys and girls equally represented)
Overall age distribution: p = 0.128 (as expected)
Overall age distribution for boys: p = 0.405 (as expected)
Overall age distribution for girls: p = 0.143 (as expected)
Overall sex/age distribution: p = 0.019 (significant difference)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	19/21.6 (0.9)	17/17.4 (1.0)	36/39.0 (0.9)	1.12

18 to 29	12	24/21.0 (1.1)	19/17.0 (1.1)	43/38.0 (1.1)	1.26
30 to 41	12	26/20.4 (1.3)	21/16.4 (1.3)	47/36.8 (1.3)	1.24
42 to 53	12	18/20.1 (0.9)	13/16.2 (0.8)	31/36.3 (0.9)	1.38
54 to 59	6	6/9.9 (0.6)	5/8.0 (0.6)	11/17.9 (0.6)	1.20
6 to 59	54	93/84.0 (1.1)	75/84.0 (0.9)		1.24

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

Overall sex ratio: p = 0.165 (boys and girls equally represented)
Overall age distribution: p = 0.129 (as expected)
Overall age distribution for boys: p = 0.401 (as expected)
Overall age distribution for girls: p = 0.514 (as expected)
Overall sex/age distribution: p = 0.054 (as expected)

Team 3:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	10/19.7 (0.5)	14/18.3 (0.8)	24/38.1 (0.6)	0.71
18 to 29	12	20/19.2 (1.0)	18/17.9 (1.0)	38/37.1 (1.0)	1.11
30 to 41	12	32/18.6 (1.7)	22/17.3 (1.3)	54/36.0 (1.5)	1.45
42 to 53	12	19/18.3 (1.0)	11/17.0 (0.6)	30/35.4 (0.8)	1.73
54 to 59	6	4/9.1 (0.4)	14/8.4 (1.7)	18/17.5 (1.0)	0.29
6 to 59	54	85/82.0 (1.0)	79/82.0 (1.0)		1.08

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

Overall sex ratio: p = 0.639 (boys and girls equally represented)
Overall age distribution: p = 0.005 (significant difference)
Overall age distribution for boys: p = 0.002 (significant difference)
Overall age distribution for girls: p = 0.088 (as expected)
Overall sex/age distribution: p = 0.000 (significant difference)

Team 4:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	15/21.3 (0.7)	29/21.3 (1.4)	44/42.7 (1.0)	0.52
18 to 29	12	27/20.8 (1.3)	20/20.8 (1.0)	47/41.6 (1.1)	1.35
30 to 41	12	23/20.2 (1.1)	21/20.2 (1.0)	44/40.3 (1.1)	1.10
42 to 53	12	19/19.9 (1.0)	18/19.9 (0.9)	37/39.7 (0.9)	1.06
54 to 59	6	8/9.8 (0.8)	4/9.8 (0.4)	12/19.6 (0.6)	2.00
6 to 59	54	92/92.0 (1.0)	92/92.0 (1.0)		1.00

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

Overall sex ratio: p = 1.000 (boys and girls equally represented)
Overall age distribution: p = 0.377 (as expected)
Overall age distribution for boys: p = 0.343 (as expected)
Overall age distribution for girls: p = 0.169 (as expected)
Overall sex/age distribution: p = 0.027 (significant difference)

Team 5:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	21/20.9 (1.0)	19/17.4 (1.1)	40/38.3 (1.0)	1.11
18 to 29	12	21/20.4 (1.0)	14/17.0 (0.8)	35/37.3 (0.9)	1.50
30 to 41	12	27/19.7 (1.4)	23/16.4 (1.4)	50/36.2 (1.4)	1.17
42 to 53	12	17/19.4 (0.9)	18/16.2 (1.1)	35/35.6 (1.0)	0.94
54 to 59	6	4/9.6 (0.4)	1/8.0 (0.1)	5/17.6 (0.3)	4.00
6 to 59	54	90/82.5 (1.1)	75/82.5 (0.9)		1.20

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

Overall sex ratio: p = 0.243 (boys and girls equally represented)
Overall age distribution: p = 0.006 (significant difference)
Overall age distribution for boys: p = 0.180 (as expected)
Overall age distribution for girls: p = 0.047 (significant difference)
Overall sex/age distribution: p = 0.002 (significant difference)

