



Global Programme
Food and Nutrition Security, Enhanced Resilience

Nutrition Baseline Survey Summary Report

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Acronyms and Abbreviations

ANC	Antenatal Care
ASF	Animal Source Foods
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung
DFID	Department for International Development
DHS	Demographic and Health Survey
FAO	Food and Agriculture Organization of the United Nations
FEWS NET	Famine Early Warning System Network
FIES-H	Food Insecurity Experience Scale – Household
FIES-I	Food Insecurity Experience Scale – Individual
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HH	Household
IFAD	International Fund for Agriculture Development
IDDS-C	Individual Dietary Diversity Score for Children
IDDS-W	Individual Dietary Diversity Score for Women
ILRI	International Livestock Research Institute
IYCF	Infant And Young Child Feeding
KAP	Knowledge, Attitudes and Practices
MAD	Minimum Acceptable Diet
MDD	Minimum Dietary Diversity
MDD-W	Minimum Dietary Diversity for Women
MMF	Minimum Meal Frequency
NA	Not available
NGO	Non-Governmental Organization
PLW	Pregnant and Lactating Women
SD	Standard Deviation
SDGs	Sustainable Development Goals
SES	Socio-economic status
SEWOH	“One World - No Hunger” Initiative (Sonderinitiative “EINEWELT ohne Hunger”)
SPSS	Statistical Package for Social Sciences
SUN	Scaling Up Nutrition
TPDS	Targeted Public Distribution System
VoH	Voices of the Hungry
UNDP	United Nations Development Programme
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization

Preface

Dear readers,

The “One World - No Hunger” initiative of the German Federal Ministry of Economic Cooperation and Development (BMZ) addresses one of the greatest global challenges: ending hunger and ensuring access to safe, nutritious and sufficient food for all people year round. Within this initiative, GIZ was commissioned by the BMZ to implement the “Food and nutrition security, enhanced resilience” Programme in 11 countries in Africa and Asia. The overall objective is to improve the nutrition situation of small children and women of childbearing age with a special focus on the “1,000 days’ window of opportunity” to break the vicious circle of under nutrition and poverty.

For the purpose of having a starting point to plan effective and efficient interventions, we conducted baseline surveys on the food and nutrition situation in 10 out of the 11 countries. The studies applied three food-based indicators in order to measure the percentage of young children receiving a minimal acceptable diet (MAD) and the dietary diversity of women (MDD-W) as a proxy of micronutrient adequacy of the diet. Additionally, the general food security situation (e.g. access to food) and the specific situation of women and young children in the respective countries were measured. Each project area faces its own potentials, problems and challenges in fighting for a world without hunger and strengthening resilience to hunger crises.

There is no “blueprint” in the fight against under- and malnutrition, especially of women and young children. However, it is worthwhile summarizing the country-specific findings and offering some general conclusions worldwide. While starting with the survey design, our intention was to apply “state of the art” scientific methods to measure the current food and nutrition situation in the selected countries. Bioversity International helped us to undertake the challenge to summarize the findings, to discuss the applied research methods and to test some basic hypotheses of our programme approach.

We hope that our partners in the fight against hunger and malnutrition within the Sustainable Development Goal Agenda will also benefit from our findings and experiences, in order to contribute to our common objective of ‘One World - No Hunger’ in 2030! Furthermore, we would like to encourage interesting discussions and invite an exchange of views.

We would like to thank Gina Kennedy, her co-authors, the data analysis team and Olga Spellman, technical editor of Bioversity International, the colleagues and partners who prepared and conducted the baseline surveys in the respective countries. Finally, we would like to express our gratitude to more than 4.000 women who offered their time to answer our questions.

Michael Lossner
Programme Director
Global Programme Food and Nutrition Security, Enhanced Resilience

Bonn, May 2017

* All baseline studies available here:

<http://star-www.giz.de/starweb/giz/pub/servlet.starweb?path=giz/pub/pub.web>

(Search term: baseline survey)

1. Introduction

Food and nutrition security is a topic of great global concern. The Sustainable Development Goals call for an end to hunger and an end to all forms of malnutrition by 2030. The United Nations has launched a Decade of Action on Nutrition to stimulate progress in realizing achievements and improvements in global food and nutrition security. It is therefore timely that the German Federal Ministry for Economic Cooperation and Development (BMZ) has launched the One World - No Hunger Initiative (SEWOH, <https://www.bmz.de/webapps/hunger/index.html#/de>), with the specific objective of enhancing rural development and food and nutrition security through development cooperation, focusing more intensely on the improvement of the food and nutrition situation for women and children and the resilience of people in fragile contexts.

Within this initiative GIZ implements the Global Programme “Food and nutrition security, enhanced resilience” in 11 countries in Africa and Asia. The programme’s main target group includes women of childbearing age, pregnant women, breastfeeding mothers and infants. The programme’s objective is to improve the nutrition situation of approximately 113,000 women, 43,000 young children and 65,000 people living in food and nutrition insecurity. Another 8.5 million people will benefit from the programme’s interventions, thus, improving their nutrition. As part of the Global Programme “Food and nutrition security, enhanced resilience”, GIZ conducted a series of nutrition baseline surveys (NBS). A technical meeting was held in Bonn in July 2015 where the survey methodology, indicators and other technical aspects of the survey design and implementation were discussed. Bioversity International participated in the discussions and also provided comments on the guiding document for data collection “Guideline for Nutrition Baseline Surveys” prepared for the Global Programme “Food and nutrition security, enhanced resilience” (GIZ and Bellin-Sesay, 2015). Data collection activities were undertaken in ten countries between September 2015 and April 2016 by survey teams contracted by GIZ.

In June, 2016, GIZ contracted Bioversity International to prepare a summary report of the ten Nutrition Baseline Surveys (NBS) that included the following objectives: (i) To synthesize ten country reports (Benin, Burkina Faso, Cambodia, Ethiopia, India, Kenya, Malawi, Mali, Togo and Zambia) into a summary report of findings, conclusions and global-level recommendations (compare results in regional clusters), and (ii) to review reports of the project interventions in each country and provide a review of the coherence between baseline indicators and planned interventions, and suggest potential alterations or adjustments to planned interventions. In addition, Bioversity was asked to calibrate the Food Insecurity Experience Scale – Household Level (FIES-H) indicator from each country to the FAO global standard. We did this using the primary data from each NBS. The primary data of the NBS was also used to perform logistic regression of the association between dietary diversity and socio-economic status (SES), agriculture and knowledge variables. The remainder of the descriptive analysis presented comes from reference material provided by GIZ that included Nutrition Baseline Survey reports from Benin, Burkina Faso, Cambodia, Ethiopia, India, Kenya, Malawi, Mali, Togo and Zambia, as well as reports from ten country packages that describe the programme interventions for each country.

