SMART SURVEY REPORT

CONDUCTED IN BAMA(BANKI), DAMBOA, DIKWA AND NGALA LOCAL GOVERNMENT AREA (LGA),

BORNO STATE, NIGERIA.

FHI 360 Country Director: Dr. Salma Anas-Kolo

SMART survey consultant: Kevin Mutegi

Co-investigators: Dr. Celestine Ekwuluo and Nigusu Aboset

SURVEY TIMELINE: 26TH SEPTEMBER TO 9THOCTOBER, 2019

Funded by OFDA

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1.0 BACKGROUND INFORMATION

Northeast Nigeria is currently faced with a growing humanitarian crisis with a vast number of Internally Displaced Persons (IDP) in need of humanitarian assistance. The IDPs are living in camps and among host communities with limited access to basic social services, health care, protection, WASH, food security, livelihoods and resources, ultimately leading to unprecedented levels of malnutrition and food security. In the month of March 2019, Nigeria's Adamawa, Borno, and Yobe States hosted an estimated 1.8 million IDPs due to insurgency. Cadre Harmonise (CH) analysis of June and August 2019 on acute food security situation had indicated more than 2.9 million people in Adamawa, Borno and Yobe were classified at Crisis (Phase 3) or worse levels of acute food insecurity and required urgent food assistance. Violence and resultant displacement in northeastern Nigeria continue to undermine agricultural, market and livelihoods activities in the region, according to the Famine Early Warning Systems Network (FEWSNET). As a result, many conflict-affected households remain reliant on humanitarian assistance to meet their daily needs, and Crisis (IPC 3) and Emergency (IPC 4) levels of acute food insecurity will persist in much of Borno, as well as parts of Adamawa and Yobe, through to August 2020. FHI 360 has been working in Nigeria for more than 30 years and has expanded its programs to respond to the humanitarian crisis through integrated WASH, health, nutrition and protection interventions.

Borno State is in North East Nigeria with geographical area of 57,799km^2. Ngala, Bama, Dikwa and Damboa LGAs are among the 27 Local Government Areas (LGA) in Borno State. The nutritional situation among children less than five years in Borno State was classified as serious according to the Nutrition in Emergency Sector Working Group. The prevalence of Global Acute Malnutrition (GAM) in Borno State based on WHZ has been on increasing trend from 6% in 2010, 13.8% in 2012, 11.5% in 2015, 11.3% in 2016, 11.4% in 2017, 10.6% in 2018 and 11.2% in May 2019[1]. The SMART survey was conducted in Bama (Banki), Damboa, Dikwa and Ngala LGAs. The JANFSA and NFSS round 1-7 surveys were conducted at domain level, where LGAs were aggregated into zones. Damboa LGA was included in Central Borno Zone A while Dikwa, Bama and Ngala were included in the East zone. Previous SMART surveys were conducted at Domain level for example East Borno and Central Borno. The GAM prevalence based on WHZ in East and Central Borno in May, 2019[2] was 12.3% and 10.4%, interpreted as serious. An increase in GAM prevalence was observed in East Borno when compared with October 2018 findings (9.9%)[3] but findings is not statistically significant, while in Central Borno a slight decline was observed (11.5%). Lack of information on acute malnutrition prevalence at LGA level has been a challenge, for decision making and action. And thus FHI 360 purposely conducted SMART surveys in each of the mentioned LGAs to address the gaps and assess nutritional status of children less than five years.

Survey location

The SMART survey study was conducted in Dikwa, Bama (Banki), Ngala and Damboa LGAs of Borno State, Nigeria. Damboa, Ngala, Dikwa and Bama LGAs have an estimated area of 6,219 km^2 1,465 km^2 1,774 km^2 and 4,997 km^{2}respectively. The population of Damboa, Ngala, Dikwa and Bama LGAs based on 2006 census was 233,200 persons, 237,071 persons, 25,300 persons and 269,986 persons respectively. However, the population dynamics has changed over time attributed to population growth, population movement/displacements as result of insurgency and thus population from 2006 census may not be the current population of the mentioned LGAs. The map of Borno State highlighting location of surveyed LGAs is available in *annex 3* of this report.

[1]National Nutrition and Health Surveys (NNHS), Nutrition and Food Security Surveillance (NFSS) and Joint Approach to Nutrition and Food Security Assessment (JANFSA)

[2]Nutrition and Food Security Surveillance (NFSS)

[3] Joint Approach to Nutrition and Food Security Assessment (JANFSA)

Justification

The main justification for conducting the SMART survey in the Bama (Banki), Ngala, Damboa and Dikwa LGAs is to assess baseline information on nutritional status of children aged (6-59) months for purposes of decision making towards better programming for FHI 360 and other stakeholders. Previous surveys and surveillance were conducted in domains (representing more than one LGA) and thus it was not possible to have findings reflect the actual situation at LGA level. The previous domains included in round 1 to round 7 NFSS report were East Borno Domain (Ngala, Dikwa, Bama, Kala) and Central Borno Domain (Damboa, Gubiro, Kaga, Kondaga, Mafa, Magumeri, Marte and Monguno). The recent survey for round 7 NFSS findings conducted in May 2019 for East Borno domain revealed GAM prevalence (WHZ<-2SD) at 12.3% (8.2-18.0 95% C.I). The survey findings for Central Borno domain revealed GAM prevalence (WHZ<-2SD) at 10.4% (7.7-14.0 95% C.I.). The recent survey in Bama (GSS camp) conducted in the month of August 2019 revealed GAM prevalence (WHZ<-2SD) of 8.3% (5.2-12.9 95% C.I.). The crude death rates at East Borno and Central domain levels were at 0.32/10,000/day and 0.27/10,000/day respectively. The update from NFSS and proposal by cluster forum indicated the need to assess both nutritional and mortality status for each of the LGA. The surveyed LGAs were affected by prolonged humanitarian crisis since the insurgency began in 2009. The findings were applied as baseline, and continuum monitoring of the situation in the LGAs will follow.

Objectives

Main objective

- ✓ To estimate the nutritional situation among children aged (6-59) months and mortality rates among under-fives (U5MR) and general population (CMR) in Dikwa, Bama (Banki), Ngala and Damboa LGAs, Borno State.

Specific objectives

- ✓ To estimate the prevalence of acute malnutrition among children aged (6-59) months
- ✓ To estimate the retrospective Crude Death Rate (CDR) and Under-five Mortality rate (U5MR)
- ✓ To assess two-weeks period prevalence of morbidity among children aged (6-59) months
- ✓ To determine the coverage of measles vaccination among children aged (9-59 months)
- ✓ To determine the coverage of vitamin A supplementation and MNP received in the last six months among children aged (6-59) months
- ✓ To determine the nutritional status of women of reproductive age
- ✓ To determine the coverage of Folic acid and Iron/fesolate during the last pregnancy
- ✓ To assess core indicators on caregiver knowledge on exclusively breastfeeding, complementary feeding and additional IYCF practices
- ✓ To determine access to and use of improved water, sanitation and hygiene facilities.
- ✓ To obtain the level of community knowledge and attitude on prevention of common diseases (diarrhea, acute respiratory infections, malaria).
- ✓ To assess household dietary diversity score
- ✓ To establish recommendations on actions to address identified gaps to support planning, advocacy, decision making and monitoring.

Target population

The target population for this survey were children aged (6 – 59) months for anthropometric indicators, while general population in the sampled households in selected clusters were targeted for the mortality indicators. Caregivers of children aged (0-59) months were targeted during interviews as respondents provide on health and nutrition sections of questionnaire as well as other cross-cutting sections.

2.0 METHODOLOGY

Survey design

The survey applied a two-stage cluster sampling using the SMART methodology with the clusters being selected using the probability proportional to population size (PPS). Stage one sampling involved the sampling of the clusters to be included in the survey while the second stage sampling involved the selection of the households from the sampled clusters. The study used both quantitative and qualitative methods.

Sampling procedure: selection of clusters

A two-stage cluster sampling design was applied. In the first stage, clusters were derived using probability proportional to size (PPS). The sampling frame in the first stage sampling was derived during the mapping process and development of sampling frame one week to the start of data collection. The list of updated host communities and IDP camps were drawn through consultation with various stakeholders at the field level. The consultation did include survey teams, International Organization of Migration, SEMA chairman, various community representatives (*Bulamas*). Also added into the sampling frame were population estimates of communities/IDP camps. The total of 36, 37, 36 and 35 clusters were sampled in Ngala, Damboa, Dikwa and Bama (Banki)LGAs respectively. The sampling frame is available in respective surveyed LGA ENA for SMART software planning tab. The smallest administrative units (community/segments) were included in the sampling frame. The list of complete and updated villages/community settlements were derived through consultation with the local administration, village elders and other key informants.

Sampling Procedure: Selection of Households

In the second stage, it involved selection of households through simple random sampling from an updated list of households in the sampled clusters. During development of sampling frame, the survey teams assessed the locations prior to survey data collection. The team observed that in Dikwa, Damboa and Ngala there was a mix of host communities and IDPs and households had no specific order. The teams also observed that in some camps and host communities the settlements were too large and close to each other. In Banki, majority of residents were IDPs however there was no distinct order in settlements and most of the households were constructed very close to each other with no space in between or order. The team following SMART recommendation on sampling tree design, simple random sampling was recommended for the SMART survey. The teams in the surveyed LGAs were able to finalize development of sampling frame, and an updated list of communities and their respective estimated population was available.

Definition of household for the survey: A household was defined as a group of people living together, cook and eat from the same cooking pot.

The standard definition of a household was shared with survey teams during training to aide in developing the household listing within the cluster. 19 households were randomly selected from the complete list of households using the random number tables or the random number generator mounted in SMART phones/tablet. The households generated from random selection were the households that were assessed by the survey team. In clusters that had more than 250 households, segmentation was applied.

In selected households, all eligible children (aged 6-59 months) were assessed for nutritional status through taking anthropometric measurements. Empty households and households with absent children were re-visited and information of the outcome recorded on the cluster control form.

Sample size calculation

Sample size calculation for the surveys were based on Acute Malnutrition (GAM) by WHZ-scores and Mortality indicators. The parameters used in *table 1* and *2* were extracted from the previous reports and

other contextual/surveillance data. Anthropometric and Mortality Sample sizes was calculated using the ENA for SMART software version 2011 (July 9, 2015) as indicated in *table 1 and 2*;

Anthropometric sample size

Table 1: Anthropometric sample size

Parameter	Ngala	Damboa	Dikwa	Bama (Banki)	Justification
Estimated Prevalence (%)	12.3	14.0	12.3	12.9	Estimated prevalence for East and Central Borno domains (Ngala, Dikwa and Damboa) where GAM (WHZ<-2SD) findings of round 7 conducted in May 2019 was 12.3% (8.2-18.0 95% C.I) for East Borno (Ngala/Dikwa) and 10.4% (7.7-14.0 95% C.I) for Central Borno (Damboa). Estimated prevalence for Bama (GSS) derived from Intersos survey of August 2019 where GAM prevalence on acute malnutrition based on WHZ<-2SD was 8.3% (5.2-12.9 95% C.I). The upper confidence limit was used for estimated prevalence in Damboa and Banki this follows a worsening indication from surveillance data while Ngala and Dikwa point estimate used the NFSS round 7 findings.
Desired Precision	3.5	3.5	3.5	3.4	The justification of the precision was based on survey objectives and guidance from SMART methodology on estimated prevalence used.
Design Effect	1.5	1.5	1.5	1.5	To cater for heterogeneity across the surveyed population attributed to cluster sampling method. Previous Design effect at surveyed LGA or zone was not available and thus 1.5 was adopted as recommended by SMART survey guideline.
Children to be Included	**552**	**617**	**552**	**610**	**As calculated by ENA**
Average Household Size	4.7	5	4.7	5.4	Referred from estimate of emergency surveillance (May 2019) for Ngala, Damboa and Dikwa. However, for Bama (Banki), findings referred from August 2019 Intersos findings. The Average Household Size also corresponds to NNHS, 2018 survey findings of 5.4.
% children Under-Five	20	20	20	19.6	For Ngala, Dikwa and Damboa LGA where specific LGA percentage of children aged below five years is unknown, SMART recommends using 20%. In Bama (Banki), percentage of under-five was obtained from recent SMART survey of August 2019 conducted at LGA level.
% Non-Respondents	3	3	3	3	Past experience for non-response rate from round 7 NFSS survey (May 2019) and past experience at domain level revealed non-response range of (2%-3%), hence, higher rate of 3% were used in case of population movements, refusal or non-covered households.

