Nutrition and Food Security Assessment in Karamoja

Report

UNICEF – Uganda
January 2013

By

Dr Wamani Henry
Dr Bagonza Arthur

Makerere University School of Public Health
P.O. Box 7272 Kampala

Tel: +256-77665500 or +256755443300
Email: wamanih@gmail.com; or arthurbagonza@yahoo.com

WFP United Nations World Food Programme

unicef

Table of content

Acknowledgements

The School of Public Health, Makerere University College of Health Sciences (Mak-SPH) team led by Dr Henry Wamani – the Principal Investigator - and assisted by Dr Arthur Bagonza acknowledges the enormous support from UNICEF, Ministry of Health and District Health Offices of Abim, Amudat, Kaabong, Kotido, Moroto and Nakapiripirit for supporting the assessment in different ways. We sincerely thank the 15 Central Supervisors, 72 Enumerators from the six districts and Data Entrants who supported the surveys. Our special thanks go to Dr Lilia Turcan and Ms Nelly Birungi of UNICEF, both Kampala and regional WFP Offices for the invaluable support and input to the assessment tools.

Summary of findings

Nutrition

- There were high levels of malnutrition observed in all districts of Karamoja. Programs should be intensified to address the emerging problem.

Table 1.1: GAM, SAM, Stunting and Underweight prevalence according to district

District	GAM	SAM	Stunting	Underweight
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Abim (N=223)	8.8 (5.7 - 13.3)	2.8 (1.3 - 5.9)	34.7 (28.7 - 41.3)	22.6 (17.5 - 28.6)
Amudat (N=273)	16.2 (12.3 - 21.1)	5.7 (3.5 - 9.1)	30.4 (25.2 - 36.2)	24.4 (19.7 - 29.9)
Kaabong (N=333)	13.5 (10.2 - 17.7)	3.4 (1.9 - 6.0)	30.8 (26.0 - 36.1)	25.7 (21.3 - 30.7)
Kotido (N=334)	10.5 (7.6 - 14.3)	4.6 (2.8 - 7.5)	36.4 (31.4 - 41.7)	22.2 (18.0 - 27.1)
Moroto (N=300)	11.7 (8.5 - 15.8)	2.3 (1.1 - 4.8)	38.7 (33.4 - 44.4)	30.4 (25.5 - 35.9)
Nakapiripirit (N=301)	14.1 (10.5 - 18.7)	4.7 (2.8 - 7.9)	40.3 (34.7 - 46.1)	30.4 (25.4 - 35.9)
Combined (N=1764)	**12.5 (11.0 - 14.1)**	**3.9 (3.1 - 4.9)**	**35.3 (33.0 - 37.6)**	**26.1 (24.1 - 28.2)**

- Exclusive breastfeeding among children less than six months was 71.9% in pooled analysis with Kotido having the highest prevalence (83.7%) while Nakapiripirit (58.3%) and Amudat (58.3%) were the least.
- Overall, initiation of complementary feeding was timely in most of the districts. Among children aged 6 – 8 months, only 8.8% of the children had not received any complementary food in the 24 hours preceding the survey. This is an improvement as compared to previous surveys and other regions in the country.
- Over 50% of the children 6-23 months in all districts combined had low or moderate Individual Dietary Diversity Score (IDDS) with the worst district being Moroto where 72.8% of the children had low IDDS
- In pooled analysis, 58% of children and 50% of the mothers were anemic.
- The BMI indicate that 19.8% of the mothers were wasted/thin, while 3.4% were overweight and/or obese.

Morbidity and immunization

- The two-week prevalence of ARI and fever pooled analysis, was in equal proportions at 53.9% and 53.8%, respectively. The prevalence of diarrhea was 36.6% and was highest in Kitido district (47.6%).
- Only 44.9% of all the households possessed any bed net. Abim district (82.0%) reported the highest availability of any bed net among households while Moroto district (27.3%) reported the least.
- Of the about 50% of the households that had any bed net, 91.7% had their children sleeping under a bed net the night to the assessment. Whereas households with bed nets had them used by their children, the availability of the bed nets seemed to be the main factor that appeared to hinder usage. Partners should distribute more bed nets.
- Two thirds (63.1%) of children aged 9-23 months had received a measles vaccination as identified with a marked health card. In all districts immunization coverage including vitamin

A supplementation and deworming was above 90% when mothers' reports (those without cards) were considered.

Water and sanitation

- Over 80% of the household of the Karamoja districts reported to have access to safe drinking water. Abim district recorded the highest (95.3%) access to safe water using boreholes while Amudat district had the least number of boreholes (61.1%) and the highest number of surface water (37.3%). However, less than a quarter of the households (16.5%) in the pooled analysis treated their drinking water.
- Despite the low water treatment practice among households in Karamoja, few households, 39 (2.2%) had their drinking water contaminated with faecal matter (E.coli).
- Up to 64.3% of the households in the Karamoja region combined lacked latrines. The district with the lowest latrine coverage was in Amudat (2.6%%), while Kaabong (69.8%) was the best. The problem of latrines ownership and usage in Karamoja is associated with cultural beliefs. More innovative strategies should be devised to promote use of latrines.

Socioeconomic status, hunger and food security

- Using a socioeconomic index derived from valuable household assets and ownership of shoes and clothes, Amudat district had the highest proportion of socioeconomically better off households 32.6% while Kotido and Nakapiripirit had high proportion of households in the poorest quintile, 58.7% and 44.2%, respectively
- The proportion of highly food insecure households (FCS Low) was 10.3% in Karamoja region with Kotido district having the highest prevalence (15.2%) while Amudat district (87.5%) had the highest proportion of food secure households. Compared to previous surveys there was relative improvement in the status of food security on the region.
- Sixteen percent of the households reported to have never cultivated or planted any food crop in the first and/or second agricultural season of 2012. More households in Moroto (36.6%) did not cultivate any crops. The main challenges to food production mentioned by the majority of the respondent who did not grow any food included no access to land (42.5%), poor weather (18.7%) and sickness or physical inability (17.9%).
- Although 57.4% and 43.2% of all households engaged in sorghum and maize production, respectively, the mean production of 82.4 kg for sorghum and 78.8kg for maize was low. Agriculture should be promoted further in Karamoja.
- Up to 44.2% of all the assessed households owned animals (cow or sheep or goat). Of the districts, Amudat households (91.1%) were more likely to have any of the three animals than any other district.
- The main household income sources were by selling firewood and charcoal (48.2%), selling food crops (45.6%) and brewing. There is an improvement in income sources as brewing is no longer the leading source of income as was observed in previous surveys.
- The median expenditure on food was low and was zero for milk, fruits and vegetables, cooked food, and drinking water. The median expenditure on sugar was only Uganda shillings 1000 in pooled analyses. However districts like Kaabong, Kotido and Moroto spent considerably higher on purchasing cereals. Karomoja region needs to be empowered economically.

Gender profiles

- In many districts there were statistically significant differences in how time was used by men and women concerning non-agricultural work, household work, and leisure. The day preceding the assessment, more men were significantly involved in non-agricultural work and leisure while women were significantly more engaged in household and care work.
- The men tended to own and control most household assets but most of the savings and income were generally jointly owned

BACKGROUND

1.1 Introduction

UNICEF contracted the School of Public Health, Makerere University College of Health Sciences, (Mak-SPH) to conduct a survey on Nutrition and Food Security in Karamoja Sub region. Field data collection was conducted between in the first half of December 2012 in six of the seven districts of Karamoja. District surveyed included: Abim, Amudat, Kaabong, Kotido, Nakapiripirit and Moroto. Sampled clusters falling in the new district of Napak were covered under Moroto district. The survey was part of the biannual assessments done in Karamoja region to generate information to monitor and improve programme and policy interventions.

Information on health, nutrition and food security was collected at household level. This report provides a detailed description of the methodology and sampling procedures, data collection process, variables assessed and how the data was analyzed; and the findings of the assessment. We also provide some conclusions and recommendations based on key findings and in line with the assessment objectives.

1.2 Objectives

1.2.1 Broad objective

The broad objective of the assessment was to obtain data on indicators of health, nutrition and food security status in Karamoja region to monitor and/or improve programming and policy interventions.

1.2.2 Specific objectives for the assessment

Nutrition objectives

- Assess the prevalence of malnutrition (wasting, stunting and underweight) among children aged 6-59 months;

- Estimate the coverage of vitamin A supplementation and deworming in past six months among children 6-59 months of age;
- Estimate the prevalence of malnutrition using BMI among women 15-49 years of age
- Assess breastfeeding and complementary feeding knowledge among mothers/caregivers and the feeding practices among children 0-23 months of age;
- Estimate the individual dietary diversity (IDDS) among children 6-23 months
- Determine the prevalence of anaemia among children months and women 15-49 years

Health and sanitation objectives

- Assess the prevalence of common diseases (diarrhoea, fever, and ARI) among children 6 – 59 months, two weeks prior to the assessment
- Assess the coverage of routine immunizations coverage (DPT and measles)
- Estimate the proportion of households with access to improved water sources and sanitation

Food security objectives

- Assess the crop cultivation patterns at household level
- Assess current household hunger and food security status
- Estimate the proportion of households at short term risks of food insecurity;
- Estimate livestock ownership of households
- Assess the household socioeconomic status

Gender based objectives

- Profile ownership and control of key household items/assets among wives and husbands
- Estimate the time spent on household chores among wife and husband in the 24 hours preceding the survey

1.3 Conceptual framework for the causes of malnutrition and food insecurity

The surveys was based on the conceptual framework of the causes of malnutrition adapted from the 1990 UNICEF model, which suggests that fundamental influences to nutrition and food security outcomes remain within the environment where people live (Figure 2).

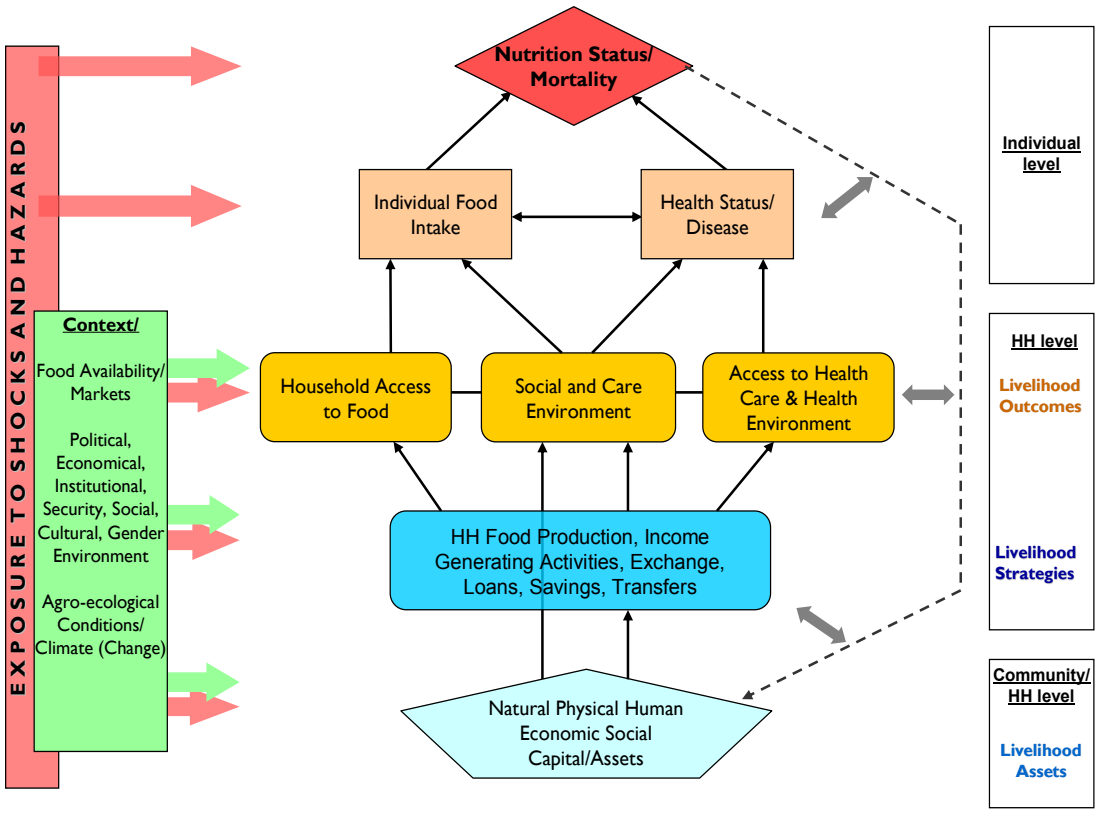

Figure 1.1: Conceptual framework to analyze food security and nutrition in society (adapted from UNICEF 1990)

Information was collected on factors at most of the framework levels with the exception of the total potential resources.

METHODOLOGY

This was a small sample surveys carried out for surveillance purposes. The survey was population based and cross-sectional targeting six districts of Abim, Amudat, Kaabong, Kotido, Moroto and Nakapiripirit.

2.1 Target population

The targets were representative households in the five districts regardless of who occupies them. Children between the ages of 0 and 59 months and their mothers if they existed in the sampled households were assessed. Where children and/or mothers never existed in a household the head of household was interviewed to collect information only on food security. Age of children was confirmed by use of child health cards. Children with physical disabilities were assessed but findings on anthropometry were excluded.

2.2 Sample size and sampling procedure

The target was to detect a minimum variation of 5% of Global Acute Malnutrition (GAM) with 85% precision. Empirically it was established that a minimum of 25 clusters was required for a survey to be representative and valid in sub-Saharan setups. We therefore aimed to sample a total of 300 representative households using a two-stage, 25x12 cluster randomization design. At the first stage a probability sample of 25 clusters was selected using an updated list of villages that constitute a district (with their corresponding populations). The updated lists were obtained from the District Population Offices. At the second stage households were systematically sampled. Systematic sampling was done by ensuring a random start and using a calculated sampling interval using a list of village households obtained from the village head. A total of 1800 households were therefore targeted for sampling in the five districts.

4.3 Variable measurements and data collection instruments

Data was collected on the following variables: age; sex; weight; height; bilateral pedal oedema; morbidity for common diseases and conditions; infant feeding practices; ownership of household

assets, livestock and land; income sources and expenditures; food consumption diversity; hunger and food security; education status of mother and household head; water and sanitation; immunization/supplementation and deworming; ownership and control of key household items/assets between husbands and wives; and time allocation to household chores between husband and wives.

Age and sex:

Exact age of the child was reported in months using information on child health cards. Where these did not exist, age (month and year of birth) was determined using a local calendar of events. An age chart (Appendix 4) was used to read off age in months if date of birth (month and year) was known. Sex was assessed based on mother's reports and/or observation as appropriate.

Weight

Any child falling within the age bracket of 0 to 59 months found in the household sampled was weighed. The weight was recorded to the nearest 0.1kg accuracy on the conventional scales. Even those with oedema were weighed and the Emergency Nutrition Assessment (ENA) for SMART software was used for data analysis and accounted for such.

Height

Children above the age of two years were measured standing upright whilst those below 2 years were measured lying down to nearest 0.1cm. Where age was difficult to determine, those measuring less than 85cm were generally measured lying down and those taller than 85cm measured standing upright. ***Note****: Only data of children measuring between 65cm and 110cm were used for analysis where age was not known.*

Bilateral oedema

Oedema was assessed by exerting medium thumb pressure on the upper side of each foot for three seconds. Oedema was recorded as present if a skin depression remained on both feet after pressure was released.

BMI and MUAC

Mothers/caregivers 15-49 years of age were assessed for weight and height to calculate their Body Mass Index (BMI). Children 6-59 months and mothers were also assessed for Mid-Upper Arm Circumference (MUAC) using tapes to nearing 0.1 cm.

Morbidity and care seeking

Morbidity from common childhood illness like acute respiratory infections (ARI), fever and diarrhea were assessed over a two-week recall period. In addition, coverage of the essential primary care services such as immunization, vitamin supplementation and deworming among infants and young children, and environmental and domestic sanitation factors such as latrine and safe water coverage were assessed. WHO definitions for diseases and conditions were used.

Infant feeding practices

Breastfeeding and complementary feeding practices were assessed for each child. Assessment covered exclusive breast-feeding rates (using 24-hour recall), quality and quantity of complementary feeding and active feeding practices. Individual dietary diversity scores (IDDS) were assessed to establish adequacy of complementary feeding among children 6-23 months.

Household hunger and food security:

Standard and valid questions from UNICEF/UNWFP and Feed The Future (FTF) indicators were used to assess household hunger and food security. Data was collected on household agricultural food production for common crops such as maize, millet, sorghum, potato, cassava and banana. The types of food and the number of times they are eaten in the past 7 days, any foods bought by the household and the income sources will be assessed. In addition hunger/ starvation was assessed using standard questions[1]. Household socioeconomic status was assessed by collecting information on household assets (bicycle, radio, hoe/axe, mobile phone, motorcycle/car, shoes, clothes, television, etc); animals (cow, goat, sheep, chicken, and pig); and education status of mothers and/or household head.

Water and sanitation

Household source of water and rapid tests for E. coli in household drinking were assessed. Faecal, garbage and other domestic hygiene practices such as ownership of garbage pit, utensil racks were assessed as well.

Immunization/Supplementation and de-worming

Vitamin A supplementation and de-worming in the last 6 months, and DPT3 and Measles vaccination coverage was ascertained from Child health cards and/or mothers recall.

[1] FANTA. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. 2007

Assessment of anemia status

Blood samples were collected through a finger prick from children and mothers/caregivers to determine the hemoglobin level. Hemocue analyzer machines 301 were used and assessments were done by qualified/trained health workers. Anemia was assessed in only three districts due to insufficient numbers of hemocue analyzer machines.

Gender profiling

Questions were asked on who between husband and wife owns, controls and makes major decisions on household key items/assets such as land, gardens, cash crops, animals, radio, telephone, bicycles, savings and incomes. Time allocation on daily household chores was also assessed. Questions on gender were skipped in case of households for singles.

4.4 Data collection

Data was collected using a single questionnaire (Appendix 6), administered face-to-face to mothers and/or household heads in their home settings. The data collection tool was in English but a translated tool was used to administer the questionnaire. Data was collected simultaneously in all the five districts by trained research assistants. Field data collection lasted a total of 8 days in each district while training of research assistants last for 3 days. For successful data collection in Uganda, the use of local and civic leaders is imperative. In this regard, local officials were identified and used as guides to identify households for interviews and to support anthropometric measurements. Data was collected in the first two weeks of December 2012.

4.5 Quality assurance procedures during data collection

To ensure that good and accurate information was collected by research assistants, the following quality assurance measures were put in place:

- Research assistants were required to edit research tools or data at the point of data collection. This enabled effective correction and verification of data collected;
- The supervisors edited questionnaires and ensured that they are correct and complete while in the field;

- A record of daily activities showing the number of tools completed, by whom and the location where they were undertaken was kept; and
- Daily debriefing of the research team was ensured at the end of every day's activities.

4.6 Data Management

Data were entered in Epidata 3.1 software by clerks based at the School of Public Health. Entered data was copied, saved and exported to ENA software for generation of z-scores and eventual analysis of the nutrition data. Data was backed-up daily including saving it on distant servers through the email system. Other data were analysed in SPSS Version 21.

4.7 Data analysis and interpretation of findings

Data were analyzed by the Principal Investigator assisted by the co-Investigators. Findings were interpreted based on national indicators and/or according to plan in some aspects especially for gender variables. District specific and pooled data were concurrently presented. As much as possible data were disaggregated by sex and age. Current findings were compared to previous surveys to establish any positive or negative changes.

4.7.1 Analysis of anthropometric data

Anthropometric indices were presented based on the WHO standard. However, results with NCHS references have been provided in Annex … for comparison with previous surveys. Acute malnutrition or wasting was estimated from the weight for height (WFH) index values combined with the presence of oedema. WFH indices were expressed in Z-scores.

Global acute malnutrition (GAM)

Was estimated using Weight-for-Height index and oedema. Children presenting with a weight for height index less than –2 z scores with/without oedema were considered to fall in this category.

Moderate Acute Malnutrition (MAM)

Was estimated using Weight-for-Height index. Children presenting less than –2 z-scores but greater than –3 z-scores were regarded as moderately malnourished.

Severe Acute Malnutrition (SAM):

Was estimated using Weight-for-Height index and oedema. Children presenting with a weight for height index less than –3 z-scores and/or presence of bilateral oedema were regarded as severely malnourished. Likewise, underweight (weight-for-age) and stunting (height-for-age) were analysed.

MUAC and BMI

Were interpreted based on WHO criteria.

Anemia

Was interpreted based on the WHO classification.

4.7.2 Analysis of morbidity and other health and sanitation data

Prevalence of diseases and conditions occurring two weeks prior the survey, latrine and coverage of health indicators were reported using descriptive statistics.