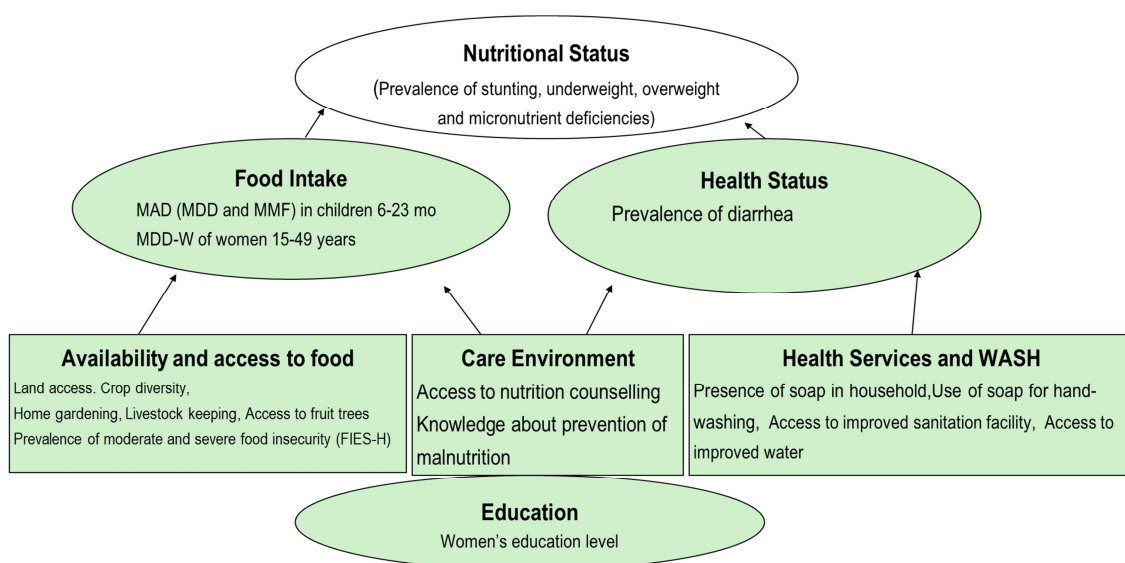


Figure 1: Results of the NBS from each country presented according to the UNICEF Model (examples of variables collected in the surveys are provided for each colored cell)

The report on the NBS results is structured according to the UNICEF conceptual framework on food and nutrition security, where food availability and access, health, water and sanitation, as well as care practices comprise the underlying causes that lead to individual nutrition status. The NBS did not collect primary data on the top circle of the framework “Nutritional Status” which generally refers to anthropometric and biochemical individual outcomes. This decision was made early on in the 2015 discussions on selection of indicators and was driven by two primary factors. One is the slow rate of change in stunting, also referred to as chronic malnutrition, which takes five to ten years to show significant differences over time. The second consideration was the nature of the country packages, which are of short duration (under five years, mostly between two to three years of implementation) and where the focus is on improving food and nutrition security primarily through agriculture and nutrition education pathways. The key variables that influence the “food based” indicators for the NBS are reflected in Figure 1 and include monitoring aspects of the three underlying causes of malnutrition: (i) availability and access to food, (ii) care environment (iii) health services and WASH, as well as the immediate causes leading to nutritional status that include food intake (measured for women and children in the NBS) and health (measured using diarrhoea prevalence of children).



2. Survey Methods in NBS

SEWOH Nutrition Baseline Surveys (NBS) were conducted in ten countries in Africa and Asia. The specific regions or districts that were included as part of the NBS were programme target areas of a GIZ development project, also referred to as a country package, being implemented in each country. Overall, the country packages aim to improve the nutrition status of women and children and household food security, primarily through improved and diversified agricultural production, nutrition education of direct beneficiaries and capacity strengthening of ancillary staff through training and formation of multi-sectoral committees on district level. The site selection of each NBS was guided by the location of the respective country packages, which will be discussed in more detail in the following section.

The main objective of the NBS was to describe the nutrition situation among the target groups in selected SEWOH implementation areas of each country using a set of standardized key indicators that included Minimum Acceptable Diet (MAD) of infants and young children, Individual Dietary Diversity Score Women (IDDS-W) and Food Insecurity Experience Scale – Household level (FIES-H). Furthermore, the NBS aimed to examine linkages between crop cultivation, dietary diversity and complementary feeding practices with living conditions, as well as with knowledge and practices in regard to nutrition and hygiene.

2.1 Country Package Area, Participants and Sample size

Baseline studies were carried out in ten countries including Benin, Burkina Faso, Cambodia, Ethiopia, India, Kenya, Malawi, Mali, Togo, and Zambia (Figure 2) between August 2015 and May 2016. In the majority of the countries the seasonal period was classified as “dry” which would generally be considered a period of “usual”, as compared to very low or very high food availability. Sample size in countries was between $n=400$ and $n=487$ with the exception of India ($n=802$). In total data was collected from approximately 4700 women-child pairs, in line with the selection criteria that the woman be of reproductive age (15-49y) with a child (6-23 months).

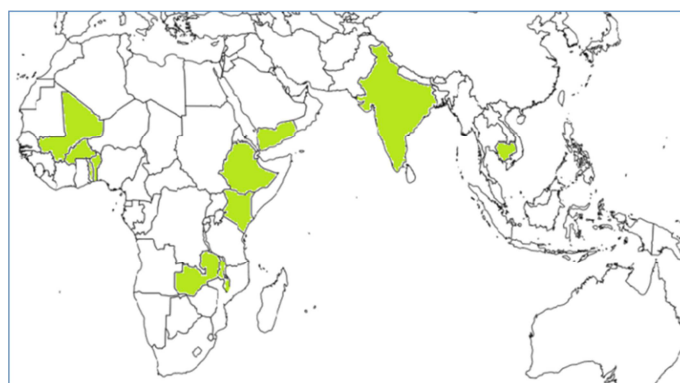


Figure 2: Overview of countries for the nutrition baseline surveys

Considering country context (e.g. availability of complete lists of all households including information concerning women of reproductive age and children under two who constitute the target group of the country package), either simple random sampling, systematic random sampling, stratified random sampling, or cluster sampling was chosen as sampling modality. No cluster weightings were applied to any of the results. For every country the survey asked questions on household demographics, agriculture production, sources of income, household food insecurity, child feeding and care practices, infant and women's dietary diversity and nutrition knowledge.

A set of core food-based indicators were identified for collection in all the NBS (see section 2.2). These indicators have internationally standardized definitions and have been endorsed by the United Nations (FAO, WHO and UNICEF), as well as by several other governmental and non-governmental organizations. An important highlight of the results of the ten NBS included in this report is that this is the first time these indicators have been used in combination to gather a holistic picture of food security and diet. An important outcome of the Global Programme can be a better understanding of how these indicators change within the context of different food and nutrition security interventions. In addition to the three core sets of information on household food insecurity, women's dietary diversity and infant and young child feeding, a number of questions were asked that reflected socio-demographics, agriculture practices, water, sanitation and hygiene, child prevalence of diarrhoea, maternal knowledge of nutrition and hygiene, and access to nutrition and hygiene counselling. The results used in this summary are based on the findings reported in each NBS, with the exception of the FIES-H where results were calibrated to the global standard by Bioversity International.