Households to be Included	**673**	**706**	**673**	**660**	**As calculated by ENA**

Mortality sample size

Table 2: Mortality sample size

Parameter	**Ngala**	**Damboa**	**Dikwa**	**Bama (Banki)**	**Justification**
Estimated death rate per 10,000/day	0.32	0.27	0.32	0.55	The estimated crude death rates used was derived from NFSS round 7 (May 2019) survey at domain level for specific LGAs namely; Ngala, Dikwa and Damboa LGAs. However, for Bama (Banki) CDR of 0.55 were used to estimate death rate based on Intersos findings of August 2019.
Desired Precision	0.3	0.3	0.3	0.35	Based on survey objectives and reference from SMART methodology guideline for the estimated death rate.
Design Effect	1.5	1.5	1.5	1.14	The design effect of 1.5 were used as recommended by SMART methodology (if design effect is unknown). It catered for heterogeneity among the surveyed population in Ngala, Damboa and Dikwa LGA level. However, in Bama (Banki) 1.14 were used as design effect; derived from the Intersos survey of August 2019 Bama (GSS camp)
Recall Period	117	119	118	117	Recall period derived by calculating number of days from Start of recall period from 4th June 2019 with the event being Eid Fitri to Mid-interval of data collection period and thus 115 days. Following delayed commencement of data collection as result of finalization of mapping process and delayed flights to survey site, the recall period was amended from 115 days to 117 days in Ngala and Banki; while 118 and 119 days in Dikwa and Damboa LGAs
Population to be Included	**1,906**	**1,581**	**1,890**	**1,829**	**As calculated by ENA**
Average Household Size	4.7	5	4.7	5.4	Referred from estimate of emergency surveillance (May 2019) for Ngala, Damboa and Dikwa. However, for Bama (Banki) findings referred from August 2019 Intersos SMART findings.
% Non-Respondents	3	3	3	3	Past experience for non-response rate from round 7 NFSS survey (May 2019) and past experience at domain level revealed non-response range of (2%-3%), hence higher rate of 3% were used to cater for the non-response rate at surveyed LGA level in case of population movements, refusal or non-covered households
Households to be Included	**418**	**326**	**415**	**349**	**As calculated by ENA**

Infant and Young Children Feeding (IYCF) Sample Size

The IYCF sample size calculation is based on the IYCF Survey calculator proposed by the step-by-step guide (Care 2010)[4]. Based on the guide, the sample size for the four indicators which have a wide age group (and are to be considered in this survey) are as presented in the table below:

Note:

1. Estimates of the selected IYCF indicators of interest were extracted from the June 2018 NNHS Survey for Borno State with exception of Exclusive Breastfeeding at regional levels.
2. The step-by-step guide by Care recommends a precision of between 5% and 10% and this is dependent on the estimate of the indicator of interest.
3. A design effect of 1.2 was used. This assumed that there was little heterogeneity in the IYCF practices in the survey area since the population has almost homogeneous socio-economic, cultural and religious practices
4. A 95% confidence Interval was also used

Table 3: IYCF sample size

Indicator	Estimate	Precision	Sample Size
1. Early Initiation of Breastfeeding (0 – 23.9 Months)	20.8%	10%	103
2. Exclusive Breastfeeding (0 – 5.9 Months)	23.0%	9%	110
3. Minimum Dietary Diversity (6 – 23.9 Months)	35.8%	10%	144
4. Minimum Meal Frequency (6 – 23.9 Months)	44.3%	10%	155

Based on the above table, the maximum sample size among the four indicators is 155 children, which when multiplied by 4 as recommended results into **620 households**.

Based on *table 1, 2 and 3*; the indicator with the largest sample size was used to calculate number of clusters to be assessed. Anthropometric sample size was used since it has the largest sample size compared to mortality and IYCF indicators.

Number of clusters

The calculation indicated in the *table 4 and 5* was used to determine the number of cluster and households required per survey LGA that each survey team can comfortably assess in a day. The table was revised after confirmation at the beginning and end of survey data collection for respective surveyed LGAs.

Table 4: Calculation of households to be assessed per team per day

Activity	Estimated Time
Departure from office/base to the field	**8:00 AM**
a. Daily morning Briefings	*10 minutes*
b. Travel to clusters	*10 minutes*
c. Introduction and household list development	*30 minutes*
d. Lunch break/prayers	*30 minutes*
e. Average time from one household to another	*5 minutes*
f. Travel back to base	*10 minutes*
Total time for household listing, travelling and breaks (a + b + c + d + f)	90minutes

[4] Infant and Young Child Feeding Practices: Collecting and Using Data: A Step-by-Step Guide. Cooperative and Relief Everywhere, Inc. (Care). 2010

Arrival back to Base	**5:30 PM**
Total Available time in a day	9hrs 30minutes (570 minutes)
Available time for work	570 –90minutes=480 minutes
g. Average time taken to complete one questionnaire	*20 minutes*

Given the above, the number of households that a team can comfortably visit in a day is calculated as follows:

480 (min) / 25 (min) = **19.2 approximate=19 households per day**

Given the above, the number of clusters assessed is presented in the *table 5*:

Table 5: Number of clusters and teams per survey location

Consideration	Ngala	Damboa	Dikwa	Bama (Banki)
Total number of households based on sample size calculation	**673**	**706**	**673**	**660**
Total number of households assessed per day per team	19	19	19	19
Clusters required	**36**	**37**	**36**	**35**
Number of days	12	13	12	12
Survey teams required	**3**	**3**	**3**	**3**

Survey teams, training, data collection and data management

Survey Teams:

The complete survey team was composed of two enumerators, one team leader and one translator. There were three teams in each survey area. The team members were a mix of both males and females and were recruited from the local communities. During the data collection period, each team was allocated one *Bulama*/elder and community nutrition mobilizer (CNM) to guide the team during data collection.

Training:

The survey teams were trained for four days (18th to 21st September 2019). The training covered various components including: anthropometric measurements, sampling of households, data collection tools, digital data collection, data quality checks, standardization exercise among other themes. The training of the survey team was facilitated by the survey consultant and venue of training was located in Maiduguri, Borno State. Standardization test results of accuracy and precision of measurements is available in *annex 6* of this report.

Field Test

Once training was finalized, the survey team were engaged in pre-testing data collection tools and methods, sampling of households, interviews and recording of responses etc. The field test exercise took place in Maiduguri on 21st September 2019. The participants were divided into six teams composed of enumerators, team leaders and supervisors. The following settlements were selected as clusters for field test exercise. They include; *Garba Buzu IDP camp*, *Teachers village IDP camp*, *Bakassi IDP camp*, *Moranti* and *Bulumkutu Abuja*. The FHI 360 and survey team had earlier sought approval and consent of SEMA chairman and camp coordinators of the settlements/IDP camps for the field test exercise. The field test exercise was conducted from 9am to 1pm. Later the team met at training hall to discuss on field experiences, challenges and lessons learnt to enhance better support prior to actual data collection.

Data collection:

The number of data collection days for each survey locations is indicated in *table 5* of this report.

Supervision:
The overall management of the surveys was done by the consultant and FHI360 staff. Supervision of the survey teams took place on daily basis.

Data Entry and Management:
Data was collected through android enabled tablets mounted with Kobo collect application. The data collection tools were programmed and uploaded in the tablets and later used by the survey teams. The teams uploaded the collected data to a central server (https://kobo.humanitarianresponse.info) on daily basis to allow the consultant to download, review the data collected and analyze. All data generated from the study were archived in FHI 360 Borno state office, Nigeria. The final data set were stored, maintained and archived by FHI 360 and accessible to the researchers, project leads or other authorized persons while the data from the field testing will be kept for a minimum of five years and will not be used or presented in the final analysis. *NB: Anthropometric and mortality backup manual forms were carried by each team as a contingency plan in any eventuality that teams face challenges with the SMART phones or tablets.*

Data Quality
In order to ensure optimal and high data quality, several measures were put in place including:

a) The survey was done in accordance with the submitted technical proposal following SMART methodology guideline and guidance from Nutrition in emergency sector working group (NiESWG) and FHI 360. It included the following:
- ✓ Ensured that training of survey teams followed standardised training package as recommended by SMART Methodology
- ✓ Undertook standardisation test as part of the training and took appropriate steps thereafter based on performance of the survey teams
- ✓ Appropriate calibration of survey equipment, during the training and every morning before proceeding to the field for data collection
- ✓ Plausibility checks were conducted on daily basis and shared with team leaders who debriefed the survey teams' sessions on areas of improvement.
- ✓ Field test conducted to test the data collection tools and sampling methods proposed.
- ✓ Data collected through Kobo collect minimized errors in manual recording of data. Data control checks and skip patterns were programmed to improve the data quality
- ✓ Anthropometry data was auto analysed using ENA software data entry anthropometry tab. The same software was used to analyse the mortality data.
- ✓ Use of local event calendar to estimate age of eligible children; was developed by consultant, FHI 360 field teams, survey enumerators and key informants for each of the specified LGA.
- ✓ Back-up forms for anthropometry, cluster control form and mortality were provided to the survey teams during data collection.
- ✓ Daily supervision of teams

Questionnaire
The survey adopted data collection tools developed by the Global SMART team for both anthropometric and mortality surveys. Other indicators were collected using the modules based on context and guidance of FHI 360, SMOH and nutrition cluster. Modification was done in order to cater to any additional indicators.

Data collected
1. Anthropometrics

Age: Were determined using birth/health cards/ records if available and local calendar of events which were jointly developed by local leaders and survey enumerators. An updated calendar of events was utilised in estimating the ages of children; when documented proof of age is lacking.

Sex: Male or female

- Weight: Children's weights were taken without clothes using mother and child digital weighing scales (SECA scales with precision of 100gm).
- Height/length: Children were measured using the wooden UNICEF measuring boards (precision of 0.1cm). Children less than 24months were measured lying down, while those greater than or equal to 24months were measured standing up.
- Mid-upper arm circumference: MUAC measurements were taken at the mid-point of the left upper arm using both the child and adult MUAC tapes (precision of 0.1cm).
- Bilateral pitting oedema: Were assessed by the application of normal thumb pressure on both feet for 3 seconds.

Referral: All children identified with acute malnutrition by WHZ and MUAC and/or bilateral oedema were referred using referral forms to existing nutrition treatment sites.