4.7.3 Analysis of food security data

Food security data was systematically analyzed. First, a household wealth index was generated from ownership of household property using principal components analysis. The wealth index was derived from the first principal component, which was then ranked and categorized into quintiles. Second, household food consumption scores were generated based on 8 food groups derived from the 16 food columns in the questionnaire using the UNWFP/UNICEF – weighted scores of certain food groups. These pre-assigned weights for starch, meat, pulses, sugar, oil and milk are 2, 4, 3, 0.5, 0.5 and 4, respectively, were used. Third, other facet of food security such as food sources, expenditures on food and coping mechanisms were accordingly analysed. Forth, household hunger scores were generated based on FTF guidelines.

4.8 Ethical considerations

Permission to collect data was sought from local authorities with the DHO's involvement. The purpose of the survey was clearly explained. Protocol was observed while entering any community. A written consent was sought from survey participant before any interview and confidentiality ensured.

FINDINGS AND DISCUSSION

3.1 Socio-demographic characteristics

3.1.1 Age and sex distribution of the sampled children

A total of 1765 children were included for anthropometric analysis (221 for Abim, 274 for Amudat, 333 for Kaabong, 334 for Kotido, 303 for Moroto, 300 for Nakapiripirit) (Table 3.1). WHO flagged cases were excluded. Overall, there was an equal representation of male and female children in each district depicting effective sampling procedures.

Table 3.1: Number of children assessed for anthropometry by age, sex and by district

District	Sex ratio of sampled children			Age distribution in months of sampled children					Total
	Boys	Girls	Boy:Girl ratio	6 - 17	18 - 29	30 - 41	42 - 53	54-59	
Abim	115	106	1.08	64	63	49	35	10	221
Amudat	133	141	0.94	91	69	66	32	16	274
Kaabong	178	155	1.15	108	93	76	42	14	333
Kotido	182	152	1.2	96	88	79	54	17	334
Moroto	143	159	0.9	120	91	52	32	8	303
Nakapiripirit	153	147	1.04	81	111	59	35	14	300
Combined	905	860	1.05	560	515	381	230	79	1765

3.1.2 Caregiver characteristics

Overall, primary care giving for children assessed was by the biological mothers, 1570 (89.8%). Amudat district recorded the highest presence of biological mothers 283 (94.0%) while Nakapiripirit district reported the highest 41 (14.1%) of the other caregivers (Table 3.2). The mean (SD) age of the biological mothers was 30.05 (9.8) years.

Table 3.2: Respondents category and age by district

	Respondents category		Respondents Age	
	Mothers	Caregivers	All respondents	Biological Mothers
District (N)	N (%)	N (%)	Years (SD)	Years (SD)
Abim (N=271)	237 (87.5)	34 (12.5)	35.2 (15.2)	33.3 (13.6)
Amudat (N= 301)	283 (94.0)	18 (6.0)	27.5 (8.9)	26.6 (6.9)
Kaabong (N= 299)	272 (91.0)	27 (9.0)	32.1 (10.8)	30.8 (8.4)
Kotido (N=282)	253 (89.7)	29 (10.3)	32.7 (11.3)	31.7 (10.2)
Moroto (N= 304)	275 (90.5)	29 (9.5)	29.5 (10.2)	27.9 (7.3)
Nakapiripirit (N=291)	250 (85.9)	41 (14.1)	31.6 (11.3)	30.3 (9.6)
Combined (N=1748)	**1570 (89.8)**	**178 (10.2)**	**31.5 (11.7)**	**30.1 (9.8)**

At a relatively moderate mean age of 30 years, the biological mothers had on average given birth to four live children. Mothers in Moroto district were having a lower average of 3.5 children compared to other districts (Table 3.3)

Table 3.3: Parity of the biological mothers

District	Mean number of live births	Std. Deviation
Abim (N=279)	4.6	2.9
Amudat (N= 301)	3.7	2.4
Kaabong (N= 307)	4.0	2.5
Kotido (N=305)	4.2	2.4
Moroto (N= 305)	3.5	2.3
Nakapiripirit (N=300)	4.1	2.8
Combined (N=1797)	**4.0**	**2.6**

3.1.3 Education status of mothers and/or caregivers

Three quarters of the mothers in the selected districts had no formal education (Table 3.4). Amudat district recorded the highest number of mothers (85.2%) who had never attained any formal training. Since the level of mother's education correlates positively with nutrition status, it is important that focus on child education should be strengthened further.

Table 3.4: Mothers education status by district

District	Zero years	Primary	Ordinary	Above ordinary
	N (%)	N (%)	N (%)	N (%)
Abim	113 (37.9)	140 (47.0)	31(10.4)	14 (4.7)
Amudat	259 (85.2)	36 (11.8)	7 (2.3)	2 (0.7)
Kaabong	256 (82.3)	49 (15.8)	6 (1.9)	0 (0.0)
Kotido	261 (83.7)	28 (9.0)	17 (5.4)	6 (1.9)
Moroto	250 (81.7)	43 (14.1)	10 (3.3)	3 (1.0)
Nakapiripirit	231 (77.3)	63 (21.1)	4 (1.3)	1 (0.3)
Combined	**1370 (74.9)**	**359 (19.6)**	**75 (4.1)**	**26 (1.4)**

3.1.4 Mother pregnancy and/or breastfeeding status

The majority 1027 (58.3%) of the mothers were found breastfeeding their children, while 24 (1.4%) were pregnant and breastfeeding. Only 28.1% of the biological mothers were neither pregnant nor breastfeeding (Table 3.5). This implies that more than 70% of the mothers were either pregnant or breastfeeding. This situation calls for a concerted effort to improve reproductive health services.

Table 3.5: Current pregnancy and breastfeeding status of the respondents who were biological mothers

District	Pregnant	Breastfeeding (Lactating)	Pregnant and breastfeeding	Neither pregnant nor breastfeeding
	N (%)	N (%)	N (%)	N (%)
Abim (N=273)	28 (10.3)	125 (45.8)	3 (1.1)	117 (42.9)
Amudat (N=302)	52 (17.2)	161 (53.3)	4 (1.3)	85 (28.1)
Kaabong (N=298)	32 (10.7)	196 (65.8)	3 (1.0)	67 (22.5)
Kotido (N=298)	37 (12.4)	170 (57.0)	4 (1.3)	87 (29.2)
Moroto (N=299)	30 (10.0)	215 (71.9)	4 (1.3)	50 (16.7)
Nakapiripirit (N=291)	37 (12.7)	160 (55.0)	6 (2.1)	88 (30.2)
Combined (N=1761)	**216 (12.3)**	**1027 (58.3)**	**24 (1.4)**	**494 (28.1)**

3.2 Nutrition status of children and mothers in the Karamoja districts

3.2.1 Prevalence of wasting, stunting and underweight

The prevalence of Global Acute Malnutrition (GAM) was 12.5 (95% CI 11.0 – 14.1) and the prevalence of Severe Acute Malnutrition (SAM) was 3.9 (95% CI 3.1 – 4.9) in pooled analyses. All results are based on weight-for-height Z-scores and/or oedema (Table 3.6). The prevalence of (GAM) was above 10% (alert level) in all the Karamoja districts combined. The prevalence of GAM in the Karamoja districts should be considered cautiously because besides the actual child health cards not being accessible at the time of the assessment, the biological mothers could not tell the exact date the children were born. This made it hard to compute actual age and actual anthropometric indices. Besides there was relatively poor plausibility of results for Amudat and Nakapiripirit due to poor sampling in the two districts. More younger children were sampled than older ones. Since GAM usually peaks in the age group 6-17 months, a higher number of children in this age group resulted in a higher GAM prevalence in the two districts.

Table 3.6: Nutrition status of children aged 6-59 months by district (WHO flags)

District	GAM	SAM	Stunting	Underweight
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Abim (N=223)	8.8 (5.7 - 13.3)	2.8 (1.3 - 5.9)	34.7 (28.7 - 41.3)	22.6 (17.5 - 28.6)
Amudat (N=273)	16.2 (12.3 - 21.1)	5.7 (3.5 - 9.1)	30.4 (25.2 - 36.2)	24.4 (19.7 - 29.9)
Kaabong (N=333)	13.5 (10.2 - 17.7)	3.4 (1.9 - 6.0)	30.8 (26.0 - 36.1)	25.7 (21.3 - 30.7)
Kotido (N=334)	10.5 (7.6 - 14.3)	4.6 (2.8 - 7.5)	36.4 (31.4 - 41.7)	22.2 (18.0 - 27.1)
Moroto (N=300)	11.7 (8.5 - 15.8)	2.3 (1.1 - 4.8)	38.7 (33.4 - 44.4)	30.4 (25.5 - 35.9)
Nakapiripirit (N=301)	14.1 (10.5 - 18.7)	4.7 (2.8 - 7.9)	40.3 (34.7 - 46.1)	30.4 (25.4 - 35.9)
Combined (N=1764)	**12.5 (11.0 - 14.1)**	**3.9 (3.1 - 4.9)**	**35.3 (33.0 - 37.6)**	**26.1 (24.1 - 28.2)**

Based on WHO classification of the prevalence of malnutrition, that is:

Wasting: acceptable (0-5%) / poor (5%-10%) / serious (10%-15%) / critical (greater than 15%);

Stunting: acceptable (less than 20%) / poor (20%-30%) / serious (30%-40%) / critical (greater than 40%);

Underweight: acceptable (less than 10%) / poor (10%-20%) / serious (20%-30%) / critical (greater than 30%), Ibanda district had the best position (Table 3.7).

Table 3.7: A diagrammatic view of malnutrition expressed according to the WHO classification of prevalence of malnutrition, by district

District	Wasting	Stunting	Underweight
Abim	Poor	Serious	Serious
Amudat	Critical	Serious	Serious
Kaabong	Serious	Serious	Serious
Kotido	Serious	Serious	Serious
Moroto	Serious	Serious	Critical
Nakapiripirit	Serious	Critical	Critical
Combined	Serious	Serious	Serious

3.2.2 Prevalence of malnutrition by sex

The differences in malnutrition between sex was statistically significant with stunting: 38.9% (35.6- 42.2) for boys compared to 30.7% (27.4-33.9) for girls (Table 3.8); and with underweight, that is, 13.5% (11.2 – 15.9) for boys compared to 9.5% (7.4 – 11.5) for girls in pooled analyses (results not presented in table). The differences in under nutrition between male and female children are common findings in studies done in sub-Saharan Africa. Unfortunately there are no programmatic actions, which have been instituted to address the sex differences and even the causes of such differences in the Ugandan setup.

Table 3.8: Sex differences in GAM and stunting by district

District	GAM		Stunting	
	Male (95%CI)	Female (95%CI)	Male (95%CI)	Female (95%CI)
Abim	8.0 (4.3-14.6)	9.5 (5.3-16.6)	36.9 (28.5-46.2)	32.4 (24.2-41.8)
Amudat	16.0 (10.7-23.3)	17.6 (12.2-24.9)	32.6 (25.1-41.0)	29.0 (22.1-37.0)
Kaabong	16.8 (11.9-23.0)	9.9 (6.1-15.6)	33.7 (27.1-41.1)	27.5 (21.0-35.2)
Kotido	10.1 (5.5-15.4)	9.5 (5.7-15.3)	38.5 (31.7-45.8)	33.8 (26.7-41.7)
Moroto	14.7 (9.8-21.4)	9.0 (5.4-14.5)	43.8 (35.9-51.9)	34.0 (27.0-41.8)
Nakapiripirit	18.4 (12.9-25.4)	10.9 (6.7-17.3)	41.5 (33.8-49.8)	37.8 (30.2-45.9)
Combined	**14.4 (12.2-16.9)**	**10.6 (8.7-12.9)**	**37.8 (34.7-41.1)**	**32.6 (29.5-35.8)**

3.2.3 Prevalence of malnutrition by age

The prevalence of GAM peaked at 6–17 months while that of stunting and underweight at 18-29 months (Figure 3.1). This seems to be the norm in many parts of Uganda.

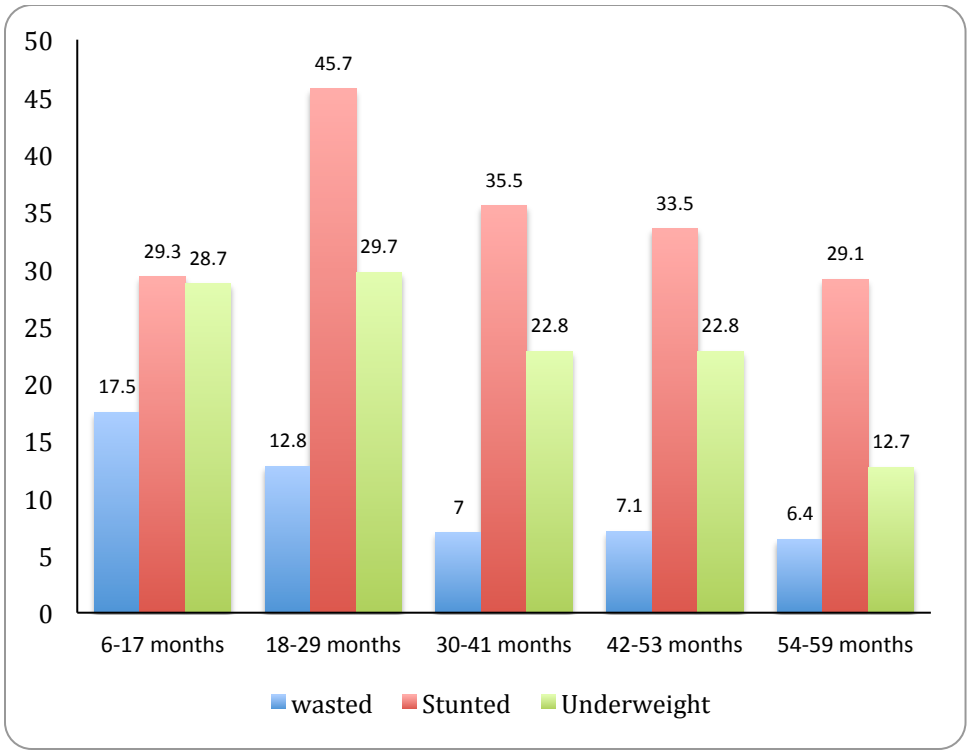

Figure 3.1: Prevalence of GAM, stunting and underweight by age categories

3.2.4 Distribution of malnutrition in the Karamoja region

The pooled mean weight-for-height z-score was -0.64 (SD=1.21). There were 20 cases of oedema (1.2%) in the entire sampled children of which the majority were from Kotido (7) while Amudat (4) was the second most affected district. The distribution is shifted to left depicting a high problem of wasting but the curve also depicts problems associated with taking height measurements or weight measurements by the enumerators (Figure 3.2).

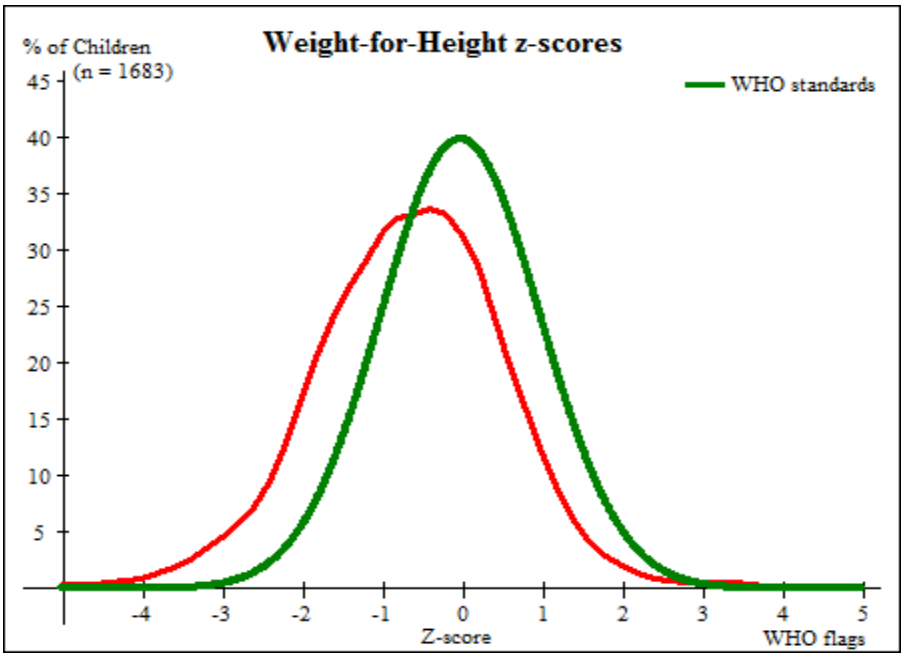

Figure 3.2: Distribution of Weight-for-Height Z-scores for both sexes

The pooled mean height-for-age z-score was -1.41 (SD=1.66). The distribution shifted to left depicting a high problem of stunting but the curve also depicts problems associated with taking height measurements or age measurements by the enumerators (Figure 3.3).

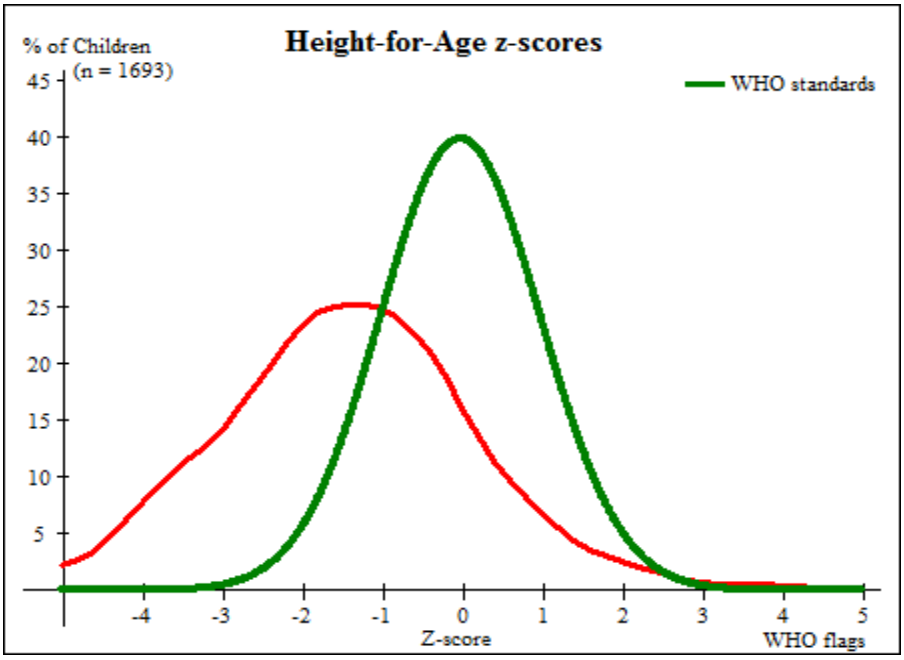

Figure 3.3: Distribution of height-for-age z-scores for both sexes

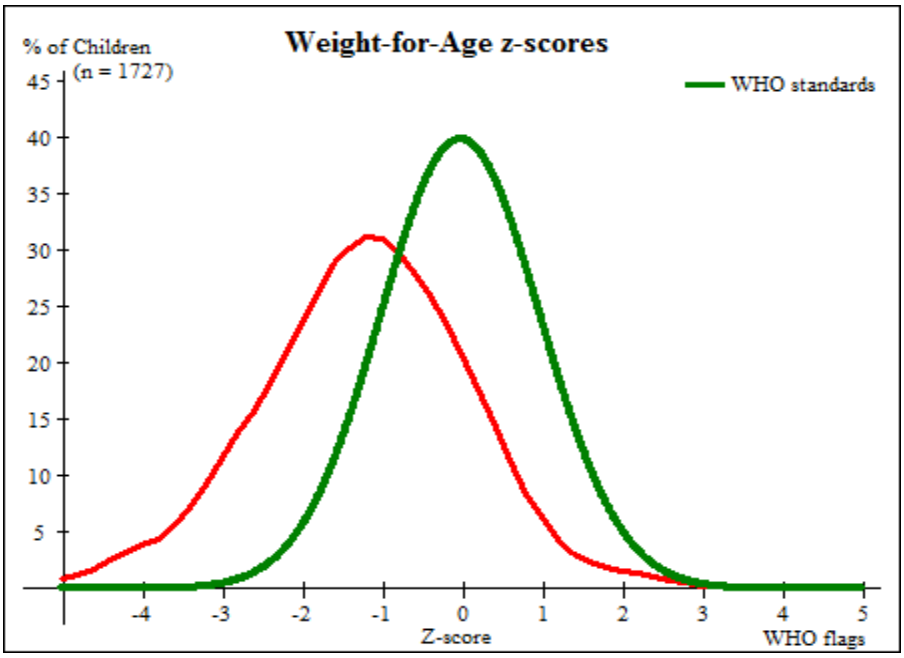

Figure 3.4: Distribution of weight-for-age z-scores for both sexes

The mean Weight-for-Age z-score was -1.22 (SD=1.35). The distribution shift to the left calls for improved intervention to address underweight (Figure 3.4).