Definitions of indicators

The following three key indicators were chosen by the programme:

- Food Insecurity Experience Scale – Household Level (FIES-H)
 - *Prevalence of Experienced Food Insecurity at moderate or severe levels (FI mod+sev)*
 - *Prevalence of Experienced Food Insecurity at severe levels (FI sev)*
- Individual Dietary Diversity Score Women (IDDS-W) for mothers 15-49 years of age
- Minimum Acceptable Diet (MAD) for infants 6-23 months of age

The NBS also collected a large range of supporting information, summarized in Table 2.

Definitions of key indicators:

Food Insecurity Experience Scale- Household level (FIES-H)

FIES-H is an indicator developed by FAO and recently applied at individual level in 146 countries through the Gallup World Poll. The FIES-H module was administered in the NBS by asking the woman respondent a series of eight questions that relate to the food security of the household over the past month. For example "During the last month, was there a time when you were worried you or anyone else in your household would not have enough food to eat because of lack of money or other resources?" (<http://www.fao.org/3/a-bl404e.pdf>). The questions proceed along an order of severity, ending with "During the last month was there a time when you or anyone in your household went without eating for a whole day because of a lack of money or other resources?". At the request of GIZ, Bioversity International worked closely with the statistical team at FAO to compute prevalence rates for FIES-H that would be as comparable as possible to those of the Gallup World Poll. As per FAO guidance, two prevalence rates, namely the *Prevalence of Experienced Food Insecurity at moderate or severe levels (mod+sev)* and the *Prevalence of Experienced Food Insecurity at severe levels (FIsev)*, were calculated using thresholds selected by the Voices of the Hungry (VoH) project based on Gallup World Poll data from 146 countries. By applying the same thresholds for the data from the ten project countries we are able to compare the prevalence rates to the VoH prevalence rates as estimated from Gallup World Poll data, which are representative of the national population (FAO, 2016). The results of *Prevalence of Experienced Food Insecurity at moderate or severe levels (mod+sev)* and the *Prevalence of Experienced Food Insecurity at severe levels (FIsev)* are presented in the body of this report.

Dietary diversity of women

Women's diets were assessed by asking the mother to describe everything that she ate during the previous day and night, whether at home or outside the home. As per recent guidelines on women's dietary diversity, the woman was asked to freely recall her day from waking up to going to sleep for the night (FAO and FHI 360, 2016.). Responses were then categorized as yes/no into a series of 20 food groups. To assist enumerators in categorizing the foods correctly into the 20 groups, the survey teams in each country adapted the survey to include the names of locally available foods in the food group descriptions. After the data collection was completed, the 20 food groups from the original data collection were aggregated into ten food groups (see Table 1) during the analysis phase. It is important to note that only the food groups indicated in Table 1 are taken into account for the IDDS-W and MDD-W indicators.

Table 1: Ten food groups used in the Women's Dietary Diversity assessment

1	Grains, White Roots and Tubers, and Plantains	6	Eggs
2	Pulses (beans, peas and lentils)	7	Dark green leafy vegetables
3	Nuts and seeds	8	Other vitamin A-rich fruit and vegetables
4	Dairy	9	Other vegetables
5	Meat, poultry and fish	10	Other fruits

The score ranges from 0-10 based on the consumption of ten standardized food groups. IDDS-W is the calculation of the average score for the ten food groups. A second indicator called "Minimum Dietary Diversity-Women" (MDD-W) can also be calculated.

Definitions of IDDS-W and MDD-W

IDDS-W is the average number of food groups out of *ten defined food groups the previous day or night* consumed by women of reproductive age the previous day or night.

MDD-W is a dichotomous indicator defined as: The proportion of women 15–49 years of age who consumed food items from at least five out of ten defined food groups the previous day or night.

Minimum Acceptable Diet (MAD) of children 6-23 months of age

The WHO indicator Minimum Acceptable Diet (MAD) is a composite indicator constructed from the indicators Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF) (WHO, 2008a). During data collection for the NBS, enumerators were instructed to ensure they were interviewing the person with primary responsibility for taking care of the child during the previous day. The interview on child diet starts by assessing whether or not the child was breastfed the day before and then continues by asking the mother a series of standardized questions about liquids, followed by the open recall format as administered to women. During the survey, information on the child's diet was initially categorized into 16 food groups (WHO, 2008a) and later, during data analysis, the data were aggregated into one of 7 groups (see list below). Food groups such as sugar and condiments are excluded from the score.

Minimum dietary diversity is defined as receiving foods from ≥ 4 of 7 food groups:

- 1) Grains, roots and tubers
- 2) Legumes and nuts
- 3) Dairy products (milk, yogurt, cheese)
- 4) Flesh foods (meat, fish, poultry and liver/organ meats)
- 5) Eggs
- 6) Vitamin A-rich fruits and vegetables
- 7) Other fruits and vegetables

Calculation of MDD: Proportion of children 6–23 months of age who received foods from 4 or more food groups.

$$\frac{\text{children 6–23 months of age who received foods from } \geq 4 \text{ food groups during the previous day}}{\text{children 6–23 months of age}}$$

Minimum meal frequency among breastfeeding children is defined as children who also received solid, semi-solid, or soft foods twice or more daily for children age 6-8 months and three times or more daily for children age 9-23 months. For non-breastfeeding children aged 6-23 months it is defined as receiving solid, semi-solid or soft foods, or milk feeds, at least four times a day.

Calculation of MMF: Proportion of breastfed and non-breastfed children aged 6–23 months, who received solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more.

$$\frac{\text{Breastfed children 6–23 months of age who received solid, semi-solid or soft foods the minimum number of times or more during the previous day}}{\text{Breastfed children 6–23 months of age}}$$

and

$$\frac{\text{non-breastfed children 6–23 months of age who received solid, semi-solid or soft foods or milk feeds the minimum number of times or more during the previous day}}{\text{non-breastfed children 6–23 months of age}}$$

The minimum acceptable diet for breastfed children aged 6-23 months is defined as receiving the minimum dietary diversity and the minimum meal frequency, while for non-breastfed children it further requires at least two milk feedings and that the minimum dietary diversity is achieved without counting milk feeds.

Calculation of MAD: Proportion of children 6–23 months of age who receive a minimum acceptable diet (apart from breast milk).

$$\frac{\text{Breastfed children 6–23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day}}{\text{Breastfed children 6–23 months of age}}$$

and

$$\frac{\text{non-breastfed children 6–23 months of age who received at least 2 milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day}}{\text{non-breastfed children 6–23 months of age}}$$

It is important to note that there were cases in the NBS in which the MAD was very low in relation to MDD and MMF. This is because, according to the above definitions, a non-breastfed child could meet both MDD and MMF but not meet MAD if the child did not receive at least two milk feedings during the previous day.