2. Health Interventions Data: BCG, Vitamin A and measles were collected through confirmation from health cards or through interviewing caregiver by recalling if child was supplemented and vaccinated or not.
3. Morbidity: Two-week retrospective morbidity data were collected from mothers/caregivers of all children (6-59 months) included in the anthropometric survey.
4. WASH – indicators on hand washing, access to safe water and sanitation
5. Mortality- were assessed through retrospective(recall) in the last 90-120 days depending on start of recall event.
    a. Crude Mortality Rate (CMR)
    b. Under-five Mortality Rate(U5MR)
6. IYCF- Exclusively breastfeed, Minimum Meal Frequency, Minimum Dietary Diversity, Minimum Acceptable Diet and Early Initiation to breast milk etc.

Data Analysis, results and output

The anthropometric and mortality data were analysed using ENA for SMART (9th July 2015 version). The other additional data (immunization, maternal nutrition, morbidity etc.) were analysed using SPSS version 23. Various statistics were used to summarize the data including percentages, means, and median, cross tabulation among others. The analysed data were presented in both tabular and graphical presentations.
The preliminary results were presented to the field office for their inputs soon after data collection. Thereafter, the preliminary results were shared with FHI 360 and NiESWG for the validation before finalizing the reports. The final reports were available within seven days after incorporating the feedback from FHI 360, SMOH, UNICEF, Nutrition cluster and NIESWG staff. All training materials, data analysis output (both raw and final) were submitted electronically to FHI 360 IHANN II project team.

Ethical consideration and community consent

Due to the comprehensive nature of the survey, the consent of individuals and organizations were obtained. Community leaders were consulted in order to discuss and clarify questions and reservations that they had on the process of surveying their population. All respondents were informed about the reason for taking the survey administration and anthropometric measurements.

- The team ensured affirmation from caregivers at the household level that their children will not be at risk of harm while being measured and confidentiality for the information they provide to the team.
- The team clearly explained to the household that they could not get any kind of benefit for participating in the survey
- The participants/households had right to withdraw from the assessment at any time.

Confidentiality

The enumerator ensured not to discuss the respondents' answers with anyone, except to the consultant or team lead when clarification was needed. For all the study components, no personal identifiers such as address, telephone and hospital identification number were documented on the study tools and during

the participant recruitment processes. There were no ways to link a specific questionnaire to a specific respondent. During the household survey, the respondent and the enumerators sought an appropriate place or corner in the house that ensured privacy during the question and answer sessions. A high level of confidentiality and security was strictly adhered to in handling the data from the study.

Informed Consent

Inform consent were read out to all participants and respondents and written informed consent were obtained from all respondents. Only respondents or participants who voluntarily accepted to form part of the research subjects participated in the study.

Potential risk

This survey utilized anthropometry measurement and interviewer-based questionnaire only, hence there were no direct or indirect potential risk to the study participants.

Training of study team on ethical consideration

The survey team were tutored on all necessary ethical considerations for this study and the technical co-investigator completed and has a valid certification for the CITI social and behavioral course for education and social researchers under the requirement of FHI 360.

Study Protocol Approval

The study protocol was submitted on 22nd September 2019 to the Nutrition in Emergency Sector Working Group for approval and findings shared on 24th October 2019.

3.0 SURVEY RESULTS

3.1Sample size (achieved and planned)

The data collection began on 26th September, 2019 and ended on October 9th 2019. The data collection was conducted concurrently in the four surveyed LGAs namely; Bama (Banki), Dikwa, Damboa and Ngala. The (*table 6 & 7)* provide details of sample size planned and achieved in each LGA. All the surveyed LGAs achieved the sample size of 80% and above for the survey results to be rendered representative. All clusters were assessed in all LGAs with exception of Ngala where one cluster in Gamboru host community was rendered inaccessible due to insecurity at the time of data collection. There were reported insecurity incidences in other locations of Banki, Dikwa and Damboa however the sampled clusters were not affected and thus all clusters were assessed.

Table 6: Sample size (planned and achieved)

	Planned	**Achieved**	**Percentage (%)**	**Planned (Actual)**	**Achieved**	**Percentage (%)**	**Planned**	**Achieved**	**Percentage (%)**
Surveyed LGA	Number of Sampled Clusters	Number of Clusters	% surveyed /planned	Number of Households	Number of Households	% surveyed /planned	Number of children aged (6-59) months	Number of children aged (6-59) months	% surveyed /planned
Bama (Banki)	35	35	100%	665	664	99.9%	610	906	148.5%
Damboa	37	37	100%	703	699	99.4%	617	610	98.9%
Dikwa	36	36	100%	684	683	99.9%	552	589	106.7%
Ngala	36	35	97.2%	684	658	96.2%	552	652	118.1%

*The actual planned number of households was slightly higher than planned(see ENA for SMART planning template/Survey proposal) since actual was based on number of sampled clusters covered and target number of households to be assessed per cluster per day.
* Anthropometric sample size was used since it superceeded sample size(households) for mortality and IYCF indicators.

Table 7: Continuation Sample size (planned & surveyed)

Surveyed LGA	**Number of persons (planned) included in mortality**	**Number of persons(surveyed) included in mortality**
Banki	1,829	2,751
Damboa	1,581	3,206
Dikwa	1,890	3,107
Ngala	1,906	3,181

3.2Data quality

The overall data quality interpreted as Data Plausibility Scores (DPS) was generated from anthropometric data using ENA for SMART software. The DPS feedback and other observations during the survey data collection period were shared with survey team on daily basis for purposes of improvement. The (*table 8)* provides a summary of anthropometric DPS. The DPS interprets z-score flags based on SMART flags (+/-3). The overall DPS ranged between excellent to acceptable scores across the surveyed LGAs. The flagged data, sex ratio (boys and girls equally represented), standard deviation and kurtosis across all surveyed LGAs were interpreted at excellent. Age ratio between (6-29 and 30-59 months) was as expected in Damboa and Ngala, however it was significant in Banki and Dikwa. The main challenge was unavailability of documentation showing the actual date of birth of eligible children. It's important to note that more than 90% of age of eligible children was determined through estimation using an event calendar across the surveyed LGA. There were instances where survey team received immunization/clinic cards however the date indicated in the card was date first seen by health personnel or date immunized and not actual date of birth. Anthropometric measurements (weight, height and MUAC) had excellent to good scores across the surveyed LGAs. Skewness was symmetrical across all the surveyed LGAs with exception of Ngala where a negative skewness was observed, perhaps due to relative excess of wasted children. The poisson distribution indicates the wasted cases were uniformly distributed across the clusters in all survey LGAs.

Table 8: Summary data quality

LGA	Flagged data	Sex ratio (male: female)	Age ratio (6-29 versus 30-59)	Digit Preference Score			Standard Deviation (SD WHZ)	Skewness WHZ	Kurtosis WHZ	Poisson distribution WHZ	Overall DPS WHZ
				Weight	Height/Length	MUAC					
Bama (Banki)	0(0.8%)	0(p=0.947) (452:454)	10(p=0.000) (1.09)	0(3)	2(12)	2(10)	0(0.96)	1(-0.20)	0(0.07)	1(p=0.020)	**16%**
Damboa	0(1.6%)	0(p=0.871) (303:307)	0(=0.341) (0.92)	0(6)	0(7)	2(8)	0(1.04)	0(-0.15)	0(-0.09)	0(p=0.276)	**2%**
Dikwa	0(1.9%)	0(p=0.902) (293:296)	10(p=0.000) (1.21)	0(4)	2(11)	2(10)	0(1.04)	0(-0.12)	0(0.00)	0(p=0.708)	**14%**
Ngala	0(2.5%)	0(p=0.159) (344:308)	2(p=0.078) (0.98)	2(8)	2(11)	2(10)	0(1.09)	3(-0.41)	0(-0.13)	0(p=0.078)	**11%**

*Overall DPS(WHZ) ranges: DPS (0-9) interpreted as excellent; DPS (10-14) interpreted as good; DPS (15-24) interpreted as acceptable and DPS>25 interpreted as problematic

3.3 Demographic and household characteristics

3.3.1 Resident status of the respondent

The main residence status of the respondents in sampled households in Bama (Banki) and Dikwa LGA were Internally Displaced Persons (IDP) representing 98.9% and 74.5% respectively. In Damboa and Ngala the respondents at household level were mainly residents, representing 55% and 53.1% respectively. Also, there were small percentage of returnees across the surveyed LGA as illustrated in (*table 9)*.

Table 9: Resident status of the respondent

LGA	N	internally displaced person (IDP)	Returnee	Resident
Banki	663	(656) 98.9	(6) 0.9	(1) 0.2
Damboa	698	(312) 44.7	(2) 0.3	(384) 55.0
Dikwa	683	(509) 74.5	(5) 0.7	(169) 24.7
Ngala	657	(308) 46.9	(0) 0.0	(349) 53.1
Total	2701	(1785) 66.1	(13) 0.5	(903) 33.4

3.3.2Marital status of the respondent

The main marital status of respondents at the household levels was married as illustrated in *figure 1*.

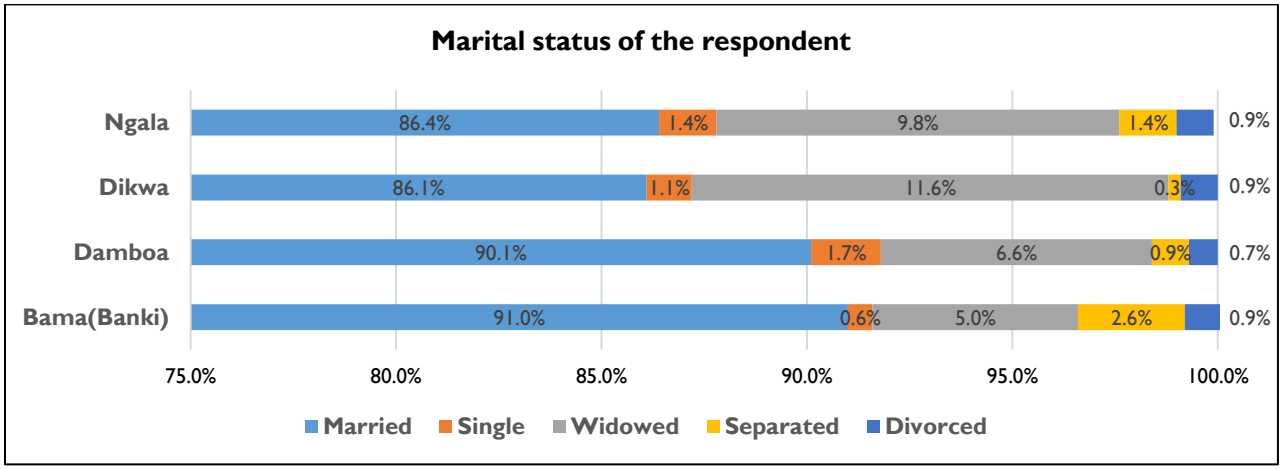


Figure 1: Marital status of the respondent:

3.4 Results of nutritional status among children aged (6-59) months

3.4.1 Prevalence of acute malnutrition (wasting)

The prevalence of acute malnutrition prevalence was based on by weight for height z-scores, Mid Upper Circumference (MUAC) and/or bilateral "pitting" oedema. WHO Standard of 2006 was used as reference standard while SMART flags (+/-3SD) was used as exclusion criteria for WHZ-scores. The findings on prevalence of Global Acute Malnutrition (GAM), Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM) based on Weight for Height Z-scores (WHZ) and MUAC (mm) are indicated in *table 10*. The prevalence of GAM based on WHZ was interpreted as high[5] (10-<15) in Ngala and Dikwa; and medium (5-<10) in Banki and Damboa. The prevalence of GAM by WHZ and MUAC reveals existing cases of Moderate and Severe Acute Malnutrition in the surveyed LGAs. Most of the wasted cases were moderately acute malnourished based on MUAC and WHZ. No confirmed case of bilateral oedema was reported.