3.2.6 Wasting assessed by Mid Upper Arm Circumference (MUAC) in children

The Mid Upper Arm Circumference (MUAC) anthropometric assessments in children 6-59 months depicted 40% risk (< 13.5 cm) of being under nourished in pooled analysis (Table 3.10). The proportion of children at risk was highest in Moroto district with 56.6%.

Table 3.10: Wasting status of children 6-59 months assessed with MUAC by district

District	MUAC CATEGORISED			
	<11.5	11.5-12.5	12.6-13.5	>13.5
	N(%)	N(%)	N(%)	N(%)
Abim (219)	6 (2.7)	12 (5.5)	39 (17.8)	162 (74.0)
Amudat (270)	1 (0.4)	14 (5.2)	72 (26.7)	183 (67.8)
Kaabong (328)	9 (2.7)	25 (7.6)	114 (34.8)	180 (54.9)
Kotido (331)	2 (0.6)	15 (4.5)	82 (24.8)	232 (70.1)
Moroto (302)	6 (2.0)	48 (15.9)	117 (38.7)	131 (43.4)
Nakapiripirit (300)	9 (3.0)	46 (15.3)	84 (28.0)	161 (53.7)
Combined (1750)	**33 (1.9)**	**160 (9.1)**	**508 (29.0)**	**1049 (59.9)**

3.2.7 Wasting status of mothers assessed using MUAC

Mid-upper arm circumference (MUAC) was assessed for 1,551 mothers and caregivers in reproductive age (15-45 years of age). This included pregnant and lactating women if they were also mothers of children less than five years of age. Using a cut-off of less than 22.5 cm, 9.1% of the women were classified as malnourished (Table 3.11). Amudat district with 14.0% had the highest proportion of women classified as malnourished while Abim district with 2.6% recorded the least malnourished women of the districts.

Table 3.11: Wasting status of mothers and caregivers 15-49 years assessed using MUAC by district in the SUN districts

District	Mothers MUAC CATEGORISED	
	<22.5	>22.5
	N(%)	N(%)
Abim	6 (2.6)	222 (97.4)
Amudat	41 (14.0)	252 (86.0)
Kaabong	20 (9.2)	197 (90.8)
Kotido	11 (4.1)	255 (95.9)
Moroto	31 (11.4)	241 (88.6)
Nakapiripirit	32 (11.6)	243 (88.4)
Combined	**141 (9.1)**	**1410 (90.9)**

Additionally mothers were weighed and their height taken. The BMI indicate that 19.8% of the mothers were wasted, while 2.7% were severely wasted. Amudat (3.8%) and Kotido (3.6%) had the highest proportion of overweight mothers while Nakapiripirit (1.7%) and Kaabong (1.2%) had the highest proportion of obese mothers (Table 3.11)

Table 3.11: Malnutrition status of mothers/caregivers 15-49 years of age

District	Severely thin (BMI <16.5)	Thin (BMI<18.5)	Normal (BMI 18.5-25)	Overweight (BMI 25.1-30)	Obese (BMI>30)
	%	%	%	%	%
Abim (N=198)	1.5	14.1	80.3	3.5	0.5
Amudat (N=240)	3.8	24.2	67.9	3.8	0.4
Kaabong (N=251)	1.6	19.9	76.1	1.2	1.2
Kotido (N=223)	0.9	13.9	80.7	3.6	0.9
Moroto (N=272)	4	25.4	69.1	0.7	0.7
Nakapiripirit (N=237)	3.8	19	73	2.5	1.7
Combined (N=1421)	**2.7**	**19.8**	**74.2**	**2.5**	**0.9**

3.3 Infant and young child feeding practices

3.3.1 Breastfeeding practices and knowledge

Exclusive breastfeeding in the 24 hours preceding the survey among children less than 6 months was 71%in pooled analysis. The prevalence of exclusive breastfeeding in districts were: Kotido (83.7%), Kaabong (75.0%), Abim (73.8%), Moroto (70.7%), Nakapiripirit (58.3%), and Amudat (58.3%). Additionally, 580 (83.1%) of children aged 6-23 months whose mothers were interviewed were still breastfeeding (Table3.12). The highest proportion of non-breast feeding children was in Amudat district 35 (30.7%) and the least proportion was in Moroto district 12 (7.5%). Mothers in the Karamoja region should be educated more on the advantages of breastfeeding.

Table 3.12: Breastfeeding status among children 6-23 month by district

District	Stopped breastfeeding	Breastfeeding
	N (%)	N (%)
Abim (N=85)	15 (17.6)	70 (82.4)
Amudat (N=114)	35 (30.7)	79 (69.3)
Kaabong (N=115)	14 (12.2)	101 (87.8)
Kotido (N=105)	23 (21.9)	82 (78.1)
Moroto (N=160)	12 (7.5)	148 (92.5)
Nakapiripirit (N=119)	19 (16.0)	100 (84.0)
Combined (N=698)	**118 (16.9)**	**580 (83.1)**

Whereas up to 83.6% of the mothers were knowledgeable that children 6-12 months should be breastfed on demand, this knowledge was not translated into practice. This gap between what is known and what is done needs to be explored.

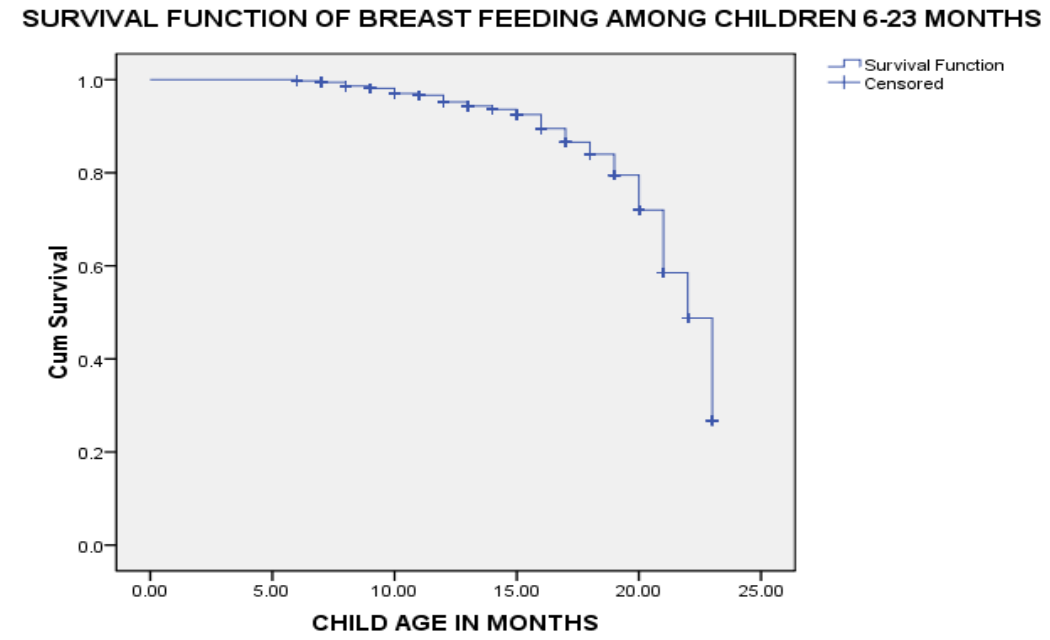

Figure 3.5: Survival function of breastfeeding in children 6 – 23 months of age

Using Kaplan Meier survival curves above (Figure 3.5), the mean duration of breastfeeding was 22 months. The practice of breastfeeding up to two years should be promoted further.

3.4.2 Complementary feeding practices

Initiation of complementary feeding

Overall, timely initiation of complementary feeding was appropriate in all the districts. Among children aged 6 – 8 months, up to 8.8% of the children had not received any complementary food in the 24 hours preceding the survey. The district with the lowest proportion of timely initiation of complementary feeding was Abim (82.4%) followed by Kotido (83.9%) (Figure 3.6). This implies that a good number of children aged 6-8 months in the Karamoja region are not breastfed exclusively, an appropriate practice. Breast milk alone is not sufficient for children in this age group, thus the need for specially prepared (transitional) complementary food.

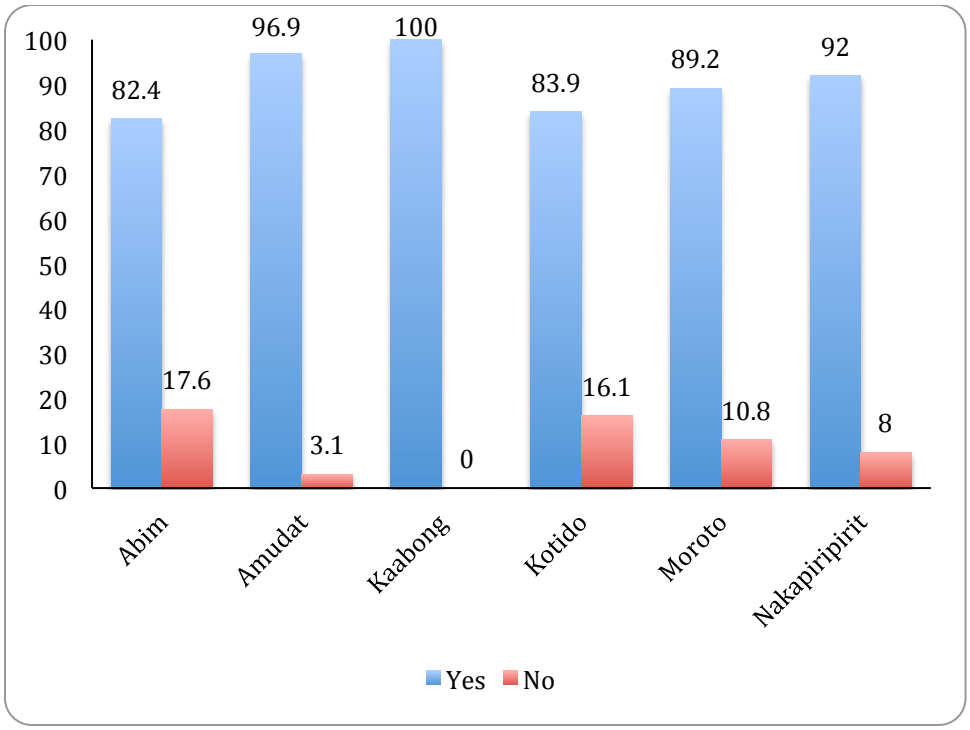

Figure 3.6: Proportion of children aged 6-8 months who received complementary food in the 24 hours preceding assessment by district

Frequency of meals for children 6–23 months

While the majority of the children 6-8 months who received complementary food had above the recommended number of two meals a day in the Karamoja districts, those in Abim district (1.7) were below the recommended two. In some districts like Amudat and Kaabong, the average meal frequency was 2.9 and 2.6, respectively (Table 3.13), was not necessarily better since a high frequency of solid or semi-solid meals at this age risks displacing breastfeeding. For children 9 - 23 months who were breastfeeding, the average meal frequency was 2.8.

Table 3.13: Meal frequency in children of different age categories

District	Children 6-8 Months			Children 9-23 Months		
	N	Mean	SD	N	Mean	SD
Abim	17	1.7	1.1	81	2.5	1.1
Amudat	32	2.9	1.2	97	3.0	1.0
Kaabong	29	2.6	1.0	109	2.9	1.1
Kotido	31	2.0	1.2	98	2.6	0.9
Moroto	37	2.2	1.3	142	2.8	1.1
Nakapiripirit	25	2.5	1.2	104	2.7	1.0
Combined	**171**	**2.4**	**1.2**	**631**	**2.8**	**1.0**

Diversity of complementary foods eaten by children 6-23 months

Using 24-hour recall, individual dietary diversity score (IDDS) was assessed based on seven food groups. The assessment was done only in children 6-23 months. Minimum dietary diversity has been defined as the proportion of children who received foods from at least 4 food groups the previous day[1]. The majority of the children in all districts had low IDDS and was worst in Moroto district (72.8%) (Figure 3.7).

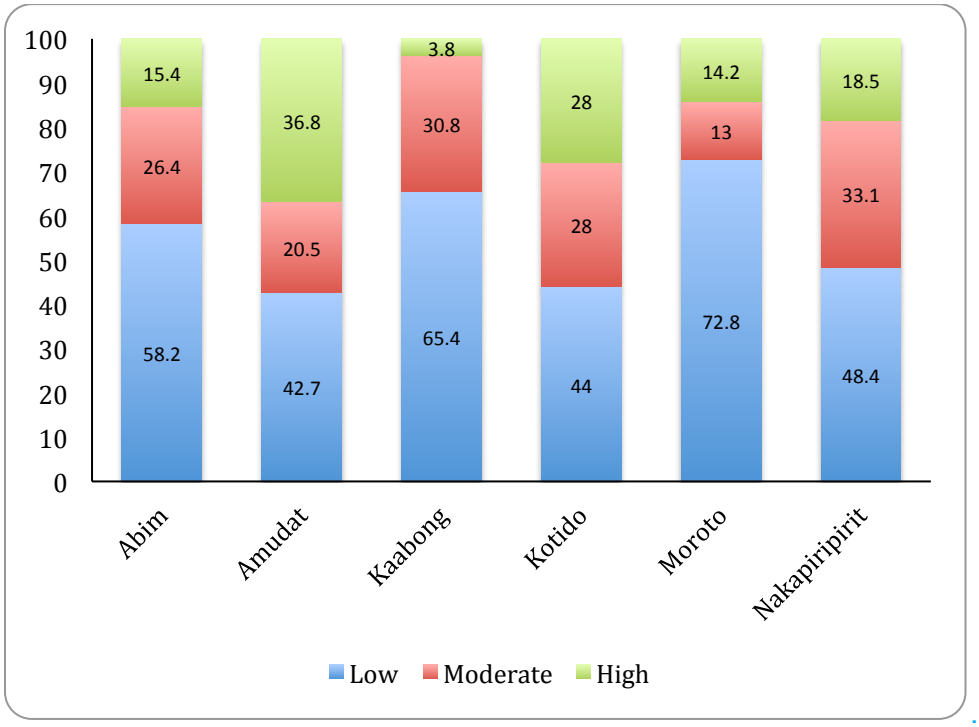

Figure 3.7: Individual dietary diversity score for children 6-23 months

The quality of complementary feeding as depicted by timing, frequency and diversity of foods provided to children 6-23 months was poor. There is need to intensify programming targeted at improving complementary feeding in the Karamoja region.

3.3 Status of health, water and sanitation

3.3.1 Morbidity due to common childhood illness among children under five

Caretakers were asked if the child had been ill during the two weeks prior to the survey. The survey specifically asked about diarrhoea (watery or bloody), ARI and fever. In pooled analysis,

ARI and fever affected the children in equal proportions at 53.9% and 53.8%, respectively (Table 3.14).

Table 3.14: Prevalence of common illnesses amongst children 6-59 months old by district

District	Diarrhoea	Fever	ARI
	N (%)	N (%)	N (%)
Abim	60 (27.6)	116 (53.2)	113 (51.8)
Amudat	81 (29.7)	117 (42.9)	130 (47.6)
Kaabong	134 (40.5)	195 (58.7)	152 (45.9)
Kotido	159 (47.6)	209 (62.6)	192 (57.5)
Moroto	101 (33.4)	123 (40.9)	142 (47.0)
Nakapiripirit	108 (35.9)	186 (61.8)	219 (72.8)
Combined	**643 (36.6)**	**946 (53.8)**	**948 (53.9)**

Children were most affected by ARI and malaria. Nakapiripirit (72.8%) and Kotido (57.5%) reported the highest incidence of ARI. Fever was reported highest in Kotido (62.6%) and Nakapiripirit. The prevalence of diarrhea was higher than what has been recently reported in other studies in Uganda like UDHS 2011 where prevalence of diarrhea was reported as 23%.

3.3.2 Use of mosquito nets

Not even half of the households 851 (44.9%) possessed an Insecticide Treated Net (ITN). Abim district 196 (82.0%) reported the highest availability of ITN among households while Moroto district 86 (27.3%) reported the least (Table 3.15). This could partly explain why malaria is still a big problem in these districts. Interventions such as distribution of ITN's to the most affected districts should be stepped up.

Table 3.15: Household ownership of an insecticide treated net by district

District	Have ITN	Don't Have ITN
	N (%)	N (%)
Abim (239)	196 (82.0)	43 (18.0)
Amudat (289)	103(35.6)	186 (64.4)
Kaabong (368)	142 (38.6)	226(61.4)
Kotido (393)	221 (56.2)	172 (43.8)
Moroto (315)	86 (27.3)	229 (72.7)
Nakapiripirit (290)	103(35.5)	187 (64.5)
Combined (1894)	**851 (44.9)**	**1043 (55.1)**

Of the 50% of the households that had any bed net, most of them (91.7%) had their children sleeping under a bed net the night to the assessment (Table 3.16). Whereas households with bed nets had them used by their children, the availability of the bed nets seemed to be the main factor that appeared to hinder usage. Partners should distribute more bed nets.

Table 3.16: Mosquito bed net usage amongst children by district

District	Slept under ITN	Didn't sleep under ITN
	N (%)	N (%)
Abim (216)	207 (95.8)	9 (4.2)
Amudat (113)	101 (89.4)	12 (10.6)
Kaabong (141)	136 (96.5)	5 (3.5)
Kotido (217)	204 (94.0))	13 (6.0)
Moroto (106)	82 (77.4)	24 (22.6)
Nakapiripirit (108)	96 (88.9)	12 (11.1)
Combined (901)	**826 (91.7)**	**75 (8.3)**

3.3.3 Immunization, vitamin A supplementation and de-worming coverage

Measles coverage

Two thirds (63.1%) of children aged 9-23 months had received a measles vaccination as identified with a marked health card (Table 3.17). A percentage of children (6.9%) were found not having been immunized as evidenced by a card with, Amudat had more than 13% of the children with cards but not yet immunized. However, all districts had immunization coverage above 80% when mothers' reports (those without cards) were considered.

Table 3.17: Measles immunization coverage among children 9-23 months by district

District	Yes with card	Yes without card	No with card	No without card
	N (%)	N (%)	N (%)	N (%)
Abim (81)	49 (60.5)	21 (25.9)	6 (7.4)	5 (6.2)
Amudat (97)	47 (48.5)	30 (30.9)	13 (13.4)	7 (7.2)
Kaabong (125)	60 (48.0)	56 (44.8)	3 (2.4)	6 (4.8)
Kotido (102)	79 (77.5)	11 (10.8)	10 (9.8)	2 (2.0)
Moroto (145)	112 (77.2)	20 (13.8)	10 (6.9)	3 (2.1)
Nakapiripirit (104)	66 (63.5)	33 (31.7)	3 (2.9)	2 (1.9)
Combined (654)	**413 (63.1)**	**171 (26.1)**	**45 (6.9)**	**25 (3.8)**

Vitamin A supplementation coverage

Vitamin A supplementation had been received by 1650 children (93.8%) aged 6-59 months; verified either by a health card or caretaker's recall. Coverage levels in the districts were highest in Kaabong, followed by Nakapiripirit and were lowest in Abim (Table 3.18). Apart from Abim district (63.2%), the rest of the assessed districts in the Karamoja region had met the national target of 80% and above for vitamin A in children less than 5 years of age when mothers reports were considered.

Table 3.18: Vitamin A coverage among children 6-59 months by district

District	Yes with card	Yes without card	No with card	No without card	Don't know
	N (%)	N (%)	N (%)	N (%)	N (%)
Abim(221)	124 (56.1)	82 (37.1)	12 (5.4)	3 (1.4)	0 (0.0)
Amudat(273)	126 (46.2)	109 (39.9)	22 (8.1)	6 (2.2)	10 (3.7)
Kaabong(331)	110 (33.2)	216 (65.3)	3 (0.9)	0 (0.0)	2 (0.6)
Kotido(331)	254 (76.7)	58 (17.5)	15 (4.5)	4 (1.2)	0 (0.0)
Moroto(303)	201 (66.3)	75 (24.8)	20 (6.6)	7 (2.3)	0 (0.0)
Nakapiripirit(301)	156 (51.8)	139 (46.2)	2 (0.7)	4 (1.3)	0 (0.0)
Combined (1760)	**971 (55.2)**	**679 (38.6)**	**74 (4.2)**	**24 (1.4)**	**12 (0.7)**

DPT3 coverage

Overall, DPT3 immunization had been received by 96.2% of children aged 9-23 months, verified either by a health card or the caretaker's recall (Table 3.19). The proportion of mothers without health cards was low. This is a very good system that should be strengthened further to make sure that all mothers have child health cards.