Table 2: Supporting information available in the NBS (those marked * are described in the body of this report)

Domain	Variable	Comments
Socio-economic status	*Mean age of mothers	Not available for Malawi and Mali
	*Mean age of child	
	*% male-headed HH	
	*Number of HH members	
	*School attendance by mother	The data for literacy available in the survey reports varied in the levels of detail, so we chose to assess any school education yes/no, rather than schooling level. Some of the reports asked about literacy, which can even be lower than school attendance, however, this also was not presented in all reports.
	*Sources of income	Multiple sources possible and not always consistent (e.g. – India did not asked about sale of livestock, only “sale of own produced crops”).
Agriculture	*HH access to land	Yes/No. A weakness in these questions was the absence of questions on amount of land or number of plots
	*Which crops do you grow	Multiple choice
	*Home garden	Yes/No
	Do you grow vegetables	Additional questions appear in different surveys. India asks which vegetables, Ethiopia asks if vegetables are stored and for possible problems with storage
	Main use of vegetables produced	1= Mainly own consumption 2= Mainly for sale 3= Both in approx. equal amounts
	*Do you have fruit or fruit trees on your homestead or accessible to you and your family?	Yes/No
	Main use of fruit	1= Mainly own consumption 2= Mainly for sale 3= Both in approx. equal amounts
	*Livestock ownership	Yes/No
	Main use of animals	1= Mainly own consumption 2= Mainly for sale 3= Both in approx. equal amounts 4=mainly agricultural or transportation (India only)
	Participation in social-safety net programmes	Response options not always the same so not analysed for comparative purposes
Water and Sanitation	*Access to improved water source in dry season	As per standard definitions based on source (http://www.wssinfo.org/definitions-methods/watsan-categories/)
	*Access to improved water source in rainy season	As per standard definitions based on source http://www.wssinfo.org/definitions-methods/watsan-categories/
	*Access to improved sanitation	As per standard definitions based on type http://www.wssinfo.org/definitions-methods/watsan-categories/
Child feeding	Child ever breastfed	Yes/No

Domain	Variable	Comments
	*Child breast fed yesterday	Yes/No
	*Minimum dietary diversity	As per standard definitions based on a series of questions on intake
	*Minimum meal frequency	As per standard definitions based on number of meals and snacks and breastfeeding
Child health	Diarrhoea in the past two weeks	Yes/No
	*Number of times child taken to under-five clinics	The robustness of this indicator is questionable as it could reflect that a child has frequent illness. Hence it would be difficult to distinguish between well child and sick child visits.
Women's diet	*IDDS-W	Dietary diversity score for women based on intake of 10 food groups over the previous 24 hours
	*MDD-W	As per standard FAO definition
Antenatal care	*Number of antenatal care visits	In most reports this is the average number of visits, but it would be better to use the WHO definition of four or more visits
Maternal Knowledge and Practices	*Preference for thick over thin porridge	Photos of a thin and thick porridge were shown to mothers and they indicated their preference
	*Knowledge of how to make child porridge more nutritious	Multiple choice 1= Animal Sourced Foods (ASF) 2= Pulses/seeds 3= Vitamin A fruits/vegetables 4= Dark green leafy vegetables (DGLVs) 5= Energy rich foods
	*Knowledge of how to prevent child malnutrition (6-23 months)	1= Give more food 2= Give different types of food 3= Feed frequently 4= Give attention during meals 5= Go to health center
Hygiene	*Does HH have soap	Yes/ No
Access to services	Do you have a counselling structure for nutrition in your village	Yes/ No
	Do you receive counselling from [...]	Responses vary by survey
	Did you ever receive hygiene counselling?	Yes/No

2.2 NBS Observations and Recommendations

Project Areas, Participants and Sample size

Analysis of the baseline results for several indicators, including FIES-H and other development variables, such as education level, access to improved water source and access to improved sanitation, confirms that the Global Programme country project areas selected are vulnerable areas where improvement in one or more of the key indicators should increase the level of food and nutrition security in the specific location of the respective project area.

Survey respondents were women between the ages of 15-49 with at least one child between 6-23 months. The criteria for selecting participants are explained in the NBS reports and are appropriate for the key indicators chosen.

Each NBS provides a description of sample size calculation and sampling procedures. All NBS, with the exception of India, followed the sample size calculation as explained in the guidelines for the NBS (GIZ and Bellin-Sesay, 2015). However, in most cases cluster sampling was used and it is unclear from the NBS descriptions if this was considered in the sample size calculation. India sampled 400 households in each district, as population sizes of districts in India were larger than in the other project countries.

Multi-stage cluster sampling was used in most but not all NBS. Each NBS has a good to fair description of the sampling procedures followed. For example in Zambia camps within districts had been pre-defined as the project area. Each camp zone was randomly selected and within each zone a village was randomly selected using a random number generator function. The Zambia report states that the number of households per village was based on village population size, but that “almost all villages did not have enough households and therefore the next nearby village was included as well”. Most NBS provide tables of population size and annexes of selected villages.

The NBS for Kenya indicates a lack of up-to-date information on villages and household sizes, and therefore the survey sites were purposively selected up to the point of divisions within sub-counties. Villages were randomly selected from each sub-country, however, the report does not indicate population sizes of villages, so it can be assumed that no population proportional to size methodology was followed. In this case potential bias in over-representing small and under-representing large villages cannot be ruled out.

In all cases it would have been helpful for the NBS teams to work with a statistician during data analysis to calculate sampling weights, which serve the purpose of compensating for unequal probabilities of selection.

Descriptions of enumerator training and data collection procedures are adequate in the NBS.

Choice of key Indicators

Bioversity International was part of 2015 discussions on selection of key indicators. Therefore we cannot make an unbiased assessment of the final choice of these indicators, as during earlier discussions we were already in favour of the decisions taken. For the reasons explained in the introduction, we agree with the choice to exclude primary data collection on stunting, wasting and underweight, and feel this was an appropriate and cost-effective choice. In relation to indicators of nutritional status (anthropometry and biochemical indicators of micronutrient deficiency) it is recommended that GIZ continues to report on these using secondary data available, for example from the Demographic and Health Surveys (DHS) at national level and perhaps from other sources of data collection. Growth monitoring and promotion activities in some of the programme areas appear to be strong and the data acquired from these activities could also be used as a source of monitoring of the nutrition outcomes at these sites.