Table 10: Prevalence of acute malnutrition by WHZ and MUAC (and/or bilateral oedema)

Surveyed LGA	**Acute Malnutrition by WHZ-scores and/or oedema** (SMART flags)				**Acute Malnutrition by MUAC and/or oedema**			
	N	GAM (WHZ<-2SD) (n) % [C.I]	MAM(WHZ≥-3-<-2SD) (n) % [C.I]	SAM (WHZ<-3SD) (n) % [C.I]	N	GAM (<125mm) (n) % [C.I]	MAM(≥115-<125mm) (n) % [C.I]	SAM (<115mm) (n) % [C.I]
Bama (Banki)	899	(78) 8.7% [6.6-11.4]	(67) 7.5% [5.6- 9.9]	(11) 1.2% [0.7- 2.2]	906	(47) 5.2% [3.7- 7.2]	(41) 4.5% [3.3- 6.2]	(6) 0.7% [0.3- 1.4]
Damboa	600	(54) 9.0% [6.8-11.8]	(44) 7.3% [5.6- 9.6]	(10) 1.7% [0.8- 3.4]	610	(62) 10.2% [7.4-13.8]	(48) 7.9% [5.6-10.9]	(14) 2.3% [1.3- 4.0]
Dikwa	577	(60) 10.4% [8.3-12.9]	(48) 8.3% [6.5-10.6]	(12) 2.1% [1.2- 3.7]	589	(35) 5.9% [3.9- 9.0]	(29) 4.9% [3.0- 7.9]	(6) 1.0% [0.4- 2.9]
Ngala	635	(91) 14.3% [11.3-18.1]	(67) 10.6% [7.9-14.0]	(24) 3.8% [2.5- 5.6]	652	(38) 5.8% [4.3- 7.9]	(33) 5.1% [3.6- 7.1]	(5) 0.8% [0.3- 1.8]

[5]The interpretation for prevalence of acute malnutrition based on GAM by WHZ was referred from new UNICEF revised prevalence thresholds.

The prevalence of GAM based on (WHZ) was below critical thresholds (>15%) across the surveyed LGAs as indicated in *figure 2*. The GAM (WHZ) across the surveyed LGAs was below that of Borno State at 11.2% (NFSS, May 2019) with exception of Ngala LGA.

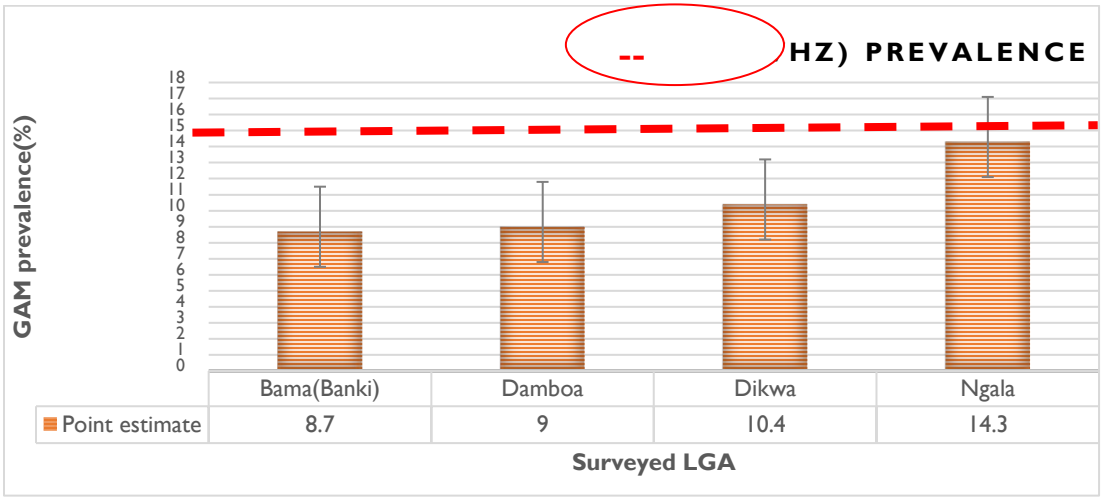
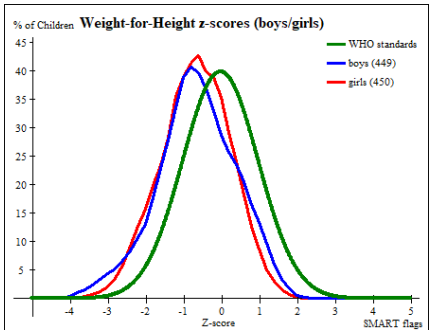


Figure 2: GAM(WHZ) prevalence across the surveyed LGAs

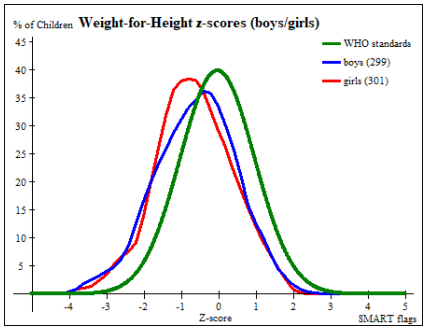
Table 11: Sex disaggregation of prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) in all surveyed LGA.
(prevalence of oedema is 0.0 %)

	Prevalence of global malnutrition GAM (WHZ<-2SD)			Prevalence of moderate malnutrition MAM(WHZ≥-3-<-2SD)			Prevalence of severe malnutrition SAM (WHZ<-3SD)			Number of children 6-59 months
LGA	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	
Ngala	(91) 14.3 [11.3- 8.1]	(53)15.8 [11.1- 22.0]	(38)12.7 [8.8- 18.0]	(67) 10.6 [7.9- 14.0]	(40) 11.9 [8.1- 17.3]	(27) 9.0 [5.8- 13.7]	(24) 3.8 [2.5- 5.6]	(13) 3.9 [2.2- 6.8]	(11) 3.7 [1.8- 7.3]	635
Dikwa	(60) 10.4 [8.3- 12.9]	(36)12.6 [9.1- 17.3]	(24) 8.2 [5.6- 11.9]	(48) 8.3 [6.5- 10.6]	(27) 9.5 [6.6- 13.5]	(21) 7.2 [4.7- 10.8]	(12) 2.1 [1.2- 3.7]	(9) 3.2 [1.5- 6.5]	(3) 1.0 [0.3- 3.1]	577
Damboa	(54) 9.0 [6.8- 11.8]	(29) 9.7 [6.6- 14.0]	(25) 8.3 [5.5- 12.3]	(44) 7.3 [5.6- 9.6]	(22) 7.4 [4.9- 10.8]	(22) 7.3 [4.7- 11.1]	(10) 1.7 [0.8- 3.4]	(7) 2.3 [1.0- 5.6]	(3) 1.0 [0.2- 4.2]	600
Bama (Banki)	(78) 8.7 [6.6- 11.4]	(42) 9.4 [6.7- 12.9]	(36) 8.0 [5.4- 11.6]	(67) 7.5 [5.6- 9.9]	(33) 7.3 [5.2- 10.4]	(34) 7.6 [5.0- 11.2]	(11) 1.2 [0.7- 2.2]	(9) 2.0 [1.0- 3.8]	(2) 0.4 [0.1- 1.8]	899

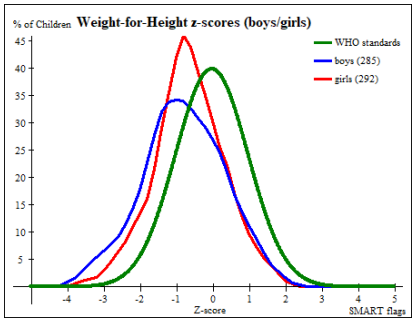
The *figure 3* below illustrates distribution GAM(WHZ) prevalence by sex versus WHO standard curve with exclusion based on SMART flags. Banki, Damboa, Dikwa and Ngala survey curves for both boys and girls tend to deviate to the left of the reference curve at mean of (-0.66), (-0.63), (-0.72) and (-0.79) respectively.



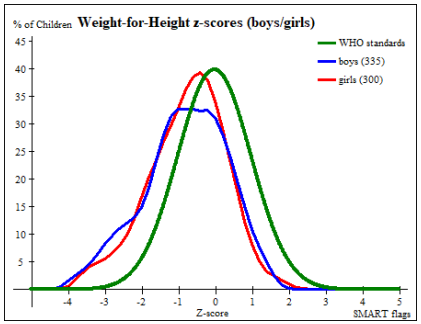
Gaussian curve: Banki



Gaussian curve: Damboa



Gaussian curve: Dikwa



Gaussian curve: Ngala

Figure 3: Gaussian curve (survey curve versus WHO curve) for age and sex

3.4.2 Prevalence of stunting and underweight

The prevalence of stunting and underweight among children aged (6-59) months was based on height for age and weight for age z-scores. WHO Standard of 2006 was used as reference standard while SMART flags (+/-3SD) was used as exclusion criteria for HAZ and WAZ-scores. The summary prevalence of stunting and underweight is illustrated in *table 12*. The prevalence of stunting and underweight was highest in Damboa LGA and lowest in Bama (Banki)LGA. Prevalence of stunting was interpreted as very high (>40) in Damboa, high (30-39) in Dikwa and medium[6](20-29) in Banki and Ngala respectively.

Table 12: Prevalence of stunting and underweight based on z-scores

Surveyed LGA	Stunting			Underweight		
	N	Prevalence of stunting (HAZ<-2SD)	Prevalence of severe stunting (HAZ<-3SD)	N	Prevalence of underweight (HAZ<-2SD)	Prevalence of severe underweight (HAZ<-3SD)
		n (%) [C.I]	n (%) [C.I]		n (%) [C.I]	n (%) [C.I]
Bama (Banki)	874	(223) 25.5% [22.1-29.3]	(57) 6.5% [4.8- 8.8]	900	(155) 17.2% [14.1-20.8]	(24) 2.7% [1.7- 4.1]
Damboa	580	(283) 48.8% [42.7-54.9]	(131) 22.6% [18.4-27.4]	603	(201) 33.3% [28.6-38.4]	(61) 10.1% [7.6-13.4]
Dikwa	565	(222) 39.3% [35.2-43.6]	(90) 15.9% [12.9-19.5]	581	(165) 28.4% [23.9-33.4]	(38) 6.5% [4.7- 9.0]
Ngala	620	(180) 29.0% [24.6-33.9]	(65) 10.5% [8.2-13.2]	646	(154) 23.8% [20.2-27.8]	(45) 7.0% [5.0- 9.7]

Mean z-scores, excluded subjects and design effect on prevalence of undernutrition based on z-scores (WHZ/HAZ/WAZ) is available in *annex 2*.

[6]The interpretation for prevalence of stunting and underweight based on HAZ and WAZ was referred from new UNICEF revised prevalence thresholds.