Table 3.19: DPT3 coverage among children 9 – 23 months by district

District	Yes with card	Yes without card	No with card	No without card
	N (%)	N (%)	N (%)	N (%)
Abim (79)	54 (68.4)	22 (27.8)	2 (2.5)	1 (1.3)
Amudat (89)	53 (59.6)	31 (34.8)	1 (1.1)	4 (4.5)
Kaabong (114)	55 (48.2)	56 (49.1)	2 (1.8)	1 (0.9)
Kotido (94)	79 (84.0)	11 (11.7)	2 (2.1)	2 (2.1)
Moroto (135)	109 (80.7)	19 (14.1)	5 (3.7)	2 (1.5)
Nakapiripirit (98)	63 (64.3)	34 (34.7)	1 (1.0)	0 (0.0)
Combined (609)	**413 (67.8)**	**173 (28.4)**	**13 (2.1)**	**10 (1.6)**

De-worming coverage

De-worming in all the assessed Karamoja districts in pooled analysis was 95% among children 12– 59 months, verified either by a health card or the caretaker's recall (Table 3.20).

Table 3.20: De-worming coverage among children 12-59 months by district

District	Yes with card	Yes without card	No with card	No without card	Don't know
	N (%)	N (%)	N (%)	N (%)	N (%)
Abim (191)	104 (54.5)	78 (40.8)	5 (2.6)	4 (2.1)	0 (0.0)
Amudat (224)	104 (46.4)	93 (41.5)	11 (4.9)	8 (3.6)	8 (3.6)
Kaabong (275)	80 (29.1)	194 (70.5)	0 (0.0)	1 (0.4)	0 (0.0)
Kotido (278)	217 (78.1)	48 (17.3)	9 (3.2)	4 (1.4)	0 (0.0)
Moroto (239)	149 (62.3)	69 (28.9)	17 (7.1)	4 (1.7)	0 (0.0)
Nakapiripirit (261)	130 (49.8)	128 (49.0)	0 (0.0)	3 (1.1)	0 (0.0)
Combined (1468)	**784 (53.4)**	**610 (41.6)**	**42 (2.9)**	**24 (1.6)**	**8 (0.5)**

3.3.4 Anemia prevalence among children and mothers

Anemia was measured by hemoglobin concentration in the blood with Hemocue machines 301, collected among children 6-59 months and mothers 15 – 49 years. A sub-sample of households in only three out of five districts was assessed due to logistical reasons. The cut-offs for mild, moderate and severe anemia among children were 10.0-10.9g/dl, 7-9.9 g/dl, and <7g/dl, respectively. Children with a hemoglobin concentration less than 11g/dl were therefore classified as anemic. The cut-offs for mild, moderate and severe anemia used for mothers was 10-11.9g/dl, 7-9.9 g/dl and <7 g/dl, respectively (i.e. assumed all mothers were not pregnant). The results are not adjusted for altitude implying that the real status of anemia might be worse than reported.

Severe anemia was most prevalent in children of Nakapiripirit district (3.8%) followed by Kaabong (2.8%) and Moroto (2.3%) had hemoglobin of less than 7 g/dl (Table 3.21). Overall, about 58% of children in in the three districts of Karamoja had anemia which calls for intensified interventions to address the problem.

Table 3.21: Anemia prevalence among children 6-59 months

District	Proportion (%) of Anemia by level of Severity			No anemia
	Severe	Moderate	Mild	
	N (%)	N (%)	N (%)	N (%)
Kaabong (106)	3 (2.8)	38 (35.8)	17 (16.0)	48 (45.3)
Moroto (132)	3 (2.3)	31 (23.5)	29 (22.0)	69 (52.3)
Nakapiripirit (131)	5 (3.8)	54 (41.2)	34 (26.0)	38 (29.0)
Combined (371)	**11 (3.0)**	**123 (33.2)**	**80 (21.6)**	**157 (42.3)**

Likewise 50% of the mothers in the three districts had anemia (Table 3.21)

Table 3.21: Anemia prevalence among women 15-49 years

District	Proportion (%) of Anemia by level of Severity			No anemia
	Severe	Moderate	Mild	
	N (%)	N (%)	N (%)	N (%)
Kaabong (85)	0 (0.0)	8 (9.4)	26 (30.6)	51 (60.0)
Moroto (115)	1 (0.9)	8 (7.0)	46 (40.0)	60 (52.2)
Nakapiripirit (97)	2 (2.1)	10 (10.3)	43 (44.3)	42 (43.3)
Combined (302)	**8 (2.6)**	**26 (8.6)**	**115 (38.1)**	**153 (50.7)**

3.3.5 Water and sanitation

Access to safe water

Over 80% of the household of the Karamoja districts reported to have access to safe drinking water (Table 3.23). Abim district recorded the highest (95.3%) access to safe water using boreholes while Amudat district had the least number of boreholes (61.1%) and the highest number of surface water (37.3%). Although coverage of safe water sources is high in the assessed Karamoja districts, the target should be to ensure 100% coverage since access to safe water is a fundamental human right.

Table 3.23: Source of drinking water in households by district

District (N)	Piped water	Protected well/spring	Bore hole	Open well/ spring/well	Surface water
	N (%)	N (%)	N (%)	N (%)	N (%)
Abim (297)	0 (0.0)	1 (0.3)	283 (95.3)	0 (0.0)	13 (4.4)
Amudat (303)	2 (0.7)	0 (0.0)	185 (61.1)	3 (1.0)	113 (37.3)
Kaabong (311)	0 (0.0)	1 (0.3)	261 (83.9)	0 (0.0)	49 (15.8)
Kotido (311)	45 (14.5)	0 (0.0)	238 (76.5)	0 (0.0)	28 (9.0)
Moroto (312)	2 (0.6)	0 (0.0)	269 (86.2)	7 (2.2)	34 (10.9)
Nakapiripirit (302)	22 (7.3)	0 (0.0)	200 (66.2)	0 (0.0)	80 (26.5)
Combined (1836)	**71 (3.9)**	**2 (0.1)**	**1436 (78.2)**	**10 (0.5)**	317 (17.3)

Treatment of drinking water at household level

Less than quarter of the households (16.5%) in the pooled analysis treated water (Table 3.24). This could have been due to the fact that most households get their water from boreholes, which is assumed to be safe. However, we cannot fully confirm whether that was the real reason when using the data collected in this assessment.

Table 3.24: Treatment of drinking water by district

District (N)	Treatment status		Method of treatment		
	Treated water	Did not treat water	Boil	Chlorination	Other
	N (%)	N (%)	N (%)	N (%)	N (%)
Abim (300)	63 (21.0)	237 (79.0)	10 (14.9)	10 (14.9)	47 (70.1)
Amudat (303)	14 (4.6)	289 (95.4)	9 (64.3)	1 (7.1)	4 (28.6)
Kaabong (308)	62 (20.1)	246 (79.9)	60 (90.9)	2 (3.0)	4 (6.1)
Kotido (310)	118 (38.1)	192 (61.9)	24 (19.8)	15 (12.4)	82 (67.8)
Moroto (312)	23 (7.4)	289 (92.6)	18 (64.3)	2 (7.1)	8 (28.6)
Nakapiripirit (302)	22 (7.3)	280 (92.7)	16 (66.7)	2 (8.3)	6 (25.0)
Combined (1835)	**302 (16.5)**	**1533 (83.5)**	**137 (42.8)**	**32 (10.0)**	**151 (47.2)**

Contamination of drinking water at household level

Despite the low water treatment practice among households in Karamoja, few households, 39 (2.2%) had their drinking water contaminated with faecal matter (Table 3.25).

Table 3.25: Prevalence of contaminated drinking water by district

District (N)	Number of households (%)
Abim (297)	7 (2.4)
Amudat (303)	4 (1.3)
Kaabong (287)	10 (3.4)
Kotido (312)	0 (0.0)
Moroto (308)	5 (1.6)
Nakapiripirit (300)	13 (4.3)
Combined (1768)	**39 (2.2)**

Sanitation

Up to 1181 (64.3%) of the households in the Karamoja region combined lacked latrines. The district with the lowest latrine coverage was in Amudat (2.6%%), while Kaabong (69.8%) was the best (Table 3.25). The problem of latrines ownership and usage in Karamoja is associated with cultural beliefs. More innovative strategies should be devised to promote use of latrines.

Table 3.25: Household ownership of latrine by district

District (N)	Yes	Yes and Shared	None
	N (%)	N (%)	N (%)
Abim (300)	140 (46.7)	65 (21.7)	95 (31.7)
Amudat (303)	8 (2.6)	9 (3.0)	286 (94.4)
Kaabong (308)	215 (69.8)	22 (7.1)	71 (23.1)
Kotido (311)	71 (22.8)	21 (6.8)	219 (70.4)
Moroto (313)	36 (11.5)	21 (6.7)	256 (81.8)
Nakapiripirit (303)	36 (11.9)	13 (4.3)	254 (83.8)
Combined (1838)	**506 (27.5)**	**151 (8.2)**	**1181 (64.3)**

The commonest type of latrine was the pit and many had no super structures (Table 3.26)

Table 3.26: Household latrine ownership by type of facility and by district

District (N)	Flush toilet	Pit latrine	No super structure
	N (%)	N (%)	N (%)
Abim (205)	0 (0.0)	197 (96.1)	8 (3.9)
Amudat (17)	0 (0.0)	10 (58.8)	7 (41.2)
Kaabong (237)	2 (0.8)	94 (39.7)	141 (59.5)
Kotido (93)	0 (0.0)	56 (60.2)	37 (39.8)
Moroto (55)	0 (0.0)	37 (67.3)	18 (32.7)
Nakapiripirit (49)	2 (4.1)	29 (59.2)	18 (36.7)
Combined (656)	**4 (0.6)**	**423 (64.5)**	**229 (34.9)**

Observations were made to determine presence of hand washing facilities in the household premises. In pooled analysis 70.7% of the households had no hand washing facilities after toilet, while 19.7% had water without soap. There were no variations between districts (results not presented).

Household dwelling structures, kitchens and compounds were also observed for the presence of garbage pits, sun rack for drying washed household utensils (plates, cups, spoons, etc) and a rack in the kitchen for storing utensils. Only 17.1% of the households in pooled analysis had garbage pits (Table 3.27). These are basic domestic hygiene practices that are still relevant in rural settings and should be promoted.

Table 3.27: Proportion of households with garbage pit, sun and kitchen racks

District (N)	Garbage pit	Sun rack	Rack in kitchen
Abim	34.7	22	16.1
Amudat	13	30.8	18.4
Kaabong	20.1	10.1	6.5
Kotido	23.7	20.7	15.2
Moroto	7.8	11.1	8.7
Nakapiripirit	3.7	5.7	4.7
Combined	**17.1**	**16.7**	**11.6**

3.5. Status of household socioeconomic status, hunger and food security

Household hunger and food security status was assessed for all selected households irrespective of whether a household had or did not have a child in the target age group.

3.5.1 Wealth profile of households

Household socioeconomic status is one of the factors, which aggravate hunger and food insecurity among households. Amudat district had the highest proportion of socioeconomically better off households 99 (32.6%) while Kotido and Nakapiripirit had the poorest, 58.7% and 44.2%, respectively (Table 3.28).

Table 3.28: Distribution of households by socioeconomic status according to districts

District (N)	Richest (%)	Rich (%)	Middle (%)	Poor (%)	Poorest (%)
Abim (295)	78 (26.4)	85 (28.8)	66 (22.4)	13 (4.4)	53 (18.0)
Amudat (304)	99 (32.6)	118 (38.8)	47 (15.5)	13 (4.3)	27 (8.9)
Kaabong (297)	21 (7.1)	53 (17.8)	61 (20.5)	60 (20.2)	102 (34.3)
Kotido (303)	28 (9.2)	30 (9.9)	31 (10.2)	36 (11.9)	178 (58.7)
Moroto (298)	55 (18.5)	62 (20.8)	67 (22.5)	13 (4.4)	101 (33.9)
Nakapiripirit (301)	29 (9.6)	61 (20.3)	57 (18.9)	21 (7.0)	133 (44.2)
Combined (1798)	310 (17.2)	409 (22.7)	329 (18.3)	156 (8.7)	594 (33.0)

3.5.2 Household food consumption scores (FCS-Low)

The proportion of highly food insecure households was most prevalent in Kotido district (15.2%) (Figure 3.9), while Amudat district (87.5%) had the highest proportion of food secure households.

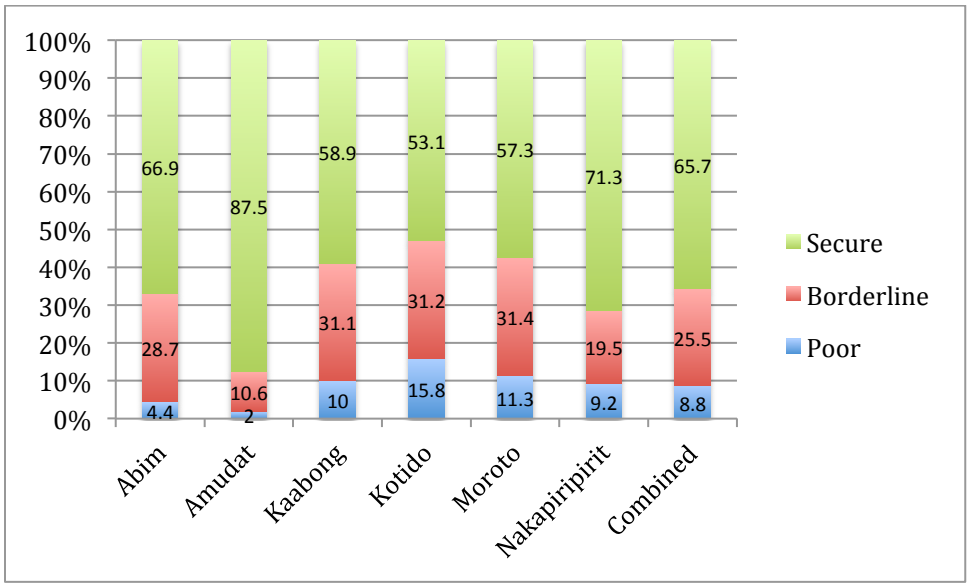

Figure 3.9: Food consumption status at household level by district

3.5.3 Household food production and other sources of foods

Of the 1833 households, which, responded to the question on food production, a total of 301 (16.4%) reported to have never cultivated or planted any food crop in the first and/or second agricultural season of 2012 (Table 3.30).

Table 3.30: Households involvement in cultivation farming in the first and/or second agricultural season of 2012

District (N)	Cultivated	Didn't cultivate
	N (%)	N (%)
Abim (300)	267 (89.0)	33 (11.0)
Amudat (303)	264 (87.1)	39 (12.9)
Kaabong (309)	287 (92.9)	22 (7.1)
Kotido (308)	256 (83.1)	52 (16.9)
Moroto (311)	197 (63.3)	114 (36.7)
Nakapiripirit (302)	261 (86.4)	41 (13.6)
Combined (1833)	**1532 (83.6)**	**301 (16.4)**

The main challenges to food production mentioned by the majority of the respondent who did not grow any food included no access to land (42.5%), poor weather (18.7%) and sickness or physical inability (17.9%). In all districts of Karamoja region combined, 1054 and 791 households engaged in sorghum and maize production, respectively. Moreover, these two crops were the most produced crops with a mean production of 82.4 kg and 78.8kg respectively (Table 3.31).

Table 3.31: Household mean food crop production by district

District(N)	Parameter	Maize	Millet	Sorghum	Potato	Cassava	Rice
Abim	Household (N)	46	115	241	190	39	6
	Mean (kg)	65.8	60.9	79.2	72.9	74.4	5.0
Amudat	Household (N)	254	0	18	5	2	0
	Mean (kg)	97.5	0.0	89.7	75.0	27.5	0.0
Kaabong	Household (N)	216	20	212	3	0	0
	Mean (kg)	76.2	40.6	93.9	80.0	0.0	0.0
Kotido	Household (N)	84	112	216	23	10	10
	Mean (kg)	37.7	47.1	67.5	16.9	0.0	0.0
Moroto	Household (N)	70	6	170	12	5	3
	Mean (kg)	63.6	50.0	79.5	54.0	47.0	0.0
Nakapiripirit	Household (N)	121	3	197	17	11	2
	Mean (kg)	86.7	40.3	91.9	81.5	76.6	100.0
Combined	**Household (N)**	**791**	**256**	**1054**	**250**	**67**	**21**
	Mean (kg)	**78.8**	**52.8**	**82.4**	**67.5**	**60.2**	**10.95**

3.5.4 Household animal ownership

Up to 810 (44.2%) of all assessed households owned animals (cow or sheep or goat). Of the districts, Amudat households were more likely to have animals than any other district (Figure 3.10).

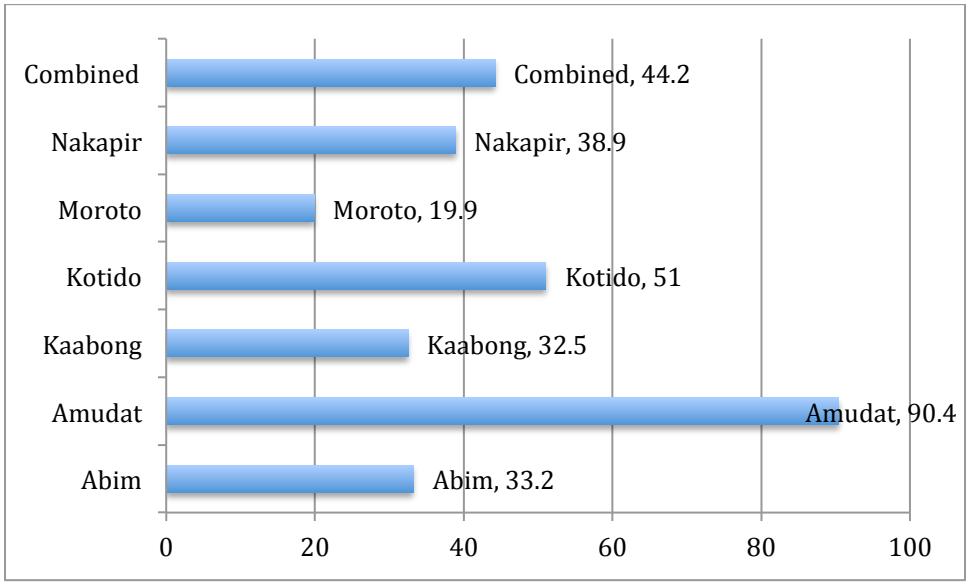

Figure 3.10: Proportion of households that owned either a cow or sheep or goat by district

It can be noted that the question on counting the number of herds is sensitive and possibly not valid. Whereas 810 households reported to have animals available, only 680 households were able to talk about the number of animals they have. The two questions were in different sections that were wide apart. However, it can also be noted that concealing of information was not in all districts but mainly in Kaabong 101 vs 69, Kotido 155 Vs 78, Moroto 62 Vs 39 while in Abim, Amudat, and Nakapiripirit the two questions yielded similar results. Overall, larger herds were reported in Amudat district (Table 3.32).

Table 3.32: Household ownership of large animal (cow, goat and sheep) by district

District (N)	1-5 heads	6-15 heads	Over 15 heads
Abim (100)	80 (80.0)	15 (15.0)	5 (5.0)
Amudat (275)	28 (10.2)	74 (26.9)	173 (62.9)
Kaabong (69)	4 (5.8)	31 (44.9)	34 (49.3)
Kotido (78)	5 (6.4)	21 (26.9)	52 (66.7)
Moroto (39)	14 (35.9)	15 (38.5)	10 (25.6)
Nakapir (119)	58 (48.7)	42 (35.3)	19 (16.0)
Combined (680)	**189 (27.8)**	**198 (29.1)**	**293 (43.1)**

3.5.5 Household income sources

The main household income sources were by selling naturals resources like firewood and charcoal (48.2%) and food crops (Figure 3:10). There is an improvement in income sources as brewing is no longer the leading source of income as was observed in previous surveys.