It should be highlighted that this is the first time FIES-H, IDDS-W, MDD-W and MAD have been applied in a standardized manner across a range of countries to gather a holistic picture of food security and diet. There is evidence from the DHS surveys that MAD is sensitive to change over time, however, the sensitivity of FIES-H, IDDS-W and MDD-W to change over time, and with certain intervention packages, has not yet been tested. The range of information on agricultural production and nutrition knowledge should be useful in determining which underlying factors could potentially lead to a change, if any over time in the key indicators.

There is a great opportunity to learn how these indicators are related to and influenced by food and nutrition security interventions that are undertaken over the course of the programme. These results should be of interest to several United Nations Organizations, as well as donor organizations, for example as already indicated by the response of FAO in assisting with the interpretation of the FIES-H. Making the data sets accessible for wider use would be considered a global public good.

Review of the Questionnaire tool

There are some inconsistencies among the ten country data sets with respect to response variables for certain questions (e.g. source of nutrition counselling), yet for most indicators the responses can be compared across countries. The length of the questionnaire, in terms of respondent burden and time needed for completion within one household, seems reasonable, although is not verified in the NBS.

For the most part the set of 51 questions asked in the baseline has a valid rationale and purpose to either better inform the country package interventions and/or be used to track progress in key variables that the programme would like to see improve. The utility of a very small number of questions could be reviewed by country programme managers for relevance to their country programme objectives and value added for understanding the impact of interventions at the programme endline. For example the question “Why did you settle here?” does not seem to have much bearing on any of the outcomes of interest, except perhaps in certain country packages such as Mali, which has a specific focus on building the resilience of the poor, particularly returning refugees and internally displaced persons.

A second example of questions to review includes the set of knowledge, attitude and practices (KAP) questions that appear in different sections of the questionnaire. The rationale behind the selection of some of the questions is not always clear, nor is the meaning of the responses recorded. For example, the woman is asked “How can you recognize that someone is not having enough food?”. This is a generic knowledge question, the purpose of which is unclear in relation to improving diets of women or feeding practices of young children. The response options that the enumerator was not meant to read aloud but was asked to “check all that apply” include “lack of energy/weakness”, “weakness of the immune system (becomes ill easily)”, “loss of weight, thinness” and “children do not grow as they should (growth faltering)”. While these questions were taken directly from a KAP manual prepared by FAO (FAO, 2016), it is difficult to understand how the chosen responses will help guide the direction of interventions or key messaging. We recommend making the KAP questions in the endline more specific to key messages delivered in the country packages and focus the questions on vulnerable members of the household such as young children, pregnant/lactating women or women in general. It would be good to review the entire set of KAP questions prior to including them in the endline survey, as some could potentially be removed. This may save time and money given that it is not easy to interpret or take action based on the answers.

A third example of a question that should be reviewed is “How many times did you go to an under-five clinic with (name of child)”. Guidance on how to interpret the result should be provided to the country teams (also this was a significant predictor of dietary diversity in the logistic regression model in the following section of this report). The interpretation of this number, as an average number of times, is difficult, as the average child age and distribution of child ages will differ by country. It is recommended to first have a yes/no variable by household, for example child did or did not attend under-five clinic. After the creation of this variable, another variable could be created based on age of child in months and number of under-five clinic visits, as the interpretation for a child who is 9 months as compared to 12 months as compared to 20 months will be different. It should also be explained in the NBS that there is a difference between the under-five clinic, which is more about growth monitoring and promotion and taking the child to the clinic when the child is ill.

With regard to the education question, it would have been useful to also have established literacy levels by simply asking if the respondent is able to read and write. In the current questionnaires, only information on school attendance and highest class completed is requested. It cannot be assumed that respondents with no schooling cannot read and write, nor that respondents who attended some school are able to read and write. Ability to read would be a key consideration in the design of education tools.

The level of detail requested on agricultural production is useful. Changes in several of the agricultural indicators (e.g. households with a home garden, households growing vegetables, rearing livestock, with access to fruit and the main use of these agriculture products, defined as “mainly own consumption”, “mainly for sale”, “both in approximately equal amounts”) could be expected between baseline and endline given the programmatic focus on agriculture production.

There are ten questions related to Sanitation and Hygiene, six in the front section “Sanitation and hygiene information” and another four in the section “Women’s information” that pertain to household ownership of

soap, uses of soap and handwashing technique. Information that can be used to track “access to improved sanitation” and “access to improved drinking water source” is also very useful for tracking global-level progress, as these indicators have a standard definition and therefore can be effectively compared across geographies and time (b and WHO, 2015). However, for the additional questions and the section in “Women’s information” on handwashing practices, country package managers could review the utility of questions such as “Do you treat your water in any way”, “What do you usually do to the water to make it safer to drink”. If the project is not specifically addressing these issues, then there is no reason to expect them to change over time as a result of the GIZ country package. However, an argument can be made for the overall importance of WASH and related WASH practices, to child health and nutrition, as half a million children die every year of diarrhoeal diseases caused by unsafe drinking water, poor sanitation and hygiene practices, and fifty percent of global malnutrition is due to waterborne diseases such as diarrhoea and intestinal worms (the Partnership for Maternal, Newborn and Child Health, 2014). The baseline information collected on access to improved sanitation, access to improved drinking water source and other supporting behaviour, such as handwashing practices, water treatment and storage, could be useful to other users. Therefore the endline survey will provide an opportunity to assess if these important aspects improved, remained the same or worsened over time, regardless of an impact pathway related to GIZ country package interventions. The relationship between hand washing and diarrhoea incidence is particularly strong, with hand washing with soap reducing diarrhoea incidence by 47% (WHO, 2011).

The “Child Information” section is well done and follows the international standard guidance (WHO, 2008) for data collection. Should it be of interest to the overall programme, the following indicators can be constructed (currently only children ever breastfed, MAD, MDD and MMF have been constructed for each dataset).

- Children ever breastfed - from question 25 of the survey questionnaire
- Age-appropriate breastfeeding (also continued breastfeeding at 1 and 2 years) (question 26 + child age in months)
- Introduction of complementary foods
- Minimum Dietary Diversity
- Minimum Meal Frequency
- Minimum Acceptable Diet
- Milk feeding frequency for non-breastfed children

The final questions in the questionnaire are on women. The women’s dietary diversity questionnaire follows FAO/FHI 360 guidelines on the collection of dietary intake for women (FAO and FHI 360, 2016). In addition, the questionnaire section on women includes two care practices: one for the number of times the woman received antenatal care during her pregnancy and another for the number of times the woman went to an under-five clinic with the child. While improvements in antenatal care-seeking behaviour is not a focus of the country packages, many country package interventions include support to health extension services and tracking levels of care seeking behaviour could be of interest to external users.