3.5 Child Health

3.5.1 Morbidity patterns

3.5.1 (a) prevalence of main child illnesses

Morbidity was assessed by interviewing caregiver based on retrospective two weeks recall prior to survey data collection to confirm if his/her child was sick. The percentage of children reported ill in Bama (Banki), Damboa, Dikwa and Ngala LGAs was 13.3%, 44.6%, 22.7% and 27.1% respectively. The main illnesses reported across the surveyed LGAs were fever/chills and acute respiratory infections/Cough as illustrated in *table 13*. Prevalence of fever with chills and ARI was highest in Damboa LGA (representing 37.2% and 29.8%) while prevalence of watery diarrhoea was highest in Ngala LGA (representing 9.0%).

Table 13: Morbidity patterns

LGA	Morbidity (child reported ill two weeks prior to survey data collection)	Prevalence of fever with chills	Prevalence of ARI and coughing	Prevalence of watery diarrhea	Prevalence of bloody diarrhea
	(n) % [C.I]	(n) % [C.I]	(n) % [C.I]	(n) % [C.I]	(n) % [C.I]
Banki	(121) 13.4 [11.1 - 15.6]	(61) 6.7 [5.1 - 8.4]	(54) 6.0 [4.4 - 7.5]	(20) 2.2 [1.3 - 3.2]	(0) 0.0
Damboa	(258) 42.3 [38.4 - 46.2]	(215) 35.2 [31.5 - 39.0]	(172) 28.2 [24.6 - 31.8]	(29) 4.8 [3.1 - 6.4]	(0) 0.0
Dikwa	(132) 22.4 [19.0 - 25.8]	(71) 12.1 [9.4 - 14.7]	(22) 3.7 [2.2 - 5.3]	(41) 7.0 [4.9 - 9.0]	(1) 0.2 [0.0 - 0.5]
Ngala	(178) 27.3 [23.9 - 30.7]	(113) 17.3 [14.4 - 20.2]	(77) 11.8 [9.3 - 14.3]	(59) 9.0 [6.8 - 11.3]	(5) 0.8 [0.1 - 1.4]

3.5.1 (b) Health seeking option sought

Majority of respondents across the surveyed LGAs sought treatment for their ill child at Non-Government Organization (NGO) operated facility representing (73.6%, 65.9%, 69.7% and 84.3%) in Banki, Damboa, Dikwa and Ngala respectively. However, it's important to note that some caregivers did not seek any treatment for their ill children as illustrated in *table 14*.

Table 14: Health Seeking sought

LGA	Traditional Healer	Private clinic	Shops	Public clinic	NGO/FBO clinic/facility	No treatment
	(n) %	(n) %	(n) %	(n) %	(n) %	(n) %
Banki	(2) 1.7	(0) 0.0	(9) 7.4	(0) 0.0	(89) 73.6	(23) 19.0
Damboa	(0) 0.0	(2) 0.8	(69) 26.7	(6) 2.3	(170) 65.9	(14) 5.4
Dikwa	(1) 0.8	(5) 3.8	(13) 9.8	(0) 0.0	(92) 69.7	(20) 15.2
Ngala	(0) 0.0	(0) 0.0	(0) 0.0	(0) 0.0	(150) 84.3	(22) 12.4
Total	(3) 0.4	(7) 1.0	(91) 13.2	(6) 0.9	(501) 72.7	(79) 11.5

3.5.2 Vaccination, Supplementation & Deworming coverage

3.5.2 (a) Measles coverage among children aged (9-59) months

The coverage of measles vaccination among children aged (9-59) months was above 80% verified by card and recall in Bama (Banki) and Dikwa respectively. The measles coverage (by card & recall) was below 80% in Damboa and Ngala as illustrated in *figure 4*.

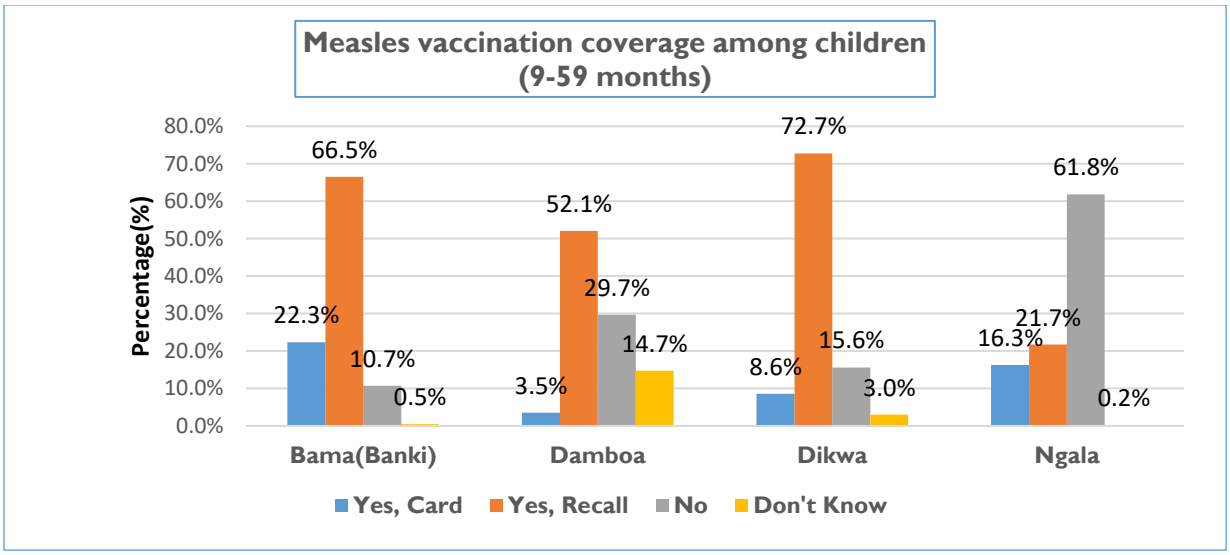


Figure 4: Measles vaccination coverage

3.5.3 (b)Vitamin A supplementation among children aged (6-59) months

Vitamin A supplementation coverage among children aged (6-59) months in the past 6 months verified by both card and recall was 74.4%, 24.7%, 53.8%, 27.8% in Bama (Banki), Damboa, Dikwa and Ngala LGA respectively. Majority of the respondents who confirmed the child was supplemented with vitamin A, the verification was through recall. The children who received twice or more supplementation in the past one year were less than 50% across the surveyed LGA.

3.5.5 (c) Deworming coverage among children aged (12-59) months

Deworming coverage among children aged (12-59) months was below 50% across the surveyed LGA with exception of Bama (Banki)LGA at 89.5%. See *table 15*

Table 15: Deworming coverage among children aged (12-59 months)

Surveyed LGA	N (12-59)	Percentage (95% C.I)
Banki	812	89.5% (87.4-91.6)
Damboa	523	34.0% (30.0-38.1)
Dikwa	494	42.7% (38.4-47.1)
Ngala	591	9.8% (7.4-12.2)

3.6 Maternal health

3.6.1 Education level of primary caregiver

Education level of respondents is as illustrated in table 16.

Table 16: Education level of primary caregiver

LGA	None	Islamia	Primary education	Secondary education	Tertiary education
	(n) %	(n) %	(n) %	(n) %	(n) %
Banki	(423) 63.8	(227) 34.2	(12) 1.8	(1) 0.2	(0) 0.0
Damboa	(393) 56.3	(252) 36.1	(27) 3.9	(24) 3.4	(2) 0.3
Dikwa	(210) 30.7	(411) 60.2	(44) 6.4	(17) 2.5	(1) 0.1
Ngala	(433) 66.6	(204) 31.4	(10) 1.5	(2) 0.3	(1) 0.2

3.6.2 Maternal nutritional status by MUAC

Nutritional status of women was based on MUAC measurements. Acute malnutrition is MUAC<23.0cm while severe acute malnutrition is MUAC< 21.0 cm as illustrated in *table 17*.

Table 17: Maternal Nutritional status by MUAC <21.0cm

Surveyed LGAs	Maternal nutritional status by MUAC	
	(MUAC<21.0cm) [95% C.I]	(MUAC 21.0 -<23.0cm) [95% C.I]
Bama (Banki)	(n=7) 1.1% [0.3-1.9]	(n=87) 13.7% [11.0-16.3]
Damboa	(n=10) 2.3% [0.9-3.6]	(n=72)16.3% [12.8-19.7]
Dikwa	(n=7)1.4% [0.4-0.24]	(n=79)15.3% [12.2-18.5]
Ngala	(n=8)1.6% [0.5-2.6]	(n=54)10.5% [7.8-13.1]

3.6.3Ante-Natal Care (ANC) visit and Iron-folate supplementation

The antenatal clinic attendance in Bama (Banki), Damboa, Dikwa and Ngala among women during their last pregnancy was 7.4%, 5.1%, 3.9% and 5.2% respectively, as illustrated in *table 18*. The percentage of women who visited ANC for 4 times or above in their last pregnancy was less than 50% across the surveyed LGAs with exception of Ngala (representing 78.9%) (Table 18). The number of mothers who received iron-folate supplementation during their last pregnancy in Bama (Banki), Damboa, Dikwa and Ngala LGA was 40.6%, 18.0%, 3.7% and 17.4% respectively.

Table18: ANC visits & number of visits to ANC during respondents last pregnancy

LGA	ANC attendance (NO) (n) %	ANC attendance (YES) (n) %	Number of ANC visits 4 and Above (n) %
Banki	(349) 92.6	(28) 7.4	(8) 2.1
Damboa	(357) 94.9	(19) 5.1	(9) 2.4
Dikwa	(545) 96.1	(22) 3.9	(10) 1.8
Ngala	(343) 94.8	(19) 5.2	(15) 4.1

3.7 Food Security

3.7.1 Main source of food at household level

The main source of food in Bama (Banki), Damboa, Dikwa and Ngala LGA is food aid representing 577 households (87%), 307 households (44%), 504 households (73.8%) and 424 households (64.5%) respectively. In Damboa and Dikwa LGA, 241 households (34.5%) and 42 households (6%) cultivate their own food. Other sources of food are indicated in (*figure 5)* below.

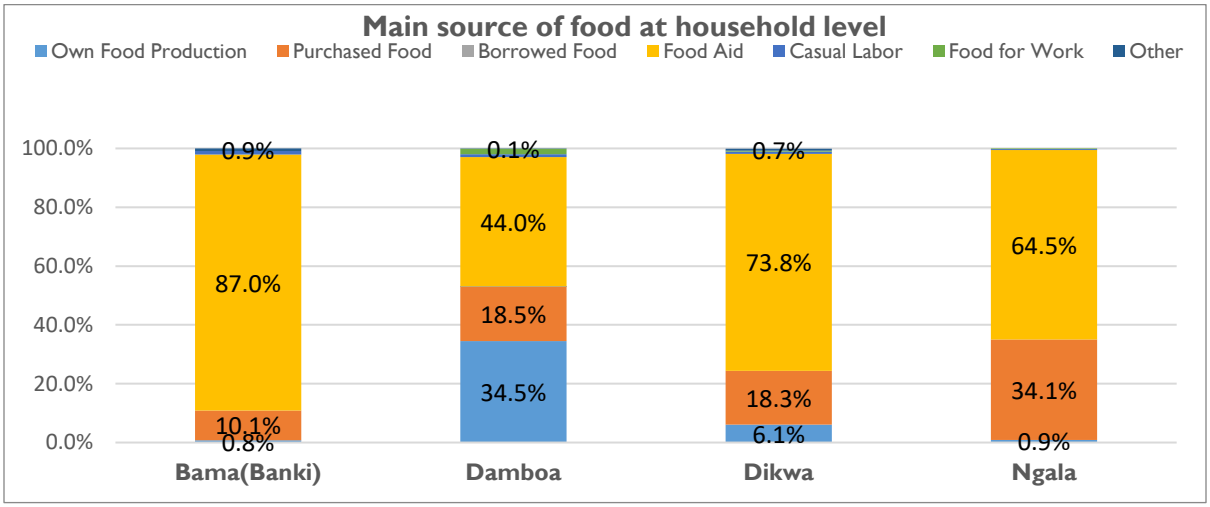


Figure 5: Main source of food at household level

3.7.2: Household Dietary Diversity Score (HDDS)

The household dietary diversity score was assessed based on foods consumed at household level in the past 24 hours. Majority of Households in the surveyed LGA were categorized in medium to high HDDS (*table 19*). Main food groups consumed at household level include cereals (>90%), oils & fats (>90%), vegetables (>80%), legumes & nuts (>70%) and condiments (>70%) respectively. However, food groups rarely consumed include: Eggs (<5%), meat & meat products (<15%), milk & milk products (<15%) and fruits (<20%) respectively across the surveyed LGAs. The mean HDDS in Banki, Damboa, Dikwa and Ngala was 5.6, 5.2, 5.7 and 6.8 respectively.