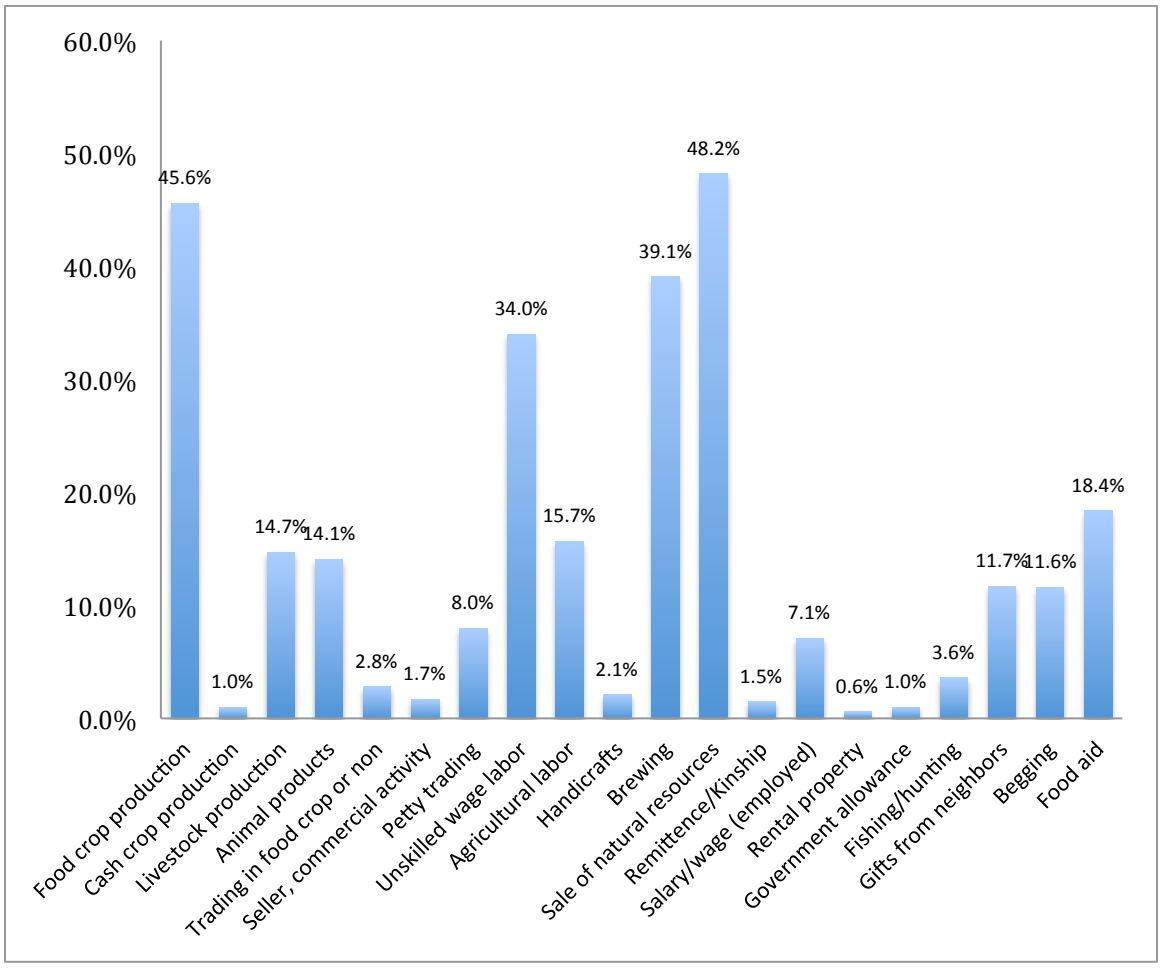

Figure 3.10: Proportion of household confirming the different income sources

3.5.6 Household expenditures

The median expenditure on milk, fruits and vegetables, cooked food and drinking water was zero while that for sugar was only Uganda shillings 1000 in pooled analyses (Table 3.33).

Kaabong, Kotido and Moroto spent considerably high amount on purchasing cereals. Karomoja region needs to be empowered economically.

Table 3.33: Household expenditure on food items during 30 days preceding the survey

District, Mean and Median	Cereals	Cooking oil	Meat/ Egg/ Fish	Pulses	Sugar	Milk/ cheese	Fruit/Vegs.	Cooked/ Processed food	Drinking water	Other foods
Abim N	298	300	300	300	300	300	300	300	300	299
Mean	13,005	6,234	5,946	8,028	3,809	569	429	122	73	619
Median	-	3,750	1,000	2,000	-	-	-	-	-	-
Amudat N	301	303	303	303	303	301	303	303	303	303
Mean	13,200	21,840	1,673	2,281	22,252	2,841	879	485	59	954
Median	-	10,000	-	-	15,000	-	-	-	-	-
Kaabong N	287	259	209	179	130	25	86	9	17	61
Mean	26,394	5,759	6,897	9,434	3,863	5,344	6,542	3,444	1,624	4,089
Median	15,000	4,000	5,000	5,500	3,000	3,000	3,000	1,000	1,000	1,000
Kotido N	219	234	141	187	76	35	70	25	73	55
Mean	36,394	9,097	15,756	20,587	10,958	10,240	6,149	3,052	8,456	2,751
Median	23,000	5,000	6,500	15,000	4,500	5,000	3,000	1,000	1,000	1,000
Moroto N	293	290	287	289	240	242	256	212	211	228
Mean	16,447	3,259	3,465	5,315	1,485	723	2,523	53	308	2,553
Median	10,000	2,200	2,000	3,000	-	-	350	-	-	-
Nakapirip N	302	303	303	302	303	303	303	303	303	301
Mean	11,370	4,516	3,990	2,813	1,824	1,384	1,070	201	57	571
Median	5,000	2,000	2,000	300	-	-	-	-	-	-
Combined N	**1,700**	**1,689**	**1,543**	**1,560**	**1,352**	**1,206**	**1,318**	**1,152**	**1,207**	**1,247**
Mean	**18,616**	**8,538**	**5,286**	**7,066**	**7,492**	**1,751**	**1,789**	**315**	**635**	**1,306**
Median	**9,000**	**4,000**	**2,000**	**2,000**	**1,000**	**-**	**-**	**-**	**-**	**-**

3.6 Gender dynamics at household level

3.6.1 Time allocation among husbands and wives on key household work and leisure

In many districts there were statistically significant differences in how time was used by men and women concerning non-agricultural work, household work, and leisure. The day preceding

the assessment, more men were significantly involved in non-agricultural work and leisure while women were significantly more engaged in household and care work (Table 3.34).

Table 3.34: Average time spent on households' tasks by men and women according to districts

Task	District	Women	Men
		Mean Hours (95%C.I)	Mean Hours (95%C.I)
Agricultural work	Abim (293)	4.1 (3.7 - 4.4)	3.7 (3.4 - 4.2)
	Amudat (301)	1.8 (1.6 - 2.1)	0.8 (0.5 - 1.1)
	Kaabong (308)	3.5 (3.2 - 3.9)	3.2 (2.8 - 3.6)
	Kotido (303)	1.0 (0.8 - 1.3)	0.7 (0.4 - 0.9)
	Moroto (304)	0.4 (0.2 - 0.5)	0.4 (0.2 - 0.6)
	Nakapiripirit (302)	0.3 (0.2 - 0.4)	0.6 (0.4 - 0.8)
	Combined (1811)	**1.8 (1.7 - 1.9)**	**1.7 (1.5 - 1.9)**
Non-agricultural Work	Abim (293)	2.2 (1.9 - 2.4)	3.9 (3.4 - 4.4)
	Amudat (301)	4.2 (3.9 - 4.5)	3.0 (2.1 - 3.8)
	Kaabong (308)	2.5 (2.2 - 2.8)	3.5 (3.1 - 3.9)
	Kotido (303)	4.3 (3.9 - 4.6)	5.5 (4.9 - 6.2)
	Moroto (304)	4.0 (3.7 - 4.4)	4.3 (3.8 - 4.8)
	Nakapiripirit (302)	2.6 (2.2 - 2.9)	2.5 (2.1 - 2.9)
	Combined (1811)	**3.3 (3.2 - 3.4)**	**3.8 (3.6 - 4.0)**
Household work and care of children and sick	Abim (293)	5.7 (5.3 - 6.0)	1.2 (0.9 - 1.6)
	Amudat (301)	5.9 (5.6 - 6.2)	0.7 (0.4 - 1.0)
	Kaabong (308)	5.5 (5.2 - 5.8)	3.0 (2.6 - 3.3)
	Kotido (303)	6.5 (6.1 - 6.8)	1.9 (1.5- 2.3)
	Moroto (304)	6.2 (5.8 - 6.5)	1.1 (0.9 - 1.3)
	Nakapiripirit (302)	7.4 (7.0 - 7.8)	1.8 (1.4 - 2.2)
	Combined (1811)	**6.2 (6.0 - 6.3)**	**1.7 (1.6 - 1.8)**
Leisure	Abim (293)	3.3 (2.9 - 3.6)	6.5 (6.0 - 6.9)
	Amudat (301)	3.3 (3.0 - 3.6)	9.8 (9.0-10.7)
	Kaabong (308)	3.6 (3.3 - 3.8)	6.3 (5.9 - 6.6)
	Kotido (303)	3.3 (3.1 - 3.5)	6.3 (5.6 - 6.8)
	Moroto (304)	3.8 (3.5 - 4.1)	6.2 (5.7 - 6.8)
	Nakapiripirit (302)	3.0 (2.8 - 3.3)	8.0 (7.5 - 8.6)
	Combined (1811)	**3.4 (3.3 - 3.5)**	**6.9 (6.7 - 7.2)**
Sleeping	Abim (293)	8.8 (8.6 - 9.9)	8.4 (8.1 - 8.6)
	Amudat (301)	8.8 (8.6 - 9.0)	9.7 (9.2 - 10.2)
	Kaabong (308)	8.8 (8.6 - 9.0)	7.8 (7.5 - 8.0)
	Kotido (303)	8.9 (8.7 - 9.1)	8.9 (8.5 - 9.3)
	Moroto (304)	9.7 (9.5 - 9.9)	8.5 (8.0 - 9.0)
	Nakapiripirit (302)	10.6 (10.4 - 10.8)	11.0 (10.8 - 11.3)
	Combined (1811)	**9.3 (9.2 - 9.4)**	**8.9 (8.8 - 9.1)**

3.6.2 Ownership and control profiles for selected items between husbands and wives

The men tended to own and control most assets but most of the savings and income were generally jointly owned (Table 3.35).

Table 3.35: Proportion of men and women who own and control key household items

Item		Ownership			Control		
		Women %	Men %	Joint %	Women %	Men %	Joint %
Radio	Abim (N=78)	12.8	59.0	28.2	11.5	51.2	37.2
	Amudat (N=44)	13.6	47.7	38.6	13.6	45.5	40.9
	Kaabong (N=47)	0.0	85.1	14.9	0.0	85.1	14.9
	Kotido (N=39)	10.3	61.5	28.2	12.8	33.3	53.8
	Moroto (N=49)	6.1	73.5	20.4	10.2	53.1	36.7
	Nakapirit (N=37)	8.1	62.2	29.7	8.1	43.2	48.6
	Combined (N=294)	**8.8**	**65.3**	**26.5**	**9.5**	**53.8**	**37.8**
Telephone	Abim (N=105)	21.9	54.3	23.8	21.9	51.5	26.7
	Amudat (N=102)	8.8	75.5	15.7	8.8	75.5	15.7
	Kaabong (N=33)	0.0	90.9	9.1	0.0	93.9	6.1
	Kotido (N=56)	14.3	71.4	14.3	16.1	64.3	19.6
	Moroto (N=65)	4.6	84.6	10.8	4.6	83.1	12.3
	Nakapirit (N=36)	13.9	75.0	11.1	13.9	75.0	11.1
	Combined (N=397)	**12.1**	**72.0**	**15.9**	**12.3**	**70.3**	**17.4**
Land	Abim (N=258)	20.9	60.4	18.6	20.2	51.6	28.3
	Amudat (N=270)	14.4	50.4	35.2	10.7	66.7	22.6
	Kaabong (N=302)	9.3	59.6	31.1	6.3	62.6	31.1
	Kotido (N=226)	15.0	54.4	30.5	13.7	36.7	49.6
	Moroto (N=188)	21.8	35.1	43.1	18.1	38.9	42.0
	Nakapirit (N=250)	12.0	56.4	31.2	13.6	52.0	34.4
	Combined (N=1494)	**15.1**	**53.8**	**31.1**	**13.3**	**52.8**	**33.8**
Cattle	Abim (N=47)	12.8	55.3	31.9	12.8	44.7	42.6
	Amudat (N=256)	2.7	93.8	3.5	2.7	94.9	2.3
	Kaabong (N=73)	0.0	64.4	35.6	0.0	50.3	49.3
	Kotido (N=123)	7.3	73.2	19.5	5.7	64.2	30.1
	Moroto (N=31)	0.0	83.9	16.1	3.2	80.6	16.1
	Nakapirit (N=87)	4.6	73.6	21.8	4.6	71.3	24.1
	Combined (N=617)	**4.2**	**79.9**	**15.9**	**4.1**	**75.7**	**20.3**
Bicycle	Abim (N=92)	8.7	76.1	15.2	6.5	65.3	28.3
	Amudat (N=23)	8.7	91.3	0.0	8.7	91.3	0.0
	Kaabong (N=35)	2.9	91.4	5.7	2.9	91.4	5.7
	Kotido (N=48)	10.4	72.9	16.7	10.4	64.6	25.0
	Moroto (N=30)	6.7	80.0	10.0	10.0	80.0	10.0

Item		Ownership			Control		
		Women %	Men %	Joint %	Women %	Men %	Joint %
	Nakapirit (N=24)	12.5	70.8	16.7	8.3	62.5	29.2
	Combined (N=252)	**8.3**	**79.4**	**12.3**	**7.5**	**72.6**	**19.8**
Savings	Abim (N=143)	37.1	17.5	44.8	30.1	9.8	60.1
	Amudat (N=190)	5.8	56.8	36.8	5.3	60.5	33.7
	Kaabong (N=46)	6.5	39.1	52.2	32.6	43.5	21.7
	Kotido (N=116)	30.2	14.7	55.2	29.3	12.9	57.8
	Moroto (N=53)	54.7	15.1	28.3	54.7	18.9	24.5
	Nakapirit (N=75)	44.0	18.7	37.3	41.3	9.3	48.0
	Combined (N=623)	**26.3**	**30.5**	**42.5**	**26.0**	**29.1**	**44.3**
Income	Abim (N=270)	27.0	27.4	45.2	26.0	16.4	57.2
	Amudat (N=285)	13.0	52.6	34.0	9.9	60.9	28.9
	Kaabong (N=164)	10.4	26.2	62.8	8.5	34.8	56.1
	Kotido (N=248)	25.8	12.1	62.1	27.0	10.9	62.1
	Moroto (N=213)	27.2	33.3	39.0	23.0	29.6	46.9
	Nakapirit (N=255)	38.8	19.6	41.6	36.9	11.4	51.4
	Combined (N=1435)	**24.3**	**29.1**	**46.3**	**22.5**	**27.4**	**49.8**

CONCLUSIONS AND RECOMMENDATIONS

Nutrition

- Prevalence of GAM was serious (12.5% 95%CI 11.0 – 14.1) in Karamoja region Programs should be intensified to address the emerging problem.
- Exclusive breastfeeding among children less than six months was 71.9% in pooled analysis with Kotido having the highest prevalence (83.7%) while Nakapiripirit (58.3%) and Amudat (58.3%) were the least.
- Overall, initiation of complementary feeding was timely in most of the districts. Among children aged 6 – 8 months, only 8.8% of the children had not received any complementary food in the 24 hours preceding the survey. This is an improvement as compared to previous surveys and other regions in the country.
- Over 50% of the children 6-23 months in all districts combined had low or moderate Individual Dietary Diversity Score (IDDS) with the worst district being Moroto where 72.8% of the children had low IDDS
- In pooled analysis, 58% of children and 50% of the mothers were anemic.
- The BMI indicate that 19.8% of the mothers were wasted/thin, while 3.4% were overweight and/or obese.

Morbidity and immunization

- The two-week prevalence of ARI and fever pooled analysis, was in equal proportions at 53.9% and 53.8%, respectively. The prevalence of diarrhea was 36.6% and was highest in Kitido district (47.6%).
- Only 44.9% of all the households possessed any bed net. Abim district (82.0%) reported the highest availability of any bed net among households while Moroto district (27.3%) reported the least.
- Of the about 50% of the households that had any bed net, 91.7% had their children sleeping under a bed net the night to the assessment. Whereas households with bed nets had them used by their children, the availability of the bed nets seemed to be the main factor that appeared to hinder usage. Partners should distribute more bed nets.

- Two thirds (63.1%) of children aged 9-23 months had received a measles vaccination as identified with a marked health card. In all districts immunization coverage including vitamin A supplementation and deworming was above 90% when mothers' reports (those without cards) were considered.

Water and sanitation

- Over 80% of the household of the Karamoja districts reported to have access to safe drinking water. Abim district recorded the highest (95.3%) access to safe water using boreholes while Amudat district had the least number of boreholes (61.1%) and the highest number of surface water (37.3%). However, less than a quarter of the households (16.5%) in the pooled analysis treated their drinking water.
- Despite the low water treatment practice among households in Karamoja, few households, 39 (2.2%) had their drinking water contaminated with faecal matter (E.coli).
- Up to 64.3% of the households in the Karamoja region combined lacked latrines. The district with the lowest latrine coverage was in Amudat (2.6%%), while Kaabong (69.8%) was the best. The problem of latrines ownership and usage in Karamoja is associated with cultural beliefs. More innovative strategies should be devised to promote use of latrines.

Socioeconomic status, hunger and food security

- Using a socioeconomic index derived from valuable household assets and ownership of shoes and clothes, Amudat district had the highest proportion of socioeconomically better off households 32.6% while Kotido and Nakapiripirit had high proportion of households in the poorest quintile, 58.7% and 44.2%, respectively
- The proportion of highly food insecure households (FCS Low) was 10.3% in Karamoja region with Kotido district having the highest prevalence (15.2%) while Amudat district (87.5%) had the highest proportion of food secure households. Compared to previous surveys there was relative improvement in the status of food security on the region.
- Sixteen percent of the households reported to have never cultivated or planted any food crop in the first and/or second agricultural season of 2012. More households in Moroto (36.6%) did not cultivate any crops. The main challenges to food production mentioned by the majority of the respondent who did not grow any food included no access to land (42.5%), poor weather (18.7%) and sickness or physical inability (17.9%).

- Although 57.4% and 43.2% of all households engaged in sorghum and maize production, respectively, the mean production of 82.4 kg for sorghum and 78.8kg for maize was low. Agriculture should be promoted further in Karamoja.
- Up to 44.2% of all the assessed households owned animals (cow or sheep or goat). Of the districts, Amudat households (91.1%) were more likely to have any of the three animals than any other district.
- The main household income sources were by selling firewood and charcoal (48.2%), selling food crops (45.6%) and brewing. There is an improvement in income sources as brewing is no longer the leading source of income as was observed in previous surveys.
- The median expenditure on food was low and was zero for milk, fruits and vegetables, cooked food, and drinking water. The median expenditure on sugar was only Uganda shillings 1000 in pooled analyses. However districts like Kaabong, Kotido and Moroto spent considerably higher on purchasing cereals. Karomoja region needs to be empowered economically.

Gender profiles

- In many districts there were statistically significant differences in how time was used by men and women concerning non-agricultural work, household work, and leisure. The day preceding the assessment, more men were significantly involved in non-agricultural work and leisure while women were significantly more engaged in household and care work.
- The men tended to own and control most household assets but most of the savings and income were generally jointly owned

Appendix 1: Supervisors

No	Name	Phone	Email
1.	Baguma K Susan	0772663812	krsusieb@yahoo.com
2.	Bagonza Moses	0759129790	bagymog@gmail.com
3.	Katuramu Patrick	0775291307	Katpat@yahoo.co.uk
4.	Okot Patrick	0772349550	Patrickokot@yahoo.com
5.	Kanyike Joseph	075172229	jbkanyike@gmail.com
6.	Kanyangabo Edward	0755028633	ekanyangabo@yahoo.com
7.	Orikiriza Grace	0788908731	graceoriks@yahoo.com
8.	Bagonza Arthur	0772408080	arthurbagonza@yahoo.com
9.	Rumoma Dickens	0776947183	Rumoma@yahoo.com
10.	Joab Tusaasire	0772581199	joabt2004@yahoo.co.uk
11.	Karungi Clara	0776959087	cakarungi@yahoo.com
12.	Kansiime Rachel	07528800072	kansiimerachel@yahoo.com
13.	Albert Mugabi	0712962582	albertmunya@yahoo.co.uk
14.	Mayengo Philomera	0702690043	Phillomayengo@yahoo.com
15.	Ngobi Johnathan	0772496630	jonangobi@gmail.com
16.	Wamani Henry	0755443300	wamanih@gmail.com

Appendix 2: Results based on NCHS reference 1977

Abim District

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 217	**Boys** n = 112	**Girls** n = 105
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(19) 8.8 % (5.7 - 13.3 95% C.I.)	(9) 8.0 % (4.3 - 14.6 95% C.I.)	(10) 9.5 % (5.3 - 16.6 95% C.I.)
Prevalence of moderate malnutrition **(<-2 z-score and >=-3 z-score, no oedema)**	(13) 6.0 % (3.5 - 10.0 95% C.I.)	(6) 5.4 % (2.5 - 11.2 95% C.I.)	(7) 6.7 % (3.3 - 13.1 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(6) 2.8 % (1.3 - 5.9 95% C.I.)	(3) 2.7 % (0.9 - 7.6 95% C.I.)	(3) 2.9 % (1.0 - 8.1 95% C.I.)