3. Summary of results

3.1 Analytical methods

Results as reported in the ten baseline reports provided by GIZ were reviewed and synthesized into summary tables by domain (SES, agriculture, child feeding, women's diet, WASH, women's knowledge and access to services). A dashboard classification was used to help visualize results. The colour coding method corresponds to green as "better", yellow as "lower" and red as "very low" based upon the color coding percentages corresponding to the color scheme (see Table 3). This is not a standardized classification scheme, but a method created for the purpose of this report to help interpret the large amount of numerical data. The colour coding also helps visualize indicators that provide information on a better situation, for example the increasing prevalence of MAD and MDD-W along-side indicators such as FIES-H where higher prevalence signals a worsening condition.

Table 3: Explanation of dashboard method

Very low/poor	(fewer than 33% of hh or individuals)
Low	(between 34% and 65% of hh or individuals)
Better	(66% or more of hh or individuals)

3.2 Key Indicators

The key indicators for the "Food and nutrition security, enhanced resilience" programme, using the explained colour scheme of red, yellow and green are summarized in Table 4, in the order of highest to lowest *Prevalence of Experienced Food Insecurity at moderate or severe levels (mod+sev)*. The patterns across FIES-H, MAD and MDD-W are consistent for most countries, with the exception of Ethiopia and India, where less than 1/3 of households are classified as experiencing moderate or severe food insecurity, yet the diet indicators for infants and young children and women of reproductive age are very low.

The existence of the public distribution system in India may have an impact on perception of food insecurity within India, as populations may feel more secure knowing that (at least in theory) they could tap into that resource in times of need. While direct comparisons cannot be made, India had the lowest levels of food insecurity in a recent Bioversity International study in three small areas of India, Guatemala and Mali (Bioversity International, personal communication).

Table 4: Percentage of households, children and women facing food and nutrition insecurity by key indicator

Country	FIES-H*	MAD	MDD-W
Kenya	87	15	12
Malawi	86	34	27
Mali	55	11	8
Togo	55	33	28
Zambia	41	34	57
Benin	32	26	34
Cambodia	24	41	53
Ethiopia	23	17	7
Burkina Faso	22	38	38
India	18	18	20

* Prevalence of Food Insecurity on Household level (moderate+severe)

Table 5 compares the rankings of calibrated FIES-Household (FIES-H) from the programme and FIES - Individual (FIES-I) collected by the FAO Voices of the Hungry programme. The table presents only country rankings to show relative rank, rather than comparing levels of prevalence, because there are substantial methodological differences in FIES-H collected by the GIZ programme, which was based on household level and the recall period of the past month and FIES-I, which used a recall period of the previous 12 months. Nevertheless, it is interesting to note that when comparing the rankings of the *nine countries there is good correspondence in eight of them. The ranking of Kenya is highest for the GIZ programme, but ranked fourth for FIES-I, FAO. If Kenya which seems to be a low outlier in terms of the population included in the GIZ Programme were removed, the rankings would be very similar for eight of the countries. India and Ethiopia are ranked lowest prevalence of food insecurity and third to lowest respectively using both the FIES-H of GIZ and FIES-I, FAO. **This provides a form of verification that the results from the NBS follow similar patterns when compared to the results from other studies, even in the case of India and Ethiopia and despite the difference in national as compared to programme-specific reference values.**

Table 5: Comparative ranking of GIZ FIES-H and FAO-Gallup World Poll (GWP) prevalence of Food Insecurity (FAO FIES-I)

Rank	FIES-H GIZ NBS	Rank	FIES-I FAO*	Difference in ranking of FIES-H and FIES-I
1	Kenya	1	Malawi	3
2	Malawi	2	Zambia	1
3	Togo	3	Togo	0
4	Zambia	4	Kenya	2
5	Benin	5	Cambodia	1
6	Cambodia	6	Benin	1
7	Ethiopia	7	Ethiopia	0
8	Burkina Faso	8	Burkina Faso	0
9	India	9	India	0

*The FAO report indicates that due to sampling, Mali may not be representative and therefore comparison for Mali was not included in the table

MAD is an indicator that has been collected routinely within the DHS programme (WHO, 2008b). Keeping in mind that the DHS samples are nationally representative, we can see from the comparison in Table 6 that compared to DHS data from ten years ago (data range from 2003-2007) MAD has improved over the past decade, even in the selected vulnerable programme areas, with the exception of Kenya.

Table 6: Comparison of NBS GIZ Infant and young child feeding with DHS figures from 2003-2006

		Mali	Kenya	Ethiopia	India	Benin	Togo	Malawi	Zambia	Burkina Faso	Cam bodia
GIZ	MAD	11	15	17	18	26	33	34	34	38	41
	MDD	27	22	19	23	33	43	43	55	50	47
	MMF	57	71	66	58	67	71	70	77	63	93
DHS	MAD	7	30	3	7	15		22	25	8	22
	MDD	16	45	4	12	28		40	37	14	29
	MMF	25	58	42	44	50		49	56	31	72
	DHS year	2006	2003	2005	2005	2006		2004	2007	2003	2005

IDDS-W and MDD-W are relatively new indicators, which is why there are no results that can be used to draw comparisons with other studies.

3.3 Socio-demographic results

In all countries male-headed households were more common than female-headed households, ranging from a low of 80 percent male-headed households in Malawi and Zambia to 98 percent in Benin and Mali. The average age of mothers in the survey ranged between 25 to 29 years (with data unavailable in the NBS reports for Cambodia, Malawi, Mali and Togo, and only accessible from the primary SPSS data sets). The average number of household members was lowest in Malawi (5.4) and highest in Benin (8.6).

In response to level of education, more than 66% of female respondents had received some schooling in Cambodia, Kenya Malawi and Zambia, while only 20% received education in Benin. This is easily visualized below using the colour coding method where Cambodia, Kenya, Malawi and Zambia appear as green, indicating $\geq 66\%$ of respondents, Burkina Faso, Ethiopia, India, Mali and Togo appear as yellow, indicating between 66-34% of respondents and Benin appears as red indicating between 33-0% of respondents received any level of schooling.

The low levels of schooling in Benin but also Burkina Faso and Mali at both only 34%, should be considered by project implementers, as it may affect the ability to understand nutrition education and hygiene messages.

Table 7: Education levels of women (% attended any school)

	Benin	Burkina Faso	Cambodia	Ethiopia	India	Kenya	Malawi	Mali	Togo	Zambia
Some schooling	20	34	90	45	51	100	87	34	56	69

In five of the baseline reports (Ethiopia, India, Kenya, Malawi and Zambia) the mean number of income sources reported ranges from 1.4 to 2.4. For the remaining five countries the primary income sources are listed, with the main income source being sale of crops, followed by sale of livestock and finally other sources, such as small business, petty trade, casual labour. Togo and Mali seem to have a larger range of income sources compared to Benin and Burkina Faso.

3.4 Agriculture

When applying the 'dashboard' definitions, access to land is better in Benin, Burkina Faso, Cambodia, Ethiopia, Malawi, Mali, Togo and Zambia. Access to land for agriculture in Kenya is very low. It should be noted that the survey area in Kenya represents an area where the population is mainly pastoral and practice a nomadic lifestyle in which livestock is a very important source of livelihoods.