Table 19: Household Dietary Diversity Score and food groups consumed at household level

	Low HDDS (<4 food groups) (n) %	Moderate HDDS (5.0-6.9 food groups) (n) %	High HDDS (>7 food groups) (n) %
Banki	(79) 11.9	(457) 68.8	(128) 19.3
Damboa	(104) 14.9	(544) 77.8	(51) 7.3
Dikwa	(86) 12.6	(465) 68.1	(132) 19.3
Ngala	(12) 1.8	(237) 36.0	(409) 62.2

3.8 Infant Young Child Feeding (proxy indicators)

3.8.1 Exclusive breast feeding and early initiation to breast milk

Exclusive breastfeeding rate was below 70% across the surveyed LGA with exception of Ngala (73.2%) as illustrated in *table 20.*

Table 20: Breastfeeding practices

LGA	Prevalence of exclusive breastfeeding		Prevalence of early initiation to breastmilk	
	N	n (%)	N	n (%)
Banki	54	(29) 53.7	375	(354) 94.4
Damboa	97	(36) 37.1	265	(82) 30.9
Dikwa	25	(14) 56.0	226	(189) 83.6
Ngala	82	(60) 73.2	258	(198) 77.3

3.8.2 Complementary feeding practices among children aged (6-<24) months

The Minimum Meal Frequency (MMF) was below 50% across the surveyed LGAs with exception of Ngala. The Minimum Dietary Diversity (MDD) was below 50% across the LGAs. The Minimum Acceptable Diet (MAD) for Banki, Damboa, Dikwa and Ngala was 10.9%, 11.9%, 4.0% and 21.3% respectively as illustrated in *table 21*. Food groups rarely consumed by children (6-<24) include eggs, milk& milk products, meat & meat products, vitamin A rich vegetables and fruits and other vegetables and fruits. Foods mostly consumed included; cereal and legumes/nuts.

Table 21: Complementary feeding practices

	Introduction to soft, semi-solid & solid food		N	Minimum meal frequency	Minimum dietary diversity	Minimum acceptable diet
	N	(n) %		(n) %	(n) %	(n) %
Banki	43	(25) 58.1	321	(146) 45.5	(71) 22.1	(35) 10.9
Damboa	41	(17) 41.5	168	(65) 38.7	(30) 17.9	(20) 11.9
Dikwa	47	(22) 46.8	201	(75) 37.3	(14) 7.0	(8) 4.0
Ngala	34	(27) 79.4	174	(134) 77.0	(37) 21.3	(37) 21.3

3.9 Water, Sanitation and Hygiene

3.9.1: Main source of drinking water at household level

The main source of drinking water at household level based on respondents was borehole in Dikwa and Damboa representing 74.4% and 42.8% respectively. In Bama (Banki) and Ngala the respondents mentioned their main source of drinking water from a public tap piped from a water tank located in the community, representing 69.7% and 62.7% respectively. Other sources are illustrated in *table 22*.

Table 22: Main sources of water for drinking at household level

LGA	Protected well/spring	Open well/spring	River	Rain water	Dam/pond	Borehole/public stand pipe	Purchase from vendor	Other
Banki	(0) 0.0	(0) 0.0	(0) 0.0	(0) 0.0	(0) 0.0	(661) 99.7	(0) 0.0	(2) 0.3
Damboa	(2) 0.3	(50) 7.2	(1) 0.1	(3) 0.4	(41) 5.9	(599) 85.8	(2) 0.3	(0) 0.0
Dikwa	(12) 1.8	(10) 1.5	(0) 0.0	(1) 0.1	(0) 0.0	(613) 89.8	(35) 5.1	(12) 1.8
Ngala	(0) 0.0	(0) 0.0	(0) 0.0	(0) 0.0	(6) 0.9	(622) 94.7	(24) 3.7	(5) 0.8

3.9.2: Household water treatment

The percentage of households that responded to treat their water before drinking was above 50% in Bama (Banki)and Damboa LGAs. In Dikwa and Ngala the households that responded to treat water before drinking was 48.9% and 25.6% respectively as illustrated in *table 23*. The households that reported to treat their water before drinking embraced use of chemical tabs or solution provided by aid agencies representing 59.3% in Bama (Banki), 61.2% in Damboa, 95.2% in Dikwa and 39.3% in Ngala respectively.

Table 23: Water treatment at household level

LGA	N	water treatment at household level (YES) (n) %	water treatment at household level (NO) (n) %
Banki	663	(546) 82.4	(117) 17.6
Damboa	698	(430) 61.6	(268) 38.4
Dikwa	683	(334) 48.9	(349) 51.1
Ngala	657	(168) 25.6	(489) 74.4

3.9.3: Hand washing practices

The respondents (>50%) reported to practice hand washing at 2 main critical points namely; visiting the toilet and before eating. However, critical hand washing practices such as before feeding the child, before cooking/preparing food and after cleaning child's bottom minimum observed as highlighted in *table 24*. The percentage of respondents at household level who practiced 3 or more critical times in Bama (Banki), Damboa, Dikwa and Ngala represented 48.6%, 38.0%, 40.7% and 69.4% respectively. Recommended hand washing by water and soap was below 50% across the surveyed LGA (*table 25*).

Table 24: Critical hand washing practices

Hand washing at critical moment in percentage	Surveyed LGA			
	Bama (Banki)	Damboa	Dikwa	Ngala
After visiting the toilet	75.3	90.3	91.1	97.7
Before cooking	31.8	7.7	29.1	44.7
Before feeding the child	48.9	6.3	14.5	13.5
After cleaning Child's Bottom	47.4	35.7	31.9	28.0
Before eating	71.2	95.1	89.5	94.4

Table 25: Hand washing substance

LGA	water only (n) %	water and ash (n) %	water and soap (n) %	others: water, ash, sand (n) %
Banki	(179) 27.0	(103) 15.5	(262) 39.5	(119) 17.9
Damboa	(345) 49.4	(13) 1.9	(324) 46.4	(16) 2.3
Dikwa	(275) 40.3	(55) 8.1	(261) 38.2	(92) 13.5
Ngala	(178) 27.1	(13) 2.0	(407) 61.9	(59) 9.0
Total	(977) 36.2	(184) 6.8	(1254) 46.4	(286) 10.6

3.9.4: Sanitation coverage

Households prefer to dispose human excreta at pit latrine representing (>80%) in all LGAs as illustrated in *table 26*. Other methods of disposal embraced include disposal at VIP latrines, bush/field and by using flush toilets.

Table 26: Sanitation type

LGA	N	pit latrine/traditional pit latrine	ventilated improved pit latrine	flush toilet	bush/field
Banki	663	(662) 99.8	(0) 0.0	(0) 0.0	(1) 0.2
Damboa	698	(692) 99.1	(3) 0.4	(2) 0.3	(1) 0.1
Dikwa	683	(510) 74.7	(172) 25.2	(0) 0.0	(1) 0.1
Ngala	657	(451) 68.6	(206) 31.4	(0) 0.0	(0) 0.0

3.10 Mortality

3.10(a) Crude Death Rate (CDR) and Under-five Death Rate (U5MR)

The CDR and U5MR across the surveyed LGAs as indicated in (*table 27*) was below emergency threshold of 1 death per 10,000 persons per day and 2 deaths per10,000 under-fives per day[7].

Table 27: Mortality rates

LGA	Crude Mortality Rate (CMR) (deaths/10,000persons /day)	Design effect	Under-five Mortality Rate(U5MR) (deaths/10,000persons/ day)	Design effect	Birth rate	In-migration Rate (joined)	Out-migration Rate (left)
Banki	0.12(0.04-0.42)	1.43	0.18(0.04-0.73)	1.00	0.31	0.00	0.68
Damboa	0.39(0.22-0.69)	1.19	1.22(0.61-2.42)	1.18	0.65	0.08	0.34
Dikwa	0.19(0.09-0.43)	1.13	0.27(0.07-1.13)	1.00	0.30	0.44	0.85
Ngala	0.40(0.22-0.73)	1.27	0.59(0.25-1.38)	1.00	0.43	0.86	1.37

[7] Thresholds for Crude Death Rate: <1/10,000/day=Acceptable; > 1/10,000/day=Very Serious/emergency, > 2/10,000/day=Out of Control, >5/10,000/day=Major Catastrophe *(adapted from Checchi and Roberts, 2005)* .
Thresholds for Under-Five Death Rate: <2/10,000/day=Acceptable, >2/10,000/day=Very Serious/emergency, >4/10,000/day=Out of Control, >10/10,000/day= Major Catastrophe *(adapted from Checchi and Roberts, 2005)*

3.11 Limitations of the survey

i. Insecurity hindering access: for example, Ngala cluster 22 (*Gamboru*) was not assessed due to reported AOG attack on the communities in mentioned cluster during survey data collection. Time to start and end the survey was limited. In Dikwa & Banki curfew at 5:30pm was mandated and thus team had to leave the field earlier.
ii. Lack of updated population estimates at community settlement: teams spent more days during the mapping of all community settlements and development of sampling frame.
iii. Lack of proper documentation (child birth certificates/clinic card) to determine actual date of birth of children. The age of (>80%) eligible children across the surveyed LGA was derived by estimation using an event calendar. lack of documentation did affect the probe on child health as most of the caregivers in sampled households confirmed vaccination and Vitamin A supplementation through recall.

4.0 Discussion and Conclusion

4.1 Correlation of acute malnutrition and morbidity (reported ill based on two weeks recall)

UNICEF conceptual framework, 1990 indicated an association between child illness and acute malnutrition prevalence among children aged (6-59 months). Hence, further analysis through cross tabulation of result obtained, using morbidity (illness) as independent variable versus acute malnutrition prevalence as dependent variable was done. The findings revealed that 25.9%, 49.1%, 14.1% and 24.7% of children aged (6-59) months confirmed as acute malnourished in Dikwa, Damboa, Bama (Banki) and Ngala LGAs were ill two weeks prior to surveyed data collection. This implied that half of children aged (6-59) months who reported ill in Damboa and more than a quarter of children who reported ill in Ngala and Dikwa LGA were of acutely malnourished.

4.2 Correlation between diarrhoea and hand washing practices

Cross tabulation between diarrhoea (dependent variable) and handwashing practices (independent variable) revealed that caregivers who did not observe critical handwashing practices had their children with diarrhoea illnesses representing (2.4%), (6.1%), (6.3%) and (8.5%) in Bama (Banki), Damboa, Dikwa and Ngala respectively.