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

Team: 1

Time point SD for WHZ 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3

```
01: 0.54 (n=12, f=0)
02: 0.96 (n=12, f=0)  #######
03: 0.99 (n=12, f=0)  ########
04: 1.03 (n=12, f=0)  #########
05: 0.76 (n=12, f=0)
06: 0.79 (n=12, f=0)
07: 0.82 (n=12, f=0)  #
08: 0.95 (n=12, f=0)  ######
09: 1.14 (n=12, f=0)  ###############
10: 0.99 (n=12, f=0)  ########
11: 0.69 (n=12, f=0)
12: 1.09 (n=12, f=0)  ############
13: 1.03 (n=12, f=0)  #########
14: 0.85 (n=09, f=0)  ##
15: 0.69 (n=07, f=0)
16: 0.81 (n=02, f=0)
```

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

Team: 2

Time point SD for WHZ 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3

```
01: 1.26 (n=11, f=0)  ###################
02: 1.09 (n=11, f=0)  ############
03: 0.61 (n=11, f=0)
04: 1.20 (n=11, f=0)  #################
05: 1.15 (n=11, f=0)  ###############
06: 0.75 (n=11, f=0)
07: 0.67 (n=11, f=0)
08: 1.00 (n=11, f=0)  ########
09: 1.01 (n=11, f=0)  #########
10: 1.06 (n=10, f=0)  ###########
11: 1.07 (n=10, f=0)  ###########
12: 0.73 (n=10, f=0)
13: 0.84 (n=10, f=0)  ##
14: 1.21 (n=09, f=0)  #################
15: 0.51 (n=07, f=0)
16: 1.05 (n=06, f=0)  OOOOOOOOOO
17: 1.22 (n=04, f=0)  OOOOOOOOOOOOOOOOO
18: 0.48 (n=02, f=0)
```

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

Team: 3

Time point SD for WHZ 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3

```
01: 0.76 (n=11, f=0)
02: 1.18 (n=11, f=0)  ################
03: 1.12 (n=11, f=0)  ##############
04: 0.61 (n=11, f=0)
05: 1.18 (n=11, f=0)  ################
```

06: 0.87 (n=11, f=0) ###
07: 1.22 (n=11, f=0) ##################
08: 0.92 (n=11, f=0) #####
09: 1.08 (n=11, f=0) ############
10: 0.98 (n=11, f=0) #######
11: 0.95 (n=11, f=0) ######
12: 0.71 (n=11, f=0)
13: 0.80 (n=11, f=0)
14: 1.03 (n=08, f=0) ##########
15: 1.03 (n=06, f=0) OOOOOOOOOO
16: 0.57 (n=04, f=0)
17: 0.69 (n=02, f=0)

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

Team: 4

Time   SD for WHZ
point   0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 0.90 (n=11, f=0) ####
02: 1.06 (n=11, f=0) ###########
03: 0.95 (n=11, f=0) ######
04: 0.82 (n=11, f=0) #
05: 1.06 (n=11, f=0) ###########
06: 1.34 (n=11, f=0) ######################
07: 0.82 (n=11, f=0) #
08: 1.24 (n=11, f=0) ##################
09: 1.03 (n=11, f=0) ##########
10: 1.22 (n=11, f=0) ##################
11: 1.07 (n=11, f=0) ###########
12: 0.91 (n=11, f=0) #####
13: 0.93 (n=11, f=0) ######
14: 1.19 (n=10, f=0) ################
15: 0.83 (n=10, f=0) #
16: 1.22 (n=07, f=0) ##################
17: 0.92 (n=05, f=0) OOOOO
18: 0.56 (n=02, f=0)
19: 0.90 (n=02, f=0) ~~~~

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

Team: 5

Time   SD for WHZ
point   0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 1.03 (n=11, f=0) ##########
02: 0.90 (n=11, f=0) ####
03: 0.95 (n=11, f=0) ######
04: 1.03 (n=10, f=0) ##########
05: 0.85 (n=11, f=0) ##
06: 1.31 (n=11, f=0) ####################
07: 0.54 (n=11, f=0)
08: 0.93 (n=11, f=0) ######
09: 0.82 (n=11, f=0) #
10: 0.82 (n=11, f=0) #
11: 0.89 (n=11, f=0) ####
12: 1.11 (n=11, f=0) #############
13: 0.48 (n=11, f=0)
14: 0.78 (n=10, f=0)
15: 1.12 (n=06, f=0) OOOOOOOOOOOOO
16: 0.68 (n=03, f=0)
17: 0.84 (n=02, f=0) ~~

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

(for better comparison it can be helpful to copy/paste part of this report into Excel)