Table 8. Percentage of households with access to land for agriculture

	Beni n	Burkin a Faso	Ethiop ia	India	Kenya	Malawi	Togo	Zambi a	Cambodi a	Mali
Access to land for agricultur e	97	81	95	72	21	90	92	99	85	78

In five countries the average number of crops grown ranged between 1.3 and 7.9. From lowest to highest the average number of crops grown was 1.3 (Cambodia), 1.8 (Mali), 2.1 (Kenya), 2.5 (Malawi), 2.7 (Zambia), 3 (Burkina Faso and Togo), 3.9 (Ethiopia), 4.6 (India) and 7.9 (Benin).

The main crops reported to be grown by country are presented in Table 9. Maize is the dominant crop grown in seven countries, with rice more common in Cambodia and Mali, and wheat in India. The second, third and fourth crops grown show much more variation across countries and include other staple foods (e.g. cassava, millet, sorghum, teff, and groundnut, different pulses and oil seeds). Interestingly, no non-food cash crops, such as cotton or tobacco, were mentioned.

Table 9: Main crops grown by households (% of HH growing the crop)

Benin	Burkina Faso	Ethiopia	India	Kenya	Malawi	Togo	Zambia	Cambodia	Mali
Maize (94)	Maize (97)	Maize (70)	Wheat (93)	Maize (88)	Maize (91)	Maize (98)	Maize (100)	Rice (95)	Rice (88)
Sorghum (75)	Millet (78)	Teff (60)	Mustard (66)	Legumes (74)	Ground nuts (45)	Manioc (94)	Ground nuts (67)	Cassava (15)	Maize (19)
Soya (76)	Ground- nuts (63)	Barley (50)	Sesame (56)		Soya (20)	Beans (66)	Sun- flower (57)	Beans (8)	Millet (19)
Yams (77)	Red sorghum (61)	Legumes (43)	Bengal gram (55)		Rice (20)	Ground nuts (58)			

The percentage of households with a home garden was below 50% for all countries except Ethiopia. These findings are quite surprising given that home gardens are one of a few strategies with evidence of improving dietary diversity (Masset et al., 2012). Ethiopia was the country reporting the highest number of home gardens, yet remains the lowest in dietary diversity. The survey reports highlight that the practice of home gardening is seasonal occurring mostly during the rainy months. The majority of the baseline surveys were administered during the dry season, therefore despite using home gardens, vegetable intakes from them during the survey period could be expected to be low. Livestock ownership and access to fruit were much higher, with livestock ownership in over 50% of households in all countries except Malawi. Access to fruits was also above 50% of households in six countries, but could be considered very low (below 25% of HH) in Ethiopia, India, Kenya and Mali. The reasons for low household access to fruit reported in these countries warrants further investigation, particularly in India and Kenya where diversity

and abundance of fruit species has been well documented (Kehlenbeck, Asaah and Jamnadass, 2013). Even in Mali, access to seasonal fruits such as mango and baobab would be expected to be higher.

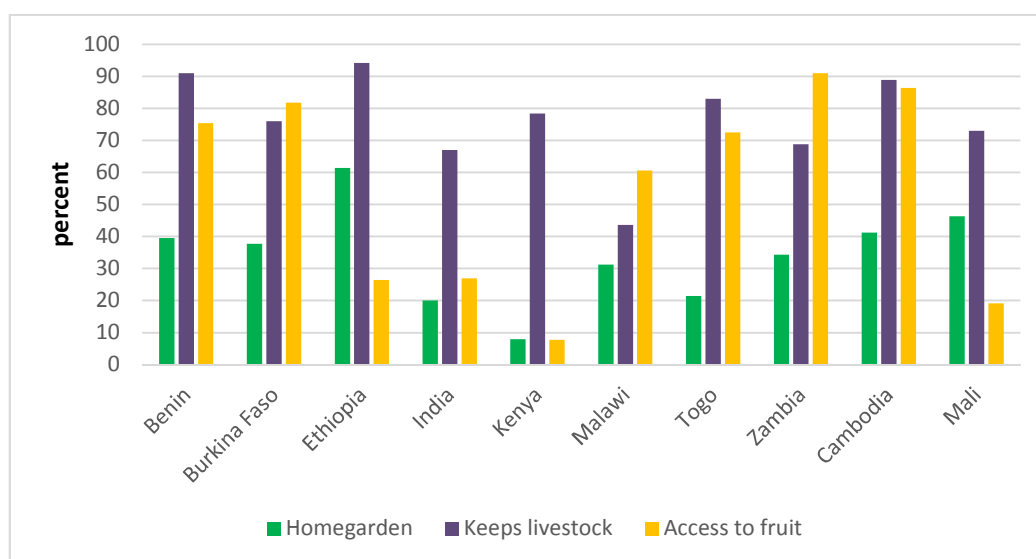


Figure 3: Percentage of households with a home garden, livestock and access to fruit trees

3.5 Water, Sanitation and Hygiene

Achieving improvements in water and sanitation is advocated as a critical measure to reduce infant stunting (Cumming and Cairncross, 2016) and therefore all development efforts to improve child nutrition and stunting will be somewhat suppressed until these basic services are provided to communities. Access to improved sanitation is very low in eight out of the ten countries and moderate in Burkina Faso and Cambodia. Access to improved water source was higher than access to safe sanitation in all countries. However, when differentiating access by rainy and dry season there are notable differences in access for Benin, Kenya and Togo.

Table 10: Percentage of households with access to improved sanitation and improved water

WASH	Benin	Burkina Faso	Ethiopia	India	Kenya	Malawi	Togo	Zambia	Cambodia	Mali
Access to improved sanitation	9	63	12	8	29	17	12	10	56	18
Access to improved water – wet season	9	78	82	70	55	89	12	76	89	78
Access to improved water – dry season	53	80	82	68	77	88	40	74	76	79

Maternal hygiene knowledge and practices

Mothers were also asked about household hygiene practices. These questions include “Does your household have soap at present?”, “When you used soap today or yesterday, what did you use it for?” and “Please describe step by step how you wash your hands”.

The percentage of households reporting to have soap ranged from a high of 100% in Cambodia to a low of 45% in Malawi. In five countries (Benin, Burkina Faso, Cambodia, India and Togo) more than 90% of households had soap.

Table 11: Percentage of households with soap

	Beni n	Burkin a Faso	Cambodi a	Ethiopi a	Indi a	Kenya a	Mala wi	Mal i	Tog o	Zambi a
% HH with soap	97	90	100	88	91	61	45	59	91	65

3.6 Diet of small children and maternal knowledge of infant feeding

WHO and UNICEF published a set of guidelines on indicators for assessing infant and young child feeding practices (WHO, 2008). The definition for each of these indicators has already been provided in the previous section.