4.3 Correlation between primary caregiver education level and health seeking pattern

Further analysis on association between primary caregiver education level(independent) and health seeking pattern (dependent) revealed that caregivers with no education were likely not to visit health facility for the treatment of their ill children representing 73.7%, 66.9%, 71.6% and 86.5% in Bama (Banki), Damboa, Dikwa and Ngala respectively. This implies that education is an important pillar especially in creating awareness on health and nutrition services available, in utilization of services and adoption of good health seeking behaviour by the primary caregiver with consequent implication on maternal and child health.

4.4 Conclusion

The prevalence of acute malnutrition based on GAM (WHZ<-2SD) among children aged (6-59) months was interpreted as high in Dikwa and Ngala, and medium in Bama (Banki) and Damboa based on UNICEF classification of acute malnutrition. This will be used as baseline and follow-up surveys based on seasonality is highly recommended. Similarly, prevalence of stunting and underweight were very high in Damboa, hence, close monitoring of the situation is recommended across the surveyed LGAs as approaching dry season and other compounding factors such as insecurity might worsen the situation.

BCG and Measles vaccination was below 50% in Damboa and Ngala, hence the need the need to trigger mop-up campaigns and strengthen integrated health services at community and facility levels. Likewise,

Vitamin A supplementation among children aged (6-59) months was below 50% in Ngala and Damboa and deworming was below 50% across all LGAs with exception of Bama (Banki). Also, Iron/folic supplementation among pregnant mothers was below 50% across the surveyed LGAs. It is worth mentioning the need to ensure proper documentation of child and maternal health and nutrition data, since most of verification for age of child, vaccination and supplementation was by recall and not a reliable source of verification.

Poor health seeking behaviour was observed across the surveyed LGAs in relation to caregiver health seeking options for their ill children as well as ANC visits. Sub-optimal complimentary feeding practices among children aged (6-23.9) months was observed across the surveyed LGAs with eggs, meat & meat products, milk & milk products rarely consumed, hence the need to diverse diet consumed by the young children. Maternal nutritional status by MUAC confirmed existence of acute malnutrition among mothers and need to target them in blanket and preventive programs. Poor hand washing practices with respondents practicing at least 3 critical times below 80% across the surveyed LGAs. Treatment of water at household level was below 50%, a need to ensure water treatment kits are provided at household level and caregivers sensitized on how to use them for treating their drinking water.

Furthermore, CMR and U5MR was below emergency thresholds of 1 death/10,000 persons/day and 2 death/10,000 persons/day across the LGAs.

4.2 Summary Recommendations

Summary finding	Proposed recommendations
Nutritional status of children (6-59) & Women of Reproductive Age **Prevalence of acute malnutrition** (child) based on GAM(WHZ) high in Ngala (14.3%) and Dikwa (10.4%). GAM(WHZ) in Banki (8.7%) & Damboa (9.0%) at medium. Prevalence of acute malnutrition by MUAC confirms presence of many cases of MAM and SAM cases across the LGA level. Majority of case of acute malnourished children were Moderately acute malnourished. Maternal nutritional status by MUAC<22.0cm was 13.7, 16.3,15.3 & 10.5 in Banki, Damboa, Dikwa & Ngala LGAs	• Strengthen CMAM activities at facility and community levels. ✓ Case finding of SAM and MAM cases ✓ Triage, follow-up and referral of SAM and MAM cases from communities/camp to the treatment sites. ✓ Integration of health, WASH and nutrition activities: growth monitoring, ANC/PNC, IYCF, Immunization, micronutrient supplementation and CMAM (community mobilization/sensitization, SC, OTP and TSFP). • Support in strengthening monitoring of nutrition status of under-fives and mothers at community through monthly MUAC screening and growth monitoring of under-fives at facility. • Strengthen partner/stakeholder engagement in fostering integration of activities at community levels • Continued CMAM training and refresher to CVs and other key community actors
Prevalence of chronic Malnutrition Stunting prevalence very high (>40%) in Damboa LGA, high in Dikwa(>30%) and medium in both Ngala and Banki.	• Strengthen integrated approaches such as behaviour change communication on optimal IYCF practices, health seeking behaviour, hygiene and sanitation practices and other multi-sectoral approaches.
Morbidity patterns (>20%) of children (6-59) months reported ill in Ngala, Damboa & Ngala. Prevalence of fever/chills and ARI/cough was the main reported illnesses across all LGAs. Diarrhoea cases was highest in Ngala **Health seeking patterns** (<20%) of children who reported ill their caregivers did not seek treatment.	• Continue nutrition and health talks at community and facility levels to trigger effect in caregiver health seeking behavior • Sensitization on hygiene promotion activities. • Strengthen referrals of ill children to the facility, working closely with community volunteers and health workers.
Immunization/vaccination coverage Measles coverage above 80% in Banki & Dikwa. In Ngala (55.6%) and Damboa (32.6%) measles coverage below 80%.	• Strengthening documentation of all children immunized/vaccinated and supplemented with various micronutrients across the LGAs.

Micro-nutrient supplementation for children (6-59 months): Vitamin A , iron folate & deworming Vitamin A supplementation coverage below 50% in Ngala (27.8%) & Damboa (24.7%). Deworming coverage among (12-59) months was below 50% across surveyed LGA with exception of Banki/Bama. **Maternal Health** ANC visits (4&above times) below 50% in Banki, Damboa & Dikwa. Iron-folate supplementation among pregnant women and mothers during their last pregnancy in Bama (Banki) (40.6%), Damboa (18.0%), Dikwa (3.7%) and Ngala (17.4%) LGA respectively. **Proxy IYCF (EBF, complementary feeding)** EBF (>50%) in Dikwa, Ngala & Banki MAD (<50%) across all LGAs. Foods rarely consumed eggs, meat & meat products, milk & milk products, vitamin A rich vegetables & fruits	• Strengthen measles vaccination in Ngala and Damboa • Integration of immunization/vaccination with other health and nutrition activities provided at facility and community levels. • Continuum of individual and group counselling of mothers during their visit to ANC/PNC • Promotion of health talks at facility levels. • Continuum of IYCF activities such as cooking demonstrations and group talks on optimal IYCF practices, continuum of support groups (mothers) and encourage other actors such as fathers/grandmothers to participate in the activities. • Continuum of individual and group counselling of caregivers(mothers) • Breastfeeding support during home visits and facility levels (ANC/PNC among others).
Water, sanitation & hygiene Majority of households across the surveyed LGA obtain their water for drinking from stand tap/pipe (connected to water) and borehole. However, in Damboa use of unimproved sources of water such as open well (7.2%) and dam/pond (15.9%) is common. Treatment of water before drinking was below (>50%) in Dikwa and Ngala. Hand washing practices for at least 3 or more critical times was below 50% across the surveyed LGAs with exception Ngala (69.4%). Sanitation coverage (pit/VIP latrine) above 80% across the surveyed LGAs.	• Improve sources of drinking water in Damboa by creating awareness of use of available safe sources such as protected boreholes. • Community sensitization on treatment of drinking water before consumption as well as promotion of hygiene practices. • Foster safe disposal of human excreta at household/community levels. • Distribution of water treatment kits at household levels
Food security Main source of food at household levels across the surveyed LGAs is food aid with exception of Damboa where majority of respondents confirmed they obtain their food through own food production. Mean HDDS ranged between 5.0-6.0 however some food groups such as eggs, meat & meat products, milk & milk products and fruits are rarely consumed.	• Continuum distribution of monthly food aid to vulnerable populations in the camp and host communities. • Encourage households in host communities to diversify diets by own production especially for households practicing food crop cultivation in Ngala and Damboa.

Annex 1: Survey activity plan

Activity	Time-frame									
	5th -16th September, 2019	16th -24th September, 2019	18th-20th September, 2019	21st September, 2019	22nd-26th September, 2019	26th September-8th October, 2019	8th and 9th October, 2019	8th -13th October, 2019	14th October, 2019	17-23rd October, 2019
Planning of the survey										
Drafting of technical proposal										
Mapping of 4 survey LGAs by settlement/units and population. Coding of questionnaire										
Training of survey enumerators (including standardization test & field test)										
Survey teams travel to the LGAs/field for data collection										
Data collection in the 4 LGAs										
Survey teams travel back to Maiduguri from respective LGAs										
Data analysis/verification and collation										
Share first draft survey report. Internal dissemination										
Finalizing and submitting report External dissemination/validation of survey findings										

Annex 2: Distribution of age and sex of the children aged 6-59 months.

In all surveyed location, Ngala, Dikwa, Banki and Damboa, the distribution of boys and girls were equally represented for children aged (6-59 months) as indicated in *table below*. However, the age distribution among younger age group range (6-29 months) and older age group (30-59 months) was uniformly distributed only in Ngala and Damboa. In Dikwa and Banki, the age distribution was not uniformly distributed with younger age groups (6-29 months) above as expected when compared to older age groups (30-59 months), the reason for significant difference in overall age distribution could be attributed to confirmation of age of majority of the children through estimation using event calendar, a likelihood of recall bias.

		Boys		Girls		Total		Ratio
LGA	Age (mo)	no.	%	no.	%	no.	%	Boy: girl
Ngala	17-Jun	60	45.8	71	54.2	131	20.1	0.8
	18-29	113	59.2	78	40.8	191	29.3	1.4
	30-41	82	49.1	85	50.9	167	25.6	1
	42-53	60	55	49	45	109	16.7	1.2
	54-59	29	53.7	25	46.3	54	8.3	1.2
	Total	344	52.8	308	47.2	652	100	1.1
Dikwa	17-Jun	92	53.2	81	46.8	173	29.4	1.1
	18-29	75	50.3	74	49.7	149	25.3	1
	30-41	57	47.1	64	52.9	121	20.5	0.9
	42-53	50	50	50	50	100	17	1
	54-59	19	41.3	27	58.7	46	7.8	0.7
	Total	293	49.7	296	50.3	589	100	1
Damboa	17-Jun	56	40.9	81	59.1	137	22.5	0.7
	18-29	85	54.8	70	45.2	155	25.4	1.2
	30-41	65	46.1	76	53.9	141	23.1	0.9
	42-53	70	56	55	44	125	20.5	1.3
	54-59	27	51.9	25	48.1	52	8.5	1.1
	Total	303	49.7	307	50.3	610	100	1
Bama (Banki)	17-Jun	118	50	118	50	236	26	1
	18-29	126	53.4	110	46.6	236	26	1.1
	30-41	101	48.3	108	51.7	209	23.1	0.9
	42-53	72	45.3	87	54.7	159	17.5	0.8
	54-59	35	53	31	47	66	7.3	1.1
	Total	452	49.9	454	50.1	906	100	1

Annex 3: Mean z-scores, design effect and excluded subjects

2(a)Banki

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	899	-0.66±0.96	1.59	0	7
Weight-for-Age	900	-1.00±1.02	1.73	0	6

Height-for-Age	874	-1.05±1.30	1.46	0	32

2(b)Damboa

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	600	-0.63±1.04	1.06	0	10
Weight-for-Age	603	-1.56±1.06	1.61	0	7
Height-for-Age	580	-1.99±1.26	2.14	0	30

2©Dikwa

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	577	-0.72±1.04	1.00	1	11
Weight-for-Age	581	-1.42±1.05	1.58	0	8
Height-for-Age	565	-1.65±1.27	1.02	1	23