The prevalence of oedema is 1.4 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting (<-3 z-score)		**Moderate wasting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	64	2	3.1	9	14.1	52	81.3	1	1.6
18-29	62	1	1.6	3	4.8	57	91.9	1	1.6
30-41	47	0	0.0	1	2.1	45	95.7	1	2.1

42-53	34	0	0.0	0	0.0	34	100.0	0	0.0
54-59	10	0	0.0	0	0.0	10	100.0	0	0.0
Total	217	3	1.4	13	6.0	198	91.2	3	1.4

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 3 (1.4 %)
Oedema absent	Marasmic No. 3 (1.4 %)	Not severely malnourished No. 211 (97.2 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 222	**Boys** n = 114	**Girls** n = 108
Prevalence of global malnutrition (< 125 mm and/or oedema)	(222) 100.0 % (98.3 - 100.0 95% C.I.)	(114) 100.0 % (96.7 - 100.0 95% C.I.)	(108) 100.0 % (96.6 - 100.0 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(0) 0.0 % (0.0 - 1.7 95% C.I.)	(0) 0.0 % (0.0 - 3.3 95% C.I.)	(0) 0.0 % (0.0 - 3.4 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(222) 100.0 % (98.3 - 100.0 95% C.I.)	(114) 100.0 % (96.7 - 100.0 95% C.I.)	(108) 100.0 % (96.6 - 100.0 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (> = 125 mm)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	64	64	100.0	0	0.0	0	0.0	1	1.6
18-29	64	64	100.0	0	0.0	0	0.0	1	1.6
30-41	49	49	100.0	0	0.0	0	0.0	1	2.0
42-53	35	35	100.0	0	0.0	0	0.0	0	0.0
54-59	10	10	100.0	0	0.0	0	0.0	0	0.0
Total	222	222	100.0	0	0.0	0	0.0	3	1.4

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 217	**Boys** n = 113	**Girls** n = 104
Prevalence of underweight (<-2 z-score)	(49) 22.6 % (17.5 - 28.6)	(22) 19.5 % (13.2 - 27.7)	(27) 26.0 % (18.5 - 35.1)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(39) 18.0 % (13.4 - 23.6)	(15) 13.3 % (8.2 - 20.8)	(24) 23.1 % (16.0 - 32.0)
Prevalence of severe underweight (<-3 z-score)	(10) 4.6 % (2.5 - 8.3 95)	(7) 6.2 % (3.0 - 12.2 .)	(3) 2.9 % (1.0 - 8.1 9.)

Table 3.8: Prevalence of underweight by age, based on weight-for-age z-scores

	Severe underweight (<-3 z-score)	Moderate underweight (>= -3 and <-2	Normal (> = -2 z score)	Oedema

				z-score)					
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	64	6	9.4	11	17.2	47	73.4	1	1.6
18-29	62	2	3.2	16	25.8	44	71.0	1	1.6
30-41	46	2	4.3	2	4.3	42	91.3	1	2.2
42-53	35	0	0.0	7	20.0	28	80.0	0	0.0
54-59	10	0	0.0	3	30.0	7	70.0	0	0.0
Total	217	10	4.6	39	18.0	168	77.4	3	1.4

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 216	**Boys** n **=** 111	**Girls** n **=** 105
Prevalence of stunting **(<-2 z-score)**	(75) 34.7 % (28.7 - 41.3 95% C.I.)	(41) 36.9 % (28.5 - 46.2 95% C.I.)	(34) 32.4 % (24.2 - 41.8 95% C.I.)
Prevalence of moderate stunting **(<-2 z-score and >=-3 z-score)**	(39) 18.1 % (13.5 - 23.7 95% C.I.)	(21) 18.9 % (12.7 - 27.2 95% C.I.)	(18) 17.1 % (11.1 - 25.5 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(36) 16.7 % (12.3 - 22.2 95% C.I.)	(20) 18.0 % (12.0 - 26.2 95% C.I.)	(16) 15.2 % (9.6 - 23.3 95% C.I.)

Table 3.10: Prevalence of stunting by age based on height-for-age z-scores

	Severe stunting (<-3 z-score)	**Moderate stunting (>= -3 and <-2 z-**	**Normal** **(> = -2 z score)**

				score)			
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	64	5	7.8	8	12.5	51	79.7
18-29	60	16	26.7	13	21.7	31	51.7
30-41	48	6	12.5	9	18.8	33	68.8
42-53	34	6	17.6	5	14.7	23	67.6
54-59	10	3	30.0	4	40.0	3	30.0
Total	216	36	16.7	39	18.1	141	65.3

Table 3.11: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	214	-0.30±1.20	1.00	7	2
Weight-for-Age	217	-1.00±1.28	1.00	5	1
Height-for-Age	216	-1.40±1.47	1.00	3	4

* contains for WHZ and WAZ the children with edema.

Amudat District

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 267	**Boys** n = 131	**Girls** n = 136
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(45) 16.9 % (12.8 - 21.8 95% C.I.)	(21) 16.0 % (10.7 - 23.3 95% C.I.)	(24) 17.6 % (12.2 - 24.9 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(28) 10.5 % (7.4 - 14.7 95% C.I.)	(13) 9.9 % (5.9 - 16.2 95% C.I.)	(15) 11.0 % (6.8 - 17.4 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score	(17) 6.4 %	(8) 6.1 %	(9) 6.6 %

and/or oedema)	(4.0 - 10.0 95% C.I.)	(3.1 - 11.6 95% C.I.)	(3.5 - 12.1 95% C.I.)

The prevalence of oedema is 1.5 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting (<-3 z-score)		**Moderate wasting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	88	5	5.7	11	12.5	70	79.5	2	2.3
18-29	66	3	4.5	6	9.1	55	83.3	2	3.0
30-41	65	3	4.6	6	9.2	56	86.2	0	0.0
42-53	32	1	3.1	5	15.6	26	81.3	0	0.0
54-59	16	1	6.3	0	0.0	15	93.8	0	0.0
Total	267	13	4.9	28	10.5	222	83.1	4	1.5

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 4 (1.5 %)
Oedema absent	Marasmic No. 13 (4.9 %)	Not severely malnourished No. 250 (93.6 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 271	Boys n = 134	Girls n = 137
Prevalence of global malnutrition (< 125 mm and/or oedema)	(271) 100.0 % (98.6 - 100.0 95% C.I.)	(134) 100.0 % (97.2 - 100.0 95% C.I.)	(137) 100.0 % (97.3 - 100.0 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(0) 0.0 % (0.0 - 1.4 95% C.I.)	(0) 0.0 % (0.0 - 2.8 95% C.I.)	(0) 0.0 % (0.0 - 2.7 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(271) 100.0 % (98.6 - 100.0 95% C.I.)	(134) 100.0 % (97.2 - 100.0 95% C.I.)	(137) 100.0 % (97.3 - 100.0 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (> = 125 mm)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	88	88	100.0	0	0.0	0	0.0	2	2.3
18-29	69	69	100.0	0	0.0	0	0.0	2	2.9
30-41	66	66	100.0	0	0.0	0	0.0	0	0.0
42-53	32	32	100.0	0	0.0	0	0.0	0	0.0
54-59	16	16	100.0	0	0.0	0	0.0	0	0.0
Total	271	271	100.0	0	0.0	0	0.0	4	1.5

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 270	Boys n = 132	Girls n = 138
Prevalence of underweight (<-2 z-score)	(66) 24.4 % (19.7 - 29.9 95% C.I.)	(35) 26.5 % (19.7 - 34.6 95% C.I.)	(31) 22.5 % (16.3 - 30.1 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(39) 14.4 % (10.7 - 19.1 95% C.I.)	(20) 15.2 % (10.0 - 22.2 95% C.I.)	(19) 13.8 % (9.0 - 20.5 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(27) 10.0 % (7.0 - 14.2 95% C.I.)	(15) 11.4 % (7.0 - 17.9 95% C.I.)	(12) 8.7 % (5.0 - 14.6 95% C.I.)

Table 3.8: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	88	9	10.2	14	15.9	65	73.9	2	2.3
18-29	67	6	9.0	9	13.4	52	77.6	2	3.0
30-41	66	9	13.6	7	10.6	50	75.8	0	0.0
42-53	32	3	9.4	6	18.8	23	71.9	0	0.0
54-59	17	0	0.0	3	17.6	14	82.4	0	0.0
Total	270	27	10.0	39	14.4	204	75.6	4	1.5

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 267	Boys n = 129	Girls n = 138
Prevalence of	(82) 30.7 %	(42) 32.6 %	(40) 29.0 %

stunting (<-2 z-score)	(25.5 - 36.5 95% C.I.)	(25.1 - 41.0 95% C.I.)	(22.1 - 37.0 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(47) 17.6 % (13.5 - 22.6 95% C.I.)	(27) 20.9 % (14.8 - 28.7 95% C.I.)	(20) 14.5 % (9.6 - 21.3 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(35) 13.1 % (9.6 - 17.7 95% C.I.)	(15) 11.6 % (7.2 - 18.3 95% C.I.)	(20) 14.5 % (9.6 - 21.3 95% C.I.)

Table 3.10: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		**Moderate stunting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	87	7	8.0	14	16.1	66	75.9
18-29	67	13	19.4	16	23.9	38	56.7
30-41	64	13	20.3	6	9.4	45	70.3
42-53	32	0	0.0	8	25.0	24	75.0
54-59	17	2	11.8	3	17.6	12	70.6
Total	267	35	13.1	47	17.6	185	69.3

Table 3.11: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	263	-0.83±1.31	1.00	8	3
Weight-for-Age	270	-1.26±1.30	1.00	4	0
Height-for-Age	267	-1.13±1.73	1.00	1	6

* contains for WHZ and WAZ the children with edema.

Kaabong District

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 325	**Boys** n = 173	**Girls** n = 152
Prevalence of global malnutrition **(<-2 z-score and/or oedema)**	(44) 13.5 % (10.2 - 17.7 95% C.I.)	(29) 16.8 % (11.9 - 23.0 95% C.I.)	(15) 9.9 % (6.1 - 15.6 95% C.I.)
Prevalence of moderate malnutrition **(<-2 z-score and >=-3 z-score, no oedema)**	(33) 10.2 % (7.3 - 13.9 95% C.I.)	(21) 12.1 % (8.1 - 17.8 95% C.I.)	(12) 7.9 % (4.6 - 13.3 95% C.I.)
Prevalence of severe malnutrition **(<-3 z-score and/or oedema)**	(11) 3.4 % (1.9 - 6.0 95% C.I.)	(8) 4.6 % (2.4 - 8.9 95% C.I.)	(3) 2.0 % (0.7 - 5.6 95% C.I.)

The prevalence of oedema is 0.3 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	7	6.7	17	16.2	80	76.2	1	1.0
18-29	92	3	3.3	8	8.7	81	88.0	0	0.0
30-41	73	0	0.0	5	6.8	68	93.2	0	0.0
42-53	41	0	0.0	2	4.9	39	95.1	0	0.0
54-59	14	0	0.0	1	7.1	13	92.9	0	0.0
Total	325	10	3.1	33	10.2	281	86.5	1	0.3

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 1 (0.3 %)
Oedema absent	Marasmic No. 10 (3.1 %)	Not severely malnourished No. 314 (96.6 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All	**Boys**	**Girls**

	n = 328	n = 176	n = 152
Prevalence of global malnutrition (< 125 mm and/or oedema)	(328) 100.0 % (98.8 - 100.0 95% C.I.)	(176) 100.0 % (97.9 - 100.0 95% C.I.)	(152) 100.0 % (97.5 - 100.0 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(0) 0.0 % (0.0 - 1.2 95% C.I.)	(0) 0.0 % (0.0 - 2.1 95% C.I.)	(0) 0.0 % (0.0 - 2.5 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(328) 100.0 % (98.8 - 100.0 95% C.I.)	(176) 100.0 % (97.9 - 100.0 95% C.I.)	(152) 100.0 % (97.5 - 100.0 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		**Moderate wasting (>= 115 mm and < 125 mm)**		**Normal (> = 125 mm)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	107	107	100.0	0	0.0	0	0.0	1	0.9
18-29	91	91	100.0	0	0.0	0	0.0	0	0.0
30-41	75	75	100.0	0	0.0	0	0.0	0	0.0
42-53	41	41	100.0	0	0.0	0	0.0	0	0.0
54-59	14	14	100.0	0	0.0	0	0.0	0	0.0
Total	328	328	100.0	0	0.0	0	0.0	1	0.3

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 327	**Boys** n **=** 173	**Girls** n **=** 154
Prevalence of underweight **(<-2 z-score)**	(84) 25.7 % (21.3 - 30.7)	(51) 29.5 % (23.2 - 36.7)	(33) 21.4 % (15.7 - 28.6)
Prevalence of moderate underweight **(<-2 z-score and >=-3 z-score)**	(50) 15.3 % (11.8 - 19.6)	(29) 16.8 % (11.9 - 23.0)	(21) 13.6 % (9.1 - 19.9)
Prevalence of severe underweight **(<-3 z-score)**	(34) 10.4 % (7.5 - 14.2)	(22) 12.7 % (8.5 - 18.5)	(12) 7.8 % (4.5 - 13.1)

Table 3.8: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		**Moderate underweight (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	15	14.3	19	18.1	71	67.6	1	1.0
18-29	92	12	13.0	11	12.0	69	75.0	0	0.0
30-41	75	5	6.7	12	16.0	58	77.3	0	0.0
42-53	41	1	2.4	8	19.5	32	78.0	0	0.0
54-59	14	1	7.1	0	0.0	13	92.9	0	0.0
Total	327	34	10.4	50	15.3	243	74.3	1	0.3

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 321	**Boys** n = 172	**Girls** n = 149
Prevalence of stunting **(<-2 z-score)**	(99) 30.8 % (26.0 - 36.1 95% C.I.)	(58) 33.7 % (27.1 - 41.1 95% C.I.)	(41) 27.5 % (21.0 - 35.2 95% C.I.)
Prevalence of moderate stunting **(<-2 z-score and >=-3 z-score)**	(49) 15.3 % (11.7 - 19.6 95% C.I.)	(25) 14.5 % (10.0 - 20.6 95% C.I.)	(24) 16.1 % (11.1 - 22.8 95% C.I.)
Prevalence of severe stunting **(<-3 z-score)**	(50) 15.6 % (12.0 - 19.9 95% C.I.)	(33) 19.2 % (14.0 - 25.7 95% C.I.)	(17) 11.4 % (7.2 - 17.5 95% C.I.)

Table 3.10: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		**Moderate stunting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	104	15	14.4	19	18.3	70	67.3
18-29	90	14	15.6	18	20.0	58	64.4
30-41	72	16	22.2	6	8.3	50	69.4
42-53	41	4	9.8	6	14.6	31	75.6
54-59	14	1	7.1	0	0.0	13	92.9
Total	321	50	15.6	49	15.3	222	69.2

Table 3.11: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	324	-0.78±1.08	1.00	8	1
Weight-for-Age	327	-1.19±1.39	1.00	4	2
Height-for-Age	321	-1.20±1.73	1.00	3	9

* contains for WHZ and WAZ the children with edema.

Kotido District

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 325	**Boys** n = 177	**Girls** n = 148
Prevalence of global malnutrition **(<-2 z-score and/or oedema)**	(34) 10.5 % (7.6 - 14.3 95% C.I.)	(20) 11.3 % (7.4 - 16.8 95% C.I.)	(14) 9.5 % (5.7 - 15.3 95% C.I.)
Prevalence of moderate malnutrition **(<-2 z-score and >=-3 z-score, no oedema)**	(19) 5.8 % (3.8 - 8.9 95% C.I.)	(13) 7.3 % (4.3 - 12.2 95% C.I.)	(6) 4.1 % (1.9 - 8.6 95% C.I.)
Prevalence of severe malnutrition **(<-3 z-score and/or oedema)**	(15) 4.6 % (2.8 - 7.5 95% C.I.)	(7) 4.0 % (1.9 - 7.9 95% C.I.)	(8) 5.4 % (2.8 - 10.3 95% C.I.)

The prevalence of oedema is 2.2 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting (<-3 z-score)		**Moderate wasting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age	**Total**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**

(mo)	no.								
6-17	96	1	1.0	9	9.4	83	86.5	3	3.1
18-29	84	5	6.0	5	6.0	73	86.9	1	1.2
30-41	76	1	1.3	4	5.3	69	90.8	2	2.6
42-53	53	1	1.9	1	1.9	50	94.3	1	1.9
54-59	16	0	0.0	0	0.0	16	100.0	0	0.0
Total	325	8	2.5	19	5.8	291	89.5	7	2.2

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 7 (2.2 %)
Oedema absent	Marasmic No. 8 (2.5 %)	Not severely malnourished No. 310 (95.4 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 331	**Boys** n = 181	**Girls** n = 150
Prevalence of global malnutrition **(< 125 mm and/or oedema)**	(331) 100.0 % (98.9 - 100.0 95% C.I.)	(181) 100.0 % (97.9 - 100.0 95% C.I.)	(150) 100.0 % (97.5 - 100.0 95% C.I.)
Prevalence of moderate malnutrition	(0) 0.0 %	(0) 0.0 %	(0) 0.0 %

(< 125 mm and >= 115 mm, no oedema)	(0.0 - 1.1 95% C.I.)	(0.0 - 2.1 95% C.I.)	(0.0 - 2.5 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(331) 100.0 % (98.9 - 100.0 95% C.I.)	(181) 100.0 % (97.9 - 100.0 95% C.I.)	(150) 100.0 % (97.5 - 100.0 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		**Moderate wasting (>= 115 mm and < 125 mm)**		**Normal (> = 125 mm)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	96	96	100.0	0	0.0	0	0.0	3	3.1
18-29	88	88	100.0	0	0.0	0	0.0	1	1.1
30-41	77	77	100.0	0	0.0	0	0.0	2	2.6
42-53	53	53	100.0	0	0.0	0	0.0	1	1.9
54-59	17	17	100.0	0	0.0	0	0.0	0	0.0
Total	331	331	100.0	0	0.0	0	0.0	7	2.1

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 324	**Boys** n = 180	**Girls** n = 144
Prevalence of underweight (<-2 z-score)	(72) 22.2 % (18.0 - 27.1.)	(48) 26.7 % (20.7 - 33.6)	(24) 16.7 % (11.5 - 23.6)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(47) 14.5 % (11.1 - 18.8)	(31) 17.2 % (12.4 - 23.4)	(16) 11.1 % (7.0 - 17.3)

Prevalence of severe underweight (<-3 z-score)	(25) 7.7 % (5.3 - 11.1)	(17) 9.4 % (6.0 - 14.6)	(8) 5.6 % (2.8 - 10.6)

Table 3.8: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		**Moderate underweight (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	93	7	7.5	17	18.3	69	74.2	3	3.2
18-29	86	12	14.0	14	16.3	60	69.8	1	1.2
30-41	76	4	5.3	12	15.8	60	78.9	2	2.6
42-53	52	1	1.9	4	7.7	47	90.4	1	1.9
54-59	17	1	5.9	0	0.0	16	94.1	0	0.0
Total	324	25	7.7	47	14.5	252	77.8	7	2.2

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 327	**Boys** n **=** 179	**Girls** n **=** 148
Prevalence of stunting (<-2 z-score)	(119) 36.4 % (31.4 - 41.7)	(69) 38.5 % (31.7 - 45.8)	(50) 33.8 % (26.7 - 41.7)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(68) 20.8 % (16.7 - 25.5)	(37) 20.7 % (15.4 - 27.2)	(31) 20.9 % (15.2 - 28.2)
Prevalence of severe stunting (<-3 z-score)	(51) 15.6 % (12.1 - 19.9)	(32) 17.9 % (13.0 - 24.1)	(19) 12.8 % (8.4 - 19.2)

Table 3.10: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	96	10	10.4	13	13.5	73	76.0
18-29	86	23	26.7	20	23.3	43	50.0
30-41	76	12	15.8	16	21.1	48	63.2
42-53	52	5	9.6	15	28.8	32	61.5
54-59	17	1	5.9	4	23.5	12	70.6
Total	327	51	15.6	68	20.8	208	63.6

Table 3.11: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	318	-0.39±1.18	1.00	13	3
Weight-for-Age	324	-1.11±1.27	1.00	10	0
Height-for-Age	327	-1.52±1.46	1.00	6	1

* contains for WHZ and WAZ the children with edema.

Moroto District

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 299	**Boys** n = 143	**Girls** n = 156
Prevalence of global malnutrition	(35) 11.7 % (8.5 - 15.8 95% C.I.)	(21) 14.7 % (9.8 - 21.4 95% C.I.)	(14) 9.0 % (5.4 - 14.5 95% C.I.)