2(d)Ngala

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	635	-0.79±1.09	1.43	1	16
Weight-for-Age	646	-1.30±1.09	1.25	0	6
Height-for-Age	620	-1.32±1.27	1.60	0	32

Annex 4: Map of Borno State illustrating surveyed LGAs (blue outline)

Annex 5: Survey team & roles

SURVEY TEAM	ROLE
Kevin Mutegi	SMART survey consultant
Dr. Celestine Emeka Ekwuluo	Coordinator/supervisor
Nuraini Aisha	Team leader/supervisor-Damboa LGA
Akeem Odewale	Team leader/supervisor-Banki LGA
Prisca Ndianefo	Team leader/supervisor-Dikwa LGA
Solomon Atuman	Team leader/supervisor-Ngala LGA
Maimuna Garba	State primary health care supervisor
Habiba Bukar Kwaya.	State primary health care supervisor
Rose Nathan	State primary health care supervisor
Idoko Simon	Enumerator
Gibson Nwosu Ihunanya	Enumerator
Abdulmajid Adamu	Enumerator
Desmond Hundu Kungwa	Enumerator
Emmanuel O. Anigbogu	Enumerator
Browne Simon	Enumerator
Euodia Ibrahim	Enumerator
Zara Kachalla	Enumerator
Fatuma Lawan	Enumerator
Ogonna Eze	Enumerator
Julie Usman	Enumerator
Akinlabi Oyegbile Junior	Enumerator
Pontim Ndam	Enumerator
Ojo Oluwaseun	Enumerator
Ibrahim A. Chiroma	Enumerator
Felix Chizoba Okonkwo	Enumerator
Gideon O. Ibeakuzie	Enumerator
Umara Baba Gana Shasha	Enumerator
Fatima Saleh	Enumerator
Hajja Fanna	Enumerator
Usman Idris Shall	Enumerator
Elisha Iliya	Enumerator
Abdulsalam Ahmed	Enumerator
Safiyanu Habibu	Enumerator
Community Guides	

Annex 6: Standardization test results

Standardization test results					**Precision**			**Accuracy**		**Outcome**	
Weight		**subjects**	**mean**	**SD**	**max**	**Technical error**	**TEM/mean**	**Bias from superv**	**Bias from median**	**Precision**	**Accuracy**
		#	Kg	kg	kg	TEM (kg)	TEM (%)	Bias (kg)	Bias (kg)		
	Supervisor	10	9.8	2.3	0.1	0.03	0.3	-	1.42	TEM good	
	Enumerator 1	10	9.8	2.3	0.1	0.02	0.2	-0.01	1.41	TEM good	Bias good
	Enumerator 2	10	9.8	2.3	0.1	0.05	0.6	0.02	1.44	TEM acceptable	Bias good
	Enumerator 3	10	9.8	2.3	0.2	0.07	0.7	0.02	1.44	TEM acceptable	Bias good
	Enumerator 4	10	9.8	2.3	0.2	0.06	0.6	0.01	1.43	TEM acceptable	Bias good
	Enumerator 5	10	9.8	2.3	0.2	0.07	0.8	0.03	1.45	TEM acceptable	Bias good
	Enumerator 6	10	9.8	2.3	0.1	0.05	0.6	-0.01	1.41	TEM acceptable	Bias good
	Enumerator 7	10	9.8	2.3	0.2	0.06	0.6	0.02	1.44	TEM acceptable	Bias good
	Enumerator 8	10	9.8	2.3	0.2	0.06	0.6	0	1.42	TEM acceptable	Bias good
	Enumerator 9	10	9.8	2.3	0.2	0.07	0.8	0.01	1.43	TEM acceptable	Bias good
	Enumerator 10	10	9.8	2.3	0.1	0.05	0.6	0.01	1.43	TEM acceptable	Bias good
	Enumerator 11	10	9.8	2.3	0.1	0.05	0.6	0.01	1.43	TEM acceptable	Bias good
	Enumerator 12	10	9.8	2.3	0.2	0.06	0.6	0.01	1.43	TEM acceptable	Bias good
	Enumerator 13	10	9.8	2.3	0.2	0.07	0.7	0.01	1.43	TEM acceptable	Bias good
	Enumerator 14	10	9.8	2.3	0.1	0.04	0.5	0.01	1.43	TEM acceptable	Bias good
	Enumerator 15	10	9.8	2.4	0.2	0.07	0.7	0.02	1.44	TEM acceptable	Bias good
	Enumerator 16	10	9.8	2.3	0.2	0.08	0.9	0.01	1.43	TEM acceptable	Bias good
	Enumerator 17	10	9.8	2.3	0.2	0.08	0.8	0.01	1.43	TEM acceptable	Bias good
	Enumerator 18	10	9.8	2.3	0.1	0.05	0.5	0.02	1.44	TEM acceptable	Bias good
	Enumerator 19	10	9.8	2.3	0.3	0.09	0.9	0.02	1.44	TEM acceptable	Bias good
	Enumerator 20	10	9.8	2.3	0.2	0.08	0.8	0	1.42	TEM acceptable	Bias good
	TOTAL intra+inter	20x10	-	-	-	0.08	0.8	0.01	1.43	TEM good	Bias good
Height		**subjects**	**mean**	**SD**	**max**	**Technical error**	**TEM/mean**	**Bias from superv**	**Bias from median**	**result**	

		#	cm	cm	cm	TEM (cm)	TEM (%)	Bias (cm)	Bias (cm)		
	Supervisor	10	80.4	11.2	1	0.22	0.3	-	7.03	TEM good	
	Enumerator 1	10	80.7	10.8	0.5	0.13	0.2	0.25	7.28	TEM good	Bias good
	Enumerator 2	10	80.4	10.9	3.5	1.14	1.4	-0.03	7	TEM reject	Bias good
	Enumerator 3	10	80.4	11.3	2.5	0.83	1	-0.01	7.02	TEM poor	Bias good
	Enumerator 4	10	81	10.5	10	2.24	2.8	0.54	7.57	TEM reject	Bias acceptable
	Enumerator 5	10	80.9	10.8	3.6	1.27	1.6	0.43	7.46	TEM reject	Bias acceptable
	Enumerator 6	10	80.7	11.5	4.2	1.16	1.4	0.26	7.29	TEM reject	Bias good
	Enumerator 7	10	80.7	11.1	4.3	1.47	1.8	0.26	7.29	TEM reject	Bias good
	Enumerator 8	10	79.7	10.2	17.6	4.37	5.5	-0.73	6.3	TEM reject	Bias good
	Enumerator 9	10	80.8	10.6	8.7	2.36	2.9	0.32	7.35	TEM reject	Bias good
	Enumerator 10	10	81.2	10.7	0.2	0.09	0.1	0.72	7.75	TEM good	Bias poor
	Enumerator 11	10	80	10.8	8.1	1.81	2.3	-0.43	6.6	TEM reject	Bias good
	Enumerator 12	10	80.5	10.8	2.1	0.52	0.6	0.11	7.14	TEM acceptable	Bias good
	Enumerator 13	10	80.3	11.3	0.1	0.04	0	-0.11	6.92	TEM good	Bias good
	Enumerator 14	10	81.6	11	17.5	3.98	4.9	1.15	8.18	TEM reject	Bias poor
	Enumerator 15	10	80.8	11	0.1	0.02	0	0.35	7.38	TEM good	Bias good
	Enumerator 16	10	80.7	11	1.9	0.6	0.7	0.27	7.3	TEM acceptable	Bias good
	Enumerator 17	10	80.8	11	0	0	0	0.37	7.4	TEM good	Bias good
	Enumerator 18	10	80.8	11	2.5	0.91	1.1	0.39	7.42	TEM poor	Bias good
	Enumerator 19	10	80.8	11	0.5	0.17	0.2	0.33	7.36	TEM good	Bias good
	Enumerator 20	10	81.8	11.1	21.6	4.93	6	1.4	8.43	TEM reject	Bias reject
	TOTAL intra+inter	20x10	-	-	-	2.91	3.6	0.29	7.31	TEM reject	Bias good
MUAC		**subjects**	**mean**	**SD**	**max**	**Technical error**	**TEM/mean**	**Bias from superv**	**Bias from median**	**result**	
		#	**mm**	**mm**	**mm**	**TEM (mm)**	**TEM (%)**	**Bias (mm)**	**Bias (mm)**		
	Supervisor	10	141.2	8.9	2	0.63	0.4	-	2.2	TEM good	
	Enumerator 1	10	142.2	9	22	4.95	3.5	1	3.2	TEM reject	Bias good
	Enumerator 2	10	139	8.9	17	5.74	4.1	-2.2	0	TEM reject	Bias good
	Enumerator 3	10	139	10.8	17	5.01	3.6	-2.2	0	TEM reject	Bias good

	Enumerator 4	10	140.7	8.3	9	2.3	1.6	-0.5	1.7	TEM acceptable	Bias good
	Enumerator 5	10	141.6	7.5	6	2.49	1.8	0.4	2.6	TEM acceptable	Bias good
	Enumerator 6	10	139.9	9.4	7	2.87	2.1	-1.35	0.85	TEM poor	Bias good
	Enumerator 7	10	138.9	9.6	28	8.8	6.3	-2.3	-0.1	TEM reject	Bias good
	Enumerator 8	10	140.9	7.7	24	6.53	4.6	-0.3	1.9	TEM reject	Bias good
	Enumerator 9	10	140.7	6.6	8	3.32	2.4	-0.5	1.7	TEM reject	Bias good
	Enumerator 10	10	139.1	9.3	7	1.72	1.2	-2.15	0.05	TEM good	Bias good
	Enumerator 11	10	139.4	7.8	2	0.77	0.6	-1.8	0.4	TEM good	Bias good
	Enumerator 12	10	137.3	5.9	6	1.55	1.1	-3.9	-1.7	TEM good	Bias good
	Enumerator 13	10	139.6	9.1	1	0.39	0.3	-1.55	0.65	TEM good	Bias good
	Enumerator 14	10	140.7	8.1	14	4.02	2.9	-0.5	1.7	TEM reject	Bias good
	Enumerator 15	10	141.7	6.8	1	0.55	0.4	0.5	2.7	TEM good	Bias good
	Enumerator 16	10	139.9	8.7	10	3.69	2.6	-1.35	0.85	TEM reject	Bias good
	Enumerator 17	10	139.8	9	0	0	0	-1.4	0.8	TEM good	Bias good
	Enumerator 18	10	140.3	7.6	8	3.04	2.2	-0.95	1.25	TEM poor	Bias good
	Enumerator 19	10	140.8	9.4	6	2	1.4	-0.4	1.8	TEM good	Bias good
	Enumerator 20	10	140.6	9	27	7.1	5	-0.65	1.55	TEM reject	Bias good
	TOTAL intra+inter	20x10	-	-	-	6.08	4.3	-1.1	1.15	TEM reject	Bias good

Annex 7: SMART data collection tools


Anthropometric back-up questionna


Mortality back-up Questionnaire.docx


FHI 360_Final SMART survey quest


Cluster control form.docx

Annex 8: Anthropometric data plausibility reports


Overall Anthro DPS report_Bama(Banki) l


Overall Anthro DPS report_Damboa LGA


Overall Anthro DPS report_Dikwa LGA.d


Overall Anthro DPS report_Ngala LGA.dc

Annex 9: Event calendar


Event calendar_updated 2


Event calendar_updated 2

Annex 10: Training schedule


Training schedule.docx