(<-2 z-score and/or oedema)			
Prevalence of moderate malnutrition **(<-2 z-score and >=-3 z-score, no oedema)**	(28) 9.4 % (6.6 - 13.2 95% C.I.)	(18) 12.6 % (8.1 - 19.0 95% C.I.)	(10) 6.4 % (3.5 - 11.4 95% C.I.)
Prevalence of severe malnutrition **(<-3 z-score and/or oedema)**	(7) 2.3 % (1.1 - 4.8 95% C.I.)	(3) 2.1 % (0.7 - 6.0 95% C.I.)	(4) 2.6 % (1.0 - 6.4 95% C.I.)

The prevalence of oedema is 0.7 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting (<-3 z-score)		**Moderate wasting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	119	1	0.8	16	13.4	102	85.7	0	0.0
18-29	89	3	3.4	6	6.7	78	87.6	2	2.2
30-41	51	1	2.0	2	3.9	48	94.1	0	0.0
42-53	32	0	0.0	4	12.5	28	87.5	0	0.0
54-59	8	0	0.0	0	0.0	8	100.0	0	0.0
Total	299	5	1.7	28	9.4	264	88.3	2	0.7

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor No. 0	Kwashiorkor No. 2

	(0.0 %)	(0.7 %)
Oedema absent	Marasmic No. 5 (1.7 %)	Not severely malnourished No. 292 (97.7 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 301	**Boys** n = 144	**Girls** n = 157
Prevalence of global malnutrition **(< 125 mm and/or oedema)**	(301) 100.0 % (98.7 - 100)	(144) 100.0 % (97.4 - 100)	(157) 100.0 % (97.6 - 100)
Prevalence of moderate malnutrition **(< 125 mm and >= 115 mm, no oedema)**	(0) 0.0 % (0.0 - 1.3)	(0) 0.0 % (0.0 - 2.6)	(0) 0.0 % (0.0 - 2.4)
Prevalence of severe malnutrition **(< 115 mm and/or oedema)**	(301) 100.0 % (98.7 - 100)	(144) 100.0 % (97.4 - 100.0)	(157) 100.0 % (97.6 - 100)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		**Moderate wasting (>= 115 mm and < 125 mm)**		**Normal (> = 125 mm)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	119	119	100.0	0	0.0	0	0.0	0	0.0
18-29	90	90	100.0	0	0.0	0	0.0	2	2.2
30-41	51	51	100.0	0	0.0	0	0.0	0	0.0

42-53	32	32	100.0	0	0.0	0	0.0	0	0.0
54-59	8	8	100.0	0	0.0	0	0.0	0	0.0
Total	300	300	100.0	0	0.0	0	0.0	2	0.7

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 299	**Boys** n **=** 143	**Girls** n **=** 156
Prevalence of underweight **(<-2 z-score)**	(91) 30.4 % (25.5 - 35.9)	(45) 31.5 % (24.4 - 39.5)	(46) 29.5 % (22.9 - 37.1)
Prevalence of moderate underweight **(<-2 z-score and >=-3 z-score)**	(63) 21.1 % (16.8 - 26.0)	(27) 18.9 % (13.3 - 26.1)	(36) 23.1 % (17.2 - 30.3)
Prevalence of severe underweight **(<-3 z-score)**	(28) 9.4 % (6.6 - 13.2 .)	(18) 12.6 % (8.1 - 19.0)	(10) 6.4 % (3.5 - 11.4)

Table 3.8: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		**Moderate underweight (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	119	9	7.6	22	18.5	88	73.9	0	0.0
18-29	87	7	8.0	20	23.0	60	69.0	2	2.3
30-41	51	7	13.7	8	15.7	36	70.6	0	0.0
42-53	32	4	12.5	11	34.4	17	53.1	0	0.0
54-59	8	0	0.0	1	12.5	7	87.5	0	0.0

Total	297	27	9.1	62	20.9	208	70.0	2	0.7

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 297	**Boys** n **=** 144	**Girls** n **=** 153
Prevalence of stunting **(<-2 z-score)**	(115) 38.7 % (33.4 - 44.4 95% C.I.)	(63) 43.8 % (35.9 - 51.9 95% C.I.)	(52) 34.0 % (27.0 - 41.8 95% C.I.)
Prevalence of moderate stunting **(<-2 z-score and >=-3 z-score)**	(65) 21.9 % (17.6 - 26.9 95% C.I.)	(33) 22.9 % (16.8 - 30.4 95% C.I.)	(32) 20.9 % (15.2 - 28.0 95% C.I.)
Prevalence of severe stunting **(<-3 z-score)**	(50) 16.8 % (13.0 - 21.5 95% C.I.)	(30) 20.8 % (15.0 - 28.2 95% C.I.)	(20) 13.1 % (8.6 - 19.3 95% C.I.)

Table 3.10: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		**Moderate stunting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	116	14	12.1	27	23.3	75	64.7
18-29	89	13	14.6	23	25.8	53	59.6
30-41	51	12	23.5	12	23.5	27	52.9
42-53	32	11	34.4	1	3.1	20	62.5
54-59	8	0	0.0	2	25.0	6	75.0
Total	296	50	16.9	65	22.0	181	61.1

Table 3.11: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	297	-0.74±1.11	1.00	6	0
Weight-for-Age	299	-1.45±1.26	1.00	3	1
Height-for-Age	297	-1.65±1.51	1.00	2	4

* contains for WHZ and WAZ the children with edema.

Appendix 3: Chart for calculating age

(ACCURATE AT DECEMBER 2012)

Date of Birth	Age (in months)	Date Of Birth	Age (in Months)
Jan-08	**59**	July–10	29
Feb-08	58	Aug -10	28
March-08	57	Sept-10	27
April-08	56	Oct-10	26
May-08	55	Nov-10	25
June-08	54	Dec-10	24
July-08	53	Jan-11	23
Aug –08	52	Feb-11	22
Sept-08	51	March-11	21
Oct–08	50	April-11	20
Nov -08	49	May –11	19
Dec-08	48	June-11	18
Jan-09	47	July–11	17
Feb-09	46	Aug -11	16
March-09	45	Sept-11	15
April-09	44	Oct-11	14
May-09	43	Nov-11	13
June-09	42	Dec-11	12
July-09	41	Jan-12	11
Aug –09	40	Feb-12	10
Sept-09	39	Mar-12	**9**
Oct–09	38	April-12	8
Nov- 09	37	May-12	7
Dec-09	36	June-12	6
Jan-10	35	July-12	5
Feb-10	34	Aug-12	**4**
March-10	33	Sept -12	**3**
Apr -10	32	Oct-12	**2**
May –10	31	Nov-12	**1**
June-10	30	Dec-12	**0**

Appendix 4: Referral form

MINISTRY OF HEALTH/ UNICEF/ MUSPH COLLABORATION

HEALTH AND NUTRITION ASSESSMENT IN KARAMOJA REGION

Under-5 Referral Card for Malnourished Children

Parent's Name: …… Household No……..

Child's Name: ……

Age: …… Sex: ……..

Village: ……

Date: Screened: ……

MUAC (cm): ……

Oedema (y/n): ……

TFP/SFP referred to: ……. (indicate nearest centers)

Name of nearest Health Facility referred to: ……

SFC Referral criteria: MUAC below 12.5 cm

TFC Referral criteria: MUAC below 11.5 cm (height>=75 cm) and or oedema

Note: *This form should be filled out in duplicate: one for the mother or caretaker of child and one for the team that has referred the child.*

Appendix 5: Plausibility checks

Plausibility check for: Kaabong districts for children 6-59 months

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	Excel.	Good	Accept	Problematic	**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** (1.2 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**0** (p=0.208)
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** (4)
Dig pref score - height	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**4** (12)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	**0** (1.04)
Skewness WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.33)
Kurtosis WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.15)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	**0** (p=)
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 acceptable.

There were no duplicate entries detected.

Missing data:

WEIGHT: Line=246/ID=, Line=305/ID=
HEIGHT: Line=93/ID=, Line=246/ID=, Line=305/ID=

Percentage of children with no exact birthday: 100 %

Age/Height out of range for WHZ:

HEIGHT:

Line=176/ID=: 47.60 cm
Line=244/ID=: 24.30 cm
Line=256/ID=: 39.50 cm

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 for a nutrition survey in emergencies. For other surveys this might not be the best procedure e.g. when the percentage of overweight children has to be calculated):

Line=8/ID=: WAZ (1.964), Age may be incorrect
Line=30/ID=: HAZ (6.140), WAZ (2.679), Age may be incorrect
Line=41/ID=: HAZ (7.059), WAZ (2.813), Age may be incorrect
Line=50/ID=: **WHZ (-4.557)**, HAZ (-5.386), WAZ (-5.840)
Line=54/ID=: WAZ (14.060), Weight may be incorrect
Line=59/ID=: HAZ (2.298), Age may be incorrect
Line=63/ID=: **WHZ (2.611)**, Height may be incorrect
Line=67/ID=: HAZ (3.882), WAZ (2.063), Age may be incorrect
Line=71/ID=: HAZ (-4.299), WAZ (-4.187), Age may be incorrect
Line=72/ID=: WAZ (-4.667), Weight may be incorrect
Line=74/ID=: WAZ (-4.427), Weight may be incorrect
Line=102/ID=: HAZ (-5.052), Age may be incorrect
Line=107/ID=: **WHZ (-6.281)**, WAZ (-4.812), Weight may be incorrect
Line=108/ID=: HAZ (7.002), WAZ (1.929), Age may be incorrect
Line=109/ID=: HAZ (2.831), Age may be incorrect
Line=111/ID=: HAZ (-4.732), Age may be incorrect
Line=112/ID=: HAZ (7.132), WAZ (2.289), Age may be incorrect
Line=120/ID=: HAZ (-5.565), WAZ (-4.761), Age may be incorrect
Line=126/ID=: HAZ (-4.302), Age may be incorrect
Line=131/ID=: HAZ (-6.077), WAZ (-5.763), Age may be incorrect
Line=158/ID=: HAZ (5.159), Age may be incorrect
Line=162/ID=: HAZ (2.084), Age may be incorrect
Line=164/ID=: HAZ (5.323), WAZ (2.509), Age may be incorrect
Line=168/ID=: HAZ (4.422), WAZ (1.975), Age may be incorrect
Line=169/ID=: HAZ (-5.126), WAZ (-4.189), Age may be incorrect
Line=176/ID=: HAZ (-11.890), WAZ (-8.171), Age may be incorrect
Line=200/ID=: HAZ (-5.250), Age may be incorrect
Line=203/ID=: HAZ (-4.355), Height may be incorrect
Line=204/ID=: HAZ (-4.267), Age may be incorrect
Line=207/ID=: HAZ (-4.646), Age may be incorrect
Line=222/ID=: HAZ (-6.755), WAZ (-4.320), Age may be incorrect
Line=225/ID=: HAZ (1.930), Age may be incorrect
Line=226/ID=: HAZ (-5.414), Age may be incorrect
Line=238/ID=: **WHZ (2.221)**, HAZ (-4.458), Height may be incorrect
Line=244/ID=: HAZ (-19.370), Height may be incorrect

Line=251/ID=: HAZ (4.816), WAZ (1.984), Age may be incorrect
Line=256/ID=: HAZ (-14.600), Height may be incorrect
Line=278/ID=: HAZ (2.058), Age may be incorrect
Line=297/ID=: HAZ (-4.996), Age may be incorrect

Percentage of values flagged with SMART flags:WHZ: 1.2 %, HAZ: 10.0 %, WAZ: 6.1 %

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: 1.52 (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	59/41.3 (1.4)	49/36.0 (1.4)	108/77.3 (1.4)	1.20
18 to 29	12	47/40.3 (1.2)	46/35.1 (1.3)	93/75.3 (1.2)	1.02
30 to 41	12	42/39.0 (1.1)	34/34.0 (1.0)	76/73.0 (1.0)	1.24
42 to 53	12	24/38.4 (0.6)	18/33.4 (0.5)	42/71.9 (0.6)	1.33
54 to 59	6	6/19.0 (0.3)	8/16.5 (0.5)	14/35.5 (0.4)	0.75
6 to 59	54	178/166.5 (1.1)	155/166.5 (0.9)		1.15

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

Overall sex ratio: p-value = 0.208 (boys and girls equally represented)
Overall age distribution: p-value = 0.000 (significant difference)
Overall age distribution for boys: p-value = 0.000 (significant difference)
Overall age distribution for girls: p-value = 0.001 (significant difference)
Overall sex/age distribution: p-value = 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: **4** (0-5 good, 6-10 acceptable, 11-20 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: **12** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference MUAC:

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

Digit Preference Score: **42** (0-5 good, 6-10 acceptable, 11-20 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 (WHO flags)	exclusion from observed mean (SMART flags)
WHZ			
Standard Deviation SD:	1.12	1.08	1.04
(The SD should be between 0.8 and 1.2)			

Prevalence (< -2)			
observed:	13.5%	13.3%	13.1%
calculated with current SD:	14.2%	13.0%	12.1%
calculated with a SD of 1:	11.5%	11.1%	11.3%

HAZ

Standard Deviation SD:	2.40	1.73	1.34
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	31.5%	30.8%	28.6%
calculated with current SD:	38.0%	32.3%	27.3%
calculated with a SD of 1:	23.2%	21.3%	20.9%

WAZ

Standard Deviation SD:	1.67	1.39	1.15
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	25.8%	25.7%	24.3%
calculated with current SD:	30.9%	28.1%	24.0%
calculated with a SD of 1:	20.2%	21.0%	20.8%

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

WHZ	p= 0.000	p= 0.075	p= 0.018
HAZ	p= 0.000	p= 0.000	p= 0.001
WAZ	p= 0.000	p= 0.002	p= 0.006

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

Skewness

WHZ	-0.57	-0.28	-0.33
HAZ	-1.56	0.26	-0.23
WAZ	1.93	-0.26	-0.33

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	1.63	0.33	-0.15
HAZ	14.04	1.26	-0.65
WAZ	21.31	0.73	-0.29

(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.

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

(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**	**999**	
n =	1	332	
Percentage of values flagged with SMART flags:			
WHZ:	0.0	3.7	
HAZ:	0.0	10.9	
WAZ:	0.0	7.3	
Age ratio of 6-29 months to 30-59 months:			
		1.52	
Sex ratio (male/female):			
		1.14	
Digit preference Weight (%):			
.0 :	0	8	
.1 :	0	11	
.2 :	0	12	
.3 :	0	7	
.4 :	0	9	
.5 :	100	11	
.6 :	0	11	
.7 :	0	10	
.8 :	0	10	
.9 :	0	11	
DPS:	100	4	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference Height (%):			
.0 :	0	12	
.1 :	0	7	
.2 :	0	11	
.3 :	0	11	
.4 :	0	10	
.5 :	0	19	
.6 :	0	10	
.7 :	0	6	
.8 :	0	6	
.9 :	100	8	
DPS:	100	12	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference MUAC (%):			
.0 :	0	1	
.1 :	0	2	
.2 :	0	6	
.3 :	100	31	
.4 :	0	32	
.5 :	0	22	

.6 : 0 4
.7 : 0 0
.8 : 0 0
.9 : 0 0
DPS: 100 42 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Standard deviation of WHZ:

SD 0.00
Prevalence (< -2) observed:
%
Prevalence (< -2) calculated with current SD:
%
Prevalence (< -2) calculated with a SD of 1:
%

Standard deviation of HAZ:

SD 0.00
observed:
%
calculated with current SD:
%
calculated with a SD of 1:
%

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	1/0.2 (4.3)	0/0.0	1/0.2	
18 to 29	12	0/0.2 (0.0)	0/0.0	0/0.2	
30 to 41	12	0/0.2 (0.0)	0/0.0	0/0.2	
42 to 53	12	0/0.2 (0.0)	0/0.0	0/0.2	
54 to 59	6	0/0.1 (0.0)	0/0.0	0/0.1	
6 to 59	54	1/0.5 (2.0)	0/0.5 (0.0)		

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

Overall sex ratio: p-value = 0.317 (boys and girls equally represented)
Overall age distribution: p-value = 0.507 (as expected)
Overall age distribution for boys: p-value = 0.507 (as expected)
Overall sex/age distribution: p-value = 0.107 (as expected)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	0/0.0	0/0.0	0/0.0	
18 to 29	12	0/0.0	0/0.0	0/0.0	

```
30 to 41     12         0/0.0    0/0.0    0/0.0
42 to 53     12         0/0.0    0/0.0    0/0.0
54 to 59      6         0/0.0    0/0.0    0/0.0
-------------------------------------------------------------------------------
6  to 59     54         0/0.0    0/0.0
```

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

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                                          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

(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

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

Plausibility check for: Abim district for children 6-59 months

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	Excel.	Good	Accept	Problematic	**Score**
Missing/Flagged data	Incl	%	0-2.5	>2.5-5.0	>5.0-10	>10	
(% of in-range subjects)			0	5	10	20	**5** (3.2 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**0** (p=0.639)
Overall Age distrib	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**4** (p=0.001)
Dig pref score - weight	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**2** (6)
Dig pref score - height	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**4** (11)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	**0** (1.05)
Skewness WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.30)
Kurtosis WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.07)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	**0** (p=)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-5	5-10	10-15	>15	**15** %

At the moment the overall score of this survey is 15 %, this is acceptable.

There were no duplicate entries detected.

Percentage of children with no exact birthday: 100 %

Age/Height out of range for WHZ:

HEIGHT:
Line=79/ID=703: 18.00 cm
Line=127/ID=679: 2.00 cm
Line=131/ID=709: 2.00 cm
Line=201/ID=521: 46.40 cm

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 for a nutrition survey in emergencies. For other

surveys this might not be the best procedure e.g. when the percentage of overweight children has to be calculated):

Line=11/ID=627: **WHZ (4.449)**, WAZ (4.185), Weight may be incorrect
Line=17/ID=776: HAZ (3.266), Height may be incorrect
Line=24/ID=563: HAZ (1.757), Age may be incorrect
Line=37/ID=625: **WHZ (5.016)**, HAZ (-10.730), WAZ (-4.907)
Line=41/ID=514: **WHZ (-4.899)**, Weight may be incorrect
Line=59/ID=526: HAZ (1.573), Age may be incorrect
Line=75/ID=622: HAZ (2.529), Height may be incorrect
Line=88/ID=744: **WHZ (3.498)**, HAZ (-5.788), Height may be incorrect
Line=93/ID=691: **WHZ (3.166)**, WAZ (2.046), Weight may be incorrect
Line=97/ID=538: HAZ (-6.665), WAZ (-4.967), Age may be incorrect
Line=100/ID=764: HAZ (1.560), Age may be incorrect
Line=102/ID=793: HAZ (1.709), Age may be incorrect
Line=106/ID=623: HAZ (6.011), WAZ (2.037), Age may be incorrect
Line=119/ID=638: **WHZ (-3.552)**, Weight may be incorrect
Line=143/ID=796: HAZ (2.314), Age may be incorrect
Line=144/ID=520: HAZ (-4.790), Age may be incorrect
Line=164/ID=514: **WHZ (-7.827)**, WAZ (-6.069), Weight may be incorrect
Line=194/ID=719: HAZ (-4.532), Age may be incorrect
Line=201/ID=521: HAZ (-13.590), Height may be incorrect
Line=216/ID=592: HAZ (-4.546), Age may be incorrect

Percentage of values flagged with SMART flags:WHZ: 3.2 %, HAZ: 6.8 %, WAZ: 2.8 %

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: 1.37 (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	35/26.7 (1.3)	30/25.1 (1.2)	65/51.7 (1.3)	1.17
18 to 29	12	28/26.0 (1.1)	36/24.4 (1.5)	64/50.4 (1.3)	0.78
30 to 41	12	26/25.2 (1.0)	23/23.7 (1.0)	49/48.9 (1.0)	1.13
42 to 53	12	18/24.8 (0.7)	17/23.3 (0.7)	35/48.1 (0.7)	1.06
54 to 59	6	8/12.3 (0.7)	2/11.5 (0.2)	10/23.8 (0.4)	4.00

```
------------------------------------------------------------------------------
6  to 59     54    115/111.5 (1.0)    108/111.5 (1.0)                      1.06
```

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

Overall sex ratio: p-value = 0.639 (boys and girls equally represented)
Overall age distribution: p-value = 0.001 (significant difference)
Overall age distribution for boys: p-value = 0.190 (as expected)
Overall age distribution for girls: p-value = 0.003 (significant difference)
Overall sex/age distribution: p-value = 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: **6** (0-5 good, 6-10 acceptable, 11-20 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: **11** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference MUAC:

Digit .0 : ##

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

Digit Preference Score: **39** (0-5 good, 6-10 acceptable, 11-20 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 (WHO flags)	exclusion from observed mean (SMART flags)
.			
.			
WHZ			
Standard Deviation SD:	1.35	1.20	1.05
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	7.9%	7.5%	6.7%
calculated with current SD:	10.7%	8.0%	5.5%
calculated with a SD of 1:	4.6%	4.5%	4.7%
HAZ			
Standard Deviation SD:	1.89	1.47	1.26
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	35.5%	34.7%	34.6%
calculated with current SD:	39.4%	34.2%	33.3%
calculated with a SD of 1:	30.5%	27.5%	29.3%
WAZ			
Standard Deviation SD:	1.32	1.28	1.14
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	22.9%	22.6%	22.2%
calculated with current SD:	22.8%	21.6%	19.3%
calculated with a SD of 1:	16.3%	15.8%	16.2%
Results for Shapiro-Wilk test for normally (Gaussian) distributed data:			
WHZ	p= 0.000	p= 0.002	p= 0.102
HAZ	p= 0.000	p= 0.382	p= 0.002
WAZ	p= 0.012	p= 0.092	p= 0.109

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

Skewness			
WHZ	-0.52	-0.03	-0.30
HAZ	-1.45	0.05	-0.14
WAZ	-0.16	0.06	-0.11

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                                          5.71            1.89            -0.07
HAZ                                         10.12            0.11            -0.83
WAZ                                          1.44            0.92            -0.66
(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.
```

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

(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**	**999**	
n =	1	222	
Percentage of values flagged with SMART flags:			
WHZ:	0.0	6.5	
HAZ:	0.0	8.2	
WAZ:	0.0	5.1	
Age ratio of 6-29 months to 30-59 months:			
		1.36	
Sex ratio (male/female):			
		1.06	
Digit preference Weight (%):			
.0 :	0	9	
.1 :	0	12	
.2 :	0	11	
.3 :	0	10	
.4 :	0	7	
.5 :	0	14	
.6 :	100	9	
.7 :	0	9	
.8 :	0	8	
.9 :	0	11	
DPS:	100	6	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference Height (%):			

.0 : 0 16
.1 : 0 8
.2 : 0 12
.3 : 0 8
.4 : 0 8
.5 : 0 14
.6 : 100 12
.7 : 0 7
.8 : 0 9
.9 : 0 6
DPS: 100 11 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Digit preference MUAC (%):

.0 : 0 1
.1 : 0 2
.2 : 0 4
.3 : 0 17
.4 : 100 28
.5 : 0 34
.6 : 0 10
.7 : 0 2
.8 : 0 1
.9 : 0 0
DPS: 100 39 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Standard deviation of WHZ:

SD 0.00
Prevalence (< -2) observed:
%
Prevalence (< -2) calculated with current SD:
%
Prevalence (< -2) calculated with a SD of 1:
%

Standard deviation of HAZ:

SD 0.00
observed:
%
calculated with current SD:
%
calculated with a SD of 1:
%

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	1/0.2 (4.3)	0/0.0	1/0.2	
18 to 29	12	0/0.2 (0.0)	0/0.0	0/0.2	
30 to 41	12	0/0.2 (0.0)	0/0.0	0/0.2	
42 to 53	12	0/0.2 (0.0)	0/0.0	0/0.2	
54 to 59	6	0/0.1 (0.0)	0/0.0	0/0.1	
6 to 59	54	1/0.5 (2.0)	0/0.5 (0.0)		

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

Overall sex ratio: p-value = 0.317 (boys and girls equally represented)
Overall age distribution: p-value = 0.507 (as expected)
Overall age distribution for boys: p-value = 0.507 (as expected)
Overall sex/age distribution: p-value = 0.107 (as expected)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	0/0.0	0/0.0	0/0.0	
18 to 29	12	0/0.0	0/0.0	0/0.0	
30 to 41	12	0/0.0	0/0.0	0/0.0	
42 to 53	12	0/0.0	0/0.0	0/0.0	
54 to 59	6	0/0.0	0/0.0	0/0.0	
6 to 59	54	0/0.0	0/0.0		

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

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

(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

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

Plausibility check for: Moroto district for children 6-59 months

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	Excel.	Good	Accept	Problematic	**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** (1.3 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**0** (p=0.419)
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** (4)
Dig pref score - height	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**2** (6)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	**0** (1.02)
Skewness WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (0.01)
Kurtosis WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.27)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	**0** (p=)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-5	5-10	10-15	>15	**12** %

At the moment the overall score of this survey is 12 %, this is acceptable.

There were no duplicate entries detected.

Missing data:

SEX: Line=40/ID=
HEIGHT: Line=15/ID=

Percentage of children with no exact birthday: 100 %

Age/Height out of range for WHZ:

MONTHS:
Line=101/ID=: 65.00 mo
Line=102/ID=: 97.00 mo

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 for a nutrition survey in emergencies. For other surveys this might not be the best procedure e.g. when the percentage of overweight children has to be calculated):

Line=15/ID=: WAZ (-6.925), Weight may be incorrect
Line=53/ID=: **WHZ (-4.064)**, Height may be incorrect
Line=59/ID=: HAZ (2.780), WAZ (1.663), Age may be incorrect
Line=61/ID=: WAZ (-4.570), Age may be incorrect
Line=70/ID=: HAZ (-5.227), Age may be incorrect
Line=71/ID=: HAZ (1.456), Age may be incorrect
Line=102/ID=: HAZ (-8.335), WAZ (-5.729), Age may be incorrect
Line=108/ID=: HAZ (-5.127), Age may be incorrect
Line=117/ID=: HAZ (-5.284), Age may be incorrect
Line=135/ID=: **WHZ (-4.968)**, WAZ (-4.955), Weight may be incorrect
Line=140/ID=: HAZ (-5.008), Age may be incorrect
Line=157/ID=: HAZ (7.756), WAZ (3.616), Age may be incorrect
Line=162/ID=: HAZ (6.976), WAZ (2.402), Age may be incorrect
Line=168/ID=: HAZ (3.517), Age may be incorrect
Line=176/ID=: HAZ (3.261), Age may be incorrect
Line=191/ID=: HAZ (5.914), WAZ (2.456), Age may be incorrect
Line=208/ID=: HAZ (-5.316), Age may be incorrect
Line=209/ID=: HAZ (2.037), Age may be incorrect
Line=238/ID=: **WHZ (-3.947)**, Weight may be incorrect
Line=269/ID=: **WHZ (3.896)**, HAZ (-7.667), Height may be incorrect
Line=287/ID=: HAZ (-5.228), Age may be incorrect
Line=294/ID=: HAZ (2.426), Height may be incorrect

Percentage of values flagged with SMART flags:WHZ: 1.3 %, HAZ: 5.6 %, WAZ: 2.7 %

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 : ##
Month 60 :
Month 61 :
Month 62 :

Month 63 :
Month 64 :
Month 65 : #

Age ratio of 6-29 months to 30-59 months: 2.31 (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	57/33.2 (1.7)	62/36.4 (1.7)	119/69.6 (1.7)	0.92
18 to 29	12	37/32.3 (1.1)	53/35.5 (1.5)	90/67.9 (1.3)	0.70
30 to 41	12	29/31.4 (0.9)	22/34.4 (0.6)	51/65.8 (0.8)	1.32
42 to 53	12	18/30.9 (0.6)	14/33.9 (0.4)	32/64.7 (0.5)	1.29
54 to 59	6	2/15.3 (0.1)	6/16.8 (0.4)	8/32.0 (0.2)	0.33
6 to 59	54	143/150.0 (1.0)	157/150.0 (1.0)		0.91

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

Overall sex ratio: p-value = 0.419 (boys and girls equally represented)
Overall age distribution: p-value = 0.000 (significant difference)
Overall age distribution for boys: p-value = 0.000 (significant difference)
Overall age distribution for girls: p-value = 0.000 (significant difference)
Overall sex/age distribution: p-value = 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: **4** (0-5 good, 6-10 acceptable, 11-20 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: **6** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference MUAC:

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

Digit Preference Score: **42** (0-5 good, 6-10 acceptable, 11-20 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 (WHO flags)	exclusion from observed mean (SMART flags)
WHZ			
Standard Deviation SD:	1.11	1.11	1.02
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	11.1%	11.1%	10.2%
calculated with current SD:	12.9%	12.9%	10.6%
calculated with a SD of 1:	10.5%	10.5%	10.1%
HAZ			
Standard Deviation SD:	1.75	1.51	1.24
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	38.9%	38.7%	38.4%
calculated with current SD:	41.8%	41.0%	40.3%
calculated with a SD of 1:	35.8%	36.5%	38.1%
WAZ			
Standard Deviation SD:	1.30	1.26	1.12
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	30.7%	30.4%	30.1%
calculated with current SD:	34.0%	33.1%	31.7%
calculated with a SD of 1:	29.7%	29.1%	29.7%

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

```
WHZ                                    p= 0.039         p= 0.039         p= 0.835
HAZ                                    p= 0.000         p= 0.000         p= 0.152
WAZ                                    p= 0.001         p= 0.033         p= 0.323
(If p < 0.05 then the data are not normally distributed. If p > 0.05 you can consider the data
normally distributed)

Skewness
WHZ                                  -0.05            -0.05             0.01
HAZ                                   0.94             0.58            -0.02
WAZ                                  -0.15             0.07            -0.15
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                                   1.20             1.20            -0.27
HAZ                                   5.94             2.43            -0.24
WAZ                                   1.73             1.13            -0.24
(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.
```

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

(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** **999**
n = 1 301
Percentage of values flagged with SMART flags:
WHZ: 0.0 3.0
HAZ: 0.0 6.0
WAZ: 0.0 3.3
Age ratio of 6-29 months to 30-59 months:
2.29
Sex ratio (male/female):
0.91
Digit preference Weight (%):

.0 : 100 13
.1 : 0 10
.2 : 0 10
.3 : 0 11
.4 : 0 10
.5 : 0 10
.6 : 0 9
.7 : 0 9
.8 : 0 9
.9 : 0 9
DPS: 100 4 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Digit preference Height (%):

.0 : 0 11
.1 : 0 11
.2 : 100 11
.3 : 0 12
.4 : 0 7
.5 : 0 12
.6 : 0 11
.7 : 0 9
.8 : 0 8
.9 : 0 8
DPS: 100 6 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Digit preference MUAC (%):

.0 : 0 0
.1 : 100 2
.2 : 0 12
.3 : 0 39
.4 : 0 27
.5 : 0 14
.6 : 0 5
.7 : 0 1
.8 : 0 0
.9 : 0 0
DPS: 100 42 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Standard deviation of WHZ:

SD 0.00
Prevalence (< -2) observed:
%
Prevalence (< -2) calculated with current SD:
%
Prevalence (< -2) calculated with a SD of 1:
%

Standard deviation of HAZ:
SD 0.00
observed:
%
calculated with current SD:
%
calculated with a SD of 1:
%

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	1/0.2 (4.3)	0/0.0	1/0.2	
18 to 29	12	0/0.2 (0.0)	0/0.0	0/0.2	
30 to 41	12	0/0.2 (0.0)	0/0.0	0/0.2	
42 to 53	12	0/0.2 (0.0)	0/0.0	0/0.2	
54 to 59	6	0/0.1 (0.0)	0/0.0	0/0.1	
6 to 59	54	1/0.5 (2.0)	0/0.5 (0.0)		

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

Overall sex ratio: p-value = 0.317 (boys and girls equally represented)
Overall age distribution: p-value = 0.507 (as expected)
Overall age distribution for boys: p-value = 0.507 (as expected)
Overall sex/age distribution: p-value = 0.107 (as expected)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	0/0.0	0/0.0	0/0.0	
18 to 29	12	0/0.0	0/0.0	0/0.0	
30 to 41	12	0/0.0	0/0.0	0/0.0	
42 to 53	12	0/0.0	0/0.0	0/0.0	
54 to 59	6	0/0.0	0/0.0	0/0.0	
6 to 59	54	0/0.0	0/0.0		

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

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                                              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

(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

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

Plausibility check for: Amudat district for children 6-59 months

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	Excel.	Good	Accept	Problematic	**Score**
Missing/Flagged data	Incl	%	0-2.5	>2.5-5.0	>5.0-10	>10	
(% of in-range subjects)			0	5	10	20	**5** (4.9 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**0** (p=0.717)
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	**2** (7)
Dig pref score - height	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**4** (11)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	**2** (1.10)
Skewness WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.04)
Kurtosis WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.38)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	**0** (p=)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-5	5-10	10-15	>15	**23** %

At the moment the overall score of this survey is 23 %, this is problematic.

There were no duplicate entries detected.

Missing data:

HEIGHT: Line=196/ID=2074

Percentage of children with no exact birthday: 100 %

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 for a nutrition survey in emergencies. For other surveys this might not be the best procedure e.g. when the percentage of overweight children has to be calculated):

Line=1/ID=2084: HAZ (-6.895), WAZ (-4.981), Age may be incorrect

Line=6/ID=2234: **WHZ (-4.266)**, HAZ (-4.584), WAZ (-5.406)
Line=19/ID=2053: HAZ (4.238), Age may be incorrect
Line=29/ID=2074: **WHZ (-4.088)**, Weight may be incorrect
Line=43/ID=2163: HAZ (-4.187), Age may be incorrect
Line=53/ID=2276: HAZ (2.273), Age may be incorrect
Line=91/ID=2150: **WHZ (3.683)**, HAZ (-4.441), Height may be incorrect
Line=93/ID=2130: HAZ (-4.240), Age may be incorrect
Line=97/ID=2057: HAZ (3.928), Height may be incorrect
Line=101/ID=2160: **WHZ (-4.156)**, Height may be incorrect
Line=105/ID=2247: HAZ (-4.567), Age may be incorrect
Line=106/ID=2167: HAZ (-4.037), Age may be incorrect
Line=117/ID=2133: HAZ (6.306), Height may be incorrect
Line=118/ID=2195: HAZ (-4.216), Age may be incorrect
Line=140/ID=2147: **WHZ (2.576)**, Weight may be incorrect
Line=145/ID=2038: HAZ (2.004), Age may be incorrect
Line=147/ID=2047: HAZ (2.506), Age may be incorrect
Line=159/ID=2044: HAZ (2.207), Age may be incorrect
Line=160/ID=2088: HAZ (-4.090), Height may be incorrect
Line=161/ID=2202: **WHZ (-4.900)**, Weight may be incorrect
Line=170/ID=2156: HAZ (4.504), Height may be incorrect
Line=177/ID=2231: HAZ (-6.155), Height may be incorrect
Line=183/ID=2054: **WHZ (-6.148)**, Weight may be incorrect
Line=186/ID=2012: HAZ (3.639), Age may be incorrect
Line=209/ID=2051: HAZ (2.459), Age may be incorrect
Line=213/ID=2150: **WHZ (-3.997)**, HAZ (7.547), Height may be incorrect
Line=216/ID=2186: **WHZ (2.335)**, Weight may be incorrect
Line=222/ID=2059: HAZ (14.330), Height may be incorrect
Line=230/ID=2284: HAZ (-5.408), Age may be incorrect
Line=231/ID=2222: **WHZ (-5.202)**, HAZ (3.807), Height may be incorrect
Line=236/ID=2259: HAZ (-4.330), Age may be incorrect
Line=237/ID=2180: **WHZ (3.991)**, Weight may be incorrect
Line=239/ID=2154: **WHZ (-5.149)**, HAZ (3.423), Height may be incorrect
Line=243/ID=2092: HAZ (-5.035), Age may be incorrect
Line=268/ID=2063: **WHZ (-4.678)**, HAZ (6.466), Height may be incorrect

Percentage of values flagged with SMART flags:WHZ: 4.9 %, HAZ: 10.3 %, WAZ: 0.7 %

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: 1.38 (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	42/31.1 (1.4)	48/32.5 (1.5)	90/63.6 (1.4)	0.88
18 to 29	12	36/30.3 (1.2)	33/31.7 (1.0)	69/62.0 (1.1)	1.09
30 to 41	12	29/29.4 (1.0)	37/30.7 (1.2)	66/60.1 (1.1)	0.78
42 to 53	12	18/28.9 (0.6)	14/30.2 (0.5)	32/59.1 (0.5)	1.29
54 to 59	6	9/14.3 (0.6)	8/14.9 (0.5)	17/29.2 (0.6)	1.13
6 to 59	54	134/137.0 (1.0)	140/137.0 (1.0)		0.96

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

Overall sex ratio: p-value = 0.717 (boys and girls equally represented)
Overall age distribution: p-value = 0.000 (significant difference)
Overall age distribution for boys: p-value = 0.027 (significant difference)
Overall age distribution for girls: p-value = 0.000 (significant difference)
Overall sex/age distribution: p-value = 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: **7** (0-5 good, 6-10 acceptable, 11-20 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: **11** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference MUAC:

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

Digit Preference Score: **39** (0-5 good, 6-10 acceptable, 11-20 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 (WHO flags)	exclusion from observed mean (SMART flags)
WHZ			
Standard Deviation SD:	1.39	1.31	1.10
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	16.5%	15.6%	13.8%
calculated with current SD:	21.1%	18.5%	14.0%
calculated with a SD of 1:	13.2%	12.1%	11.7%
HAZ			
Standard Deviation SD:	2.17	1.73	1.37
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	30.8%	30.7%	29.0%
calculated with current SD:	32.7%	30.8%	27.4%
calculated with a SD of 1:	16.5%	19.2%	20.5%
WAZ			
Standard Deviation SD:	1.30	1.30	1.26
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	24.4%	24.4%	23.9%
calculated with current SD:	28.6%	28.6%	27.2%
calculated with a SD of 1:	23.1%	23.1%	22.2%
Results for Shapiro-Wilk test for normally (Gaussian) distributed data:			
WHZ	p= 0.000	p= 0.010	p= 0.452
HAZ	p= 0.000	p= 0.019	p= 0.041

```
WAZ                                    p= 0.040         p= 0.040         p= 0.033
(If p < 0.05 then the data are not normally distributed. If p > 0.05 you can consider the data
normally distributed)

Skewness
WHZ                                     -0.31             0.02            -0.04
HAZ                                      1.82             0.40             0.07
WAZ                                     -0.31            -0.31            -0.18
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                                      1.70             1.16            -0.38
HAZ                                     10.03             0.51            -0.59
WAZ                                     -0.06            -0.06            -0.35
(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.
```

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

(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**	**999**
n =	1	273

Percentage of values flagged with SMART flags:

WHZ:	0.0	7.9
HAZ:	0.0	10.7
WAZ:	0.0	2.2

Age ratio of 6-29 months to 30-59 months:
1.37

Sex ratio (male/female):
0.95

Digit preference Weight (%):

.0 :	0	8
.1 :	0	10

.2 : 0 5
.3 : 0 11
.4 : 0 11
.5 : 0 10
.6 : 0 13
.7 : 100 12
.8 : 0 9
.9 : 0 11
DPS: 100 7 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Digit preference Height (%):

.0 : 0 11
.1 : 0 13
.2 : 0 17
.3 : 0 11
.4 : 0 8
.5 : 100 6
.6 : 0 13
.7 : 0 6
.8 : 0 7
.9 : 0 7
DPS: 100 12 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Digit preference MUAC (%):

.0 : 0 0
.1 : 0 1
.2 : 0 3
.3 : 0 26
.4 : 100 30
.5 : 0 26
.6 : 0 12
.7 : 0 2
.8 : 0 0
.9 : 0 0
DPS: 100 39 Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)

Standard deviation of WHZ:

SD 0.00
Prevalence (< -2) observed:
%
Prevalence (< -2) calculated with current SD:
%
Prevalence (< -2) calculated with a SD of 1:
%

Standard deviation of HAZ:

SD 0.00

observed:
%
calculated with current SD:
%
calculated with a SD of 1:
%

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	1/0.2 (4.3)	0/0.0	1/0.2	
18 to 29	12	0/0.2 (0.0)	0/0.0	0/0.2	
30 to 41	12	0/0.2 (0.0)	0/0.0	0/0.2	
42 to 53	12	0/0.2 (0.0)	0/0.0	0/0.2	
54 to 59	6	0/0.1 (0.0)	0/0.0	0/0.1	
6 to 59	54	1/0.5 (2.0)	0/0.5 (0.0)		

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

Overall sex ratio: p-value = 0.317 (boys and girls equally represented)
Overall age distribution: p-value = 0.507 (as expected)
Overall age distribution for boys: p-value = 0.507 (as expected)
Overall sex/age distribution: p-value = 0.107 (as expected)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	0/0.0	0/0.0	0/0.0	
18 to 29	12	0/0.0	0/0.0	0/0.0	
30 to 41	12	0/0.0	0/0.0	0/0.0	
42 to 53	12	0/0.0	0/0.0	0/0.0	
54 to 59	6	0/0.0	0/0.0	0/0.0	
6 to 59	54	0/0.0	0/0.0		

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

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

(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

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