The first important parameter in constructing the indicators for infant and young child feeding is assessing if the child was breastfed. This was assessed in the NBS by following the WHO recommended question “Was (name of child) breastfed yesterday during the day or at night?”. The responses to this question are presented in Table 12. WHO recommends that children are breastfed up to two years of age, the highest current breastfeeding rates are seen in Benin, Togo, Burkina Faso, Ethiopia and Malawi where > 90% of children are currently being breastfed. The lowest rates, where nearly 25% of children under the age of two are no longer breastfed are seen in Cambodia and Zambia. For the calculation of the MAD, children who are not breastfed need to receive at least two milk feeds, this milk feeding requirement often poses a considerable constraint in the country contexts under study.

Table 12: Percentage of children breastfed yesterday

	ETH	KEN	BEN	BF	MALI	TO	MALAWI	ZA	CAM	IN
Child breastfed yesterday	94	82	96	95	81	96	92	76	76	88

The dietary diversity of children age 6-23 months is based on seven food groups, with MDD of children defined as consumption of four or more food groups out of the seven. WHO recommend disaggregating this indicator by breastfeeding and child age. For simplicity of presentation and due to the high rates of current breastfeeding, all children 6-23 months of age, both currently breastfed and not are presented in these summary tables.

Minimum acceptable diet (MAD) is a composite indicator based on the proportion of children who meet MDD and MMF, which are each calculated separately based on current breastfeeding status. MAD ranged from 11-41 %. MAD is below 33% in six out of the ten countries and between 33-41% in the remaining four countries.

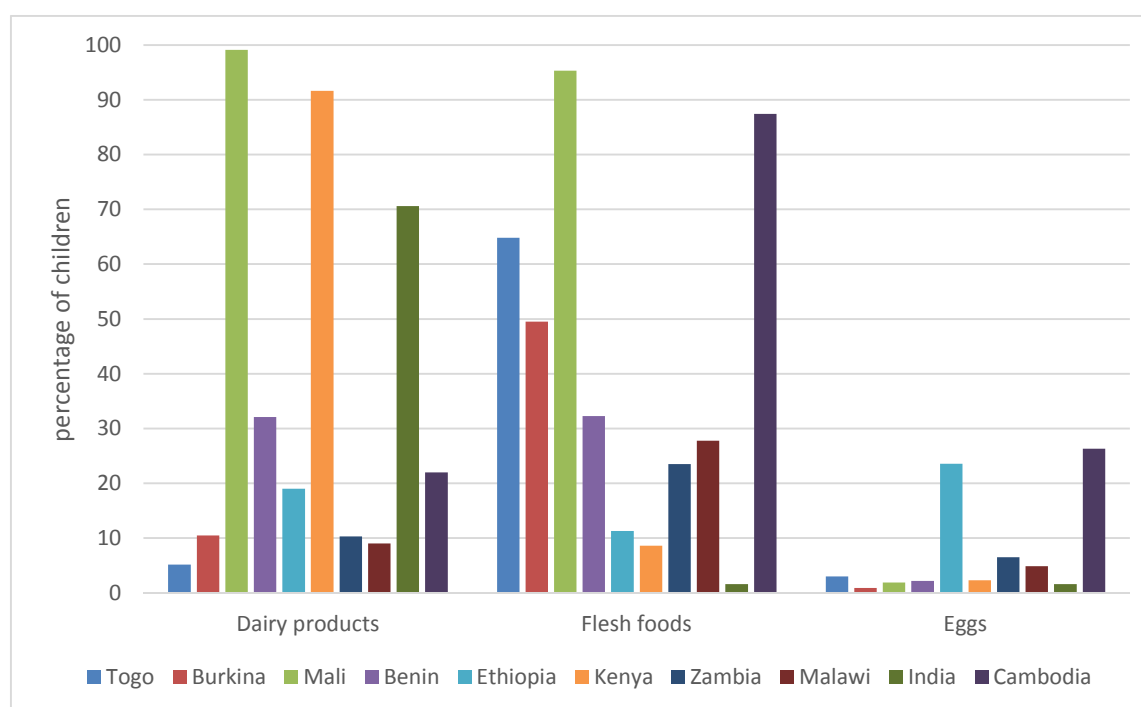
MDD ranged from 19-55 %. The best MDD is seen in Burkina Faso and Zambia where 50% or more of the children achieved MDD. MDD is very low in Benin, Ethiopia, India, Kenya and Mali. (Table 13).

Minimum meal frequency represents the number of times children are given meals and snacks during the previous 24 hours and is calculated differently based on breastfeeding status. MMF ranged from 93 % (Cambodia) to 57% (Mali). A higher percentage of children meet MMF than MDD, so MDD can be considered as a main barrier to improving MAD.

Table 13: Dashboard view of percentage of children achieving MAD, MDD and MMF

	Benin	Burkina Faso	Cambodia	Ethiopia	India	Kenya	Malawi	Mali	Togo	Zambia
MAD	26	38	41	17	18	15	34	11	33	34
MDD	33	50	47	19	23	22	43	27	43	55
MMF	67	63	93	66	58	71	70	57	71	77

For projects that will work with the agriculture sector to improve nutrition it is important to gain a more in-depth picture of the food groups consumed, as well as those not consumed. This helps identify entry points of focus for increasing production in addition to mainstreaming nutrition education. There are large variations in intake of the food groups dairy and flesh foods, ranging from very low to high, while intake of eggs is very low across all ten countries. The percentage of children consuming dairy is high in Mali, Kenya and India, and very low in Benin, Togo, Burkina Faso, Ethiopia, Zambia, Malawi and Cambodia. The percentage of children consuming flesh foods, including beef, chicken, fish and other small animal proteins ranged from 95% in Mali to 2% in India and was very low in six countries.

**Figure 4: Percentage of children consuming animal source foods by country**

Knowledge attitudes and practices

The questionnaires asked several different maternal knowledge questions, two general questions on malnutrition “How can you recognize that someone is not eating enough food” and “What are some of the reasons why people are malnourished”, and a series of questions specific to complementary feeding. These questions included “Preference for giving a thick or watery porridge, based on a photo of each” “Please tell me some ways to make porridge more nutritious for your baby’s health” and “What should we do to prevent malnutrition among young children (6-23 months)?”. Another set of questions on care during illness included “When (name of child) is sick, is he/she given less than usual, about the same, more than usual or nothing to drink” and the same set of questions for child feeding during illness.

In this report we highlight the results of questions related to infant and young child feeding. Research on complementary feeding practices has shown that caregivers of young children often have a preference for feeding infants and young children very watery porridges that run off the spoon due to high liquid content of the porridge. The common understanding of parents is that this is easier for children to swallow thin porridge and they may choke on thicker porridge. From a nutritional perspective the thin and watery porridge does not provide enough dietary energy for children, particularly given their small stomach capacity. In order to modify this practice, many countries are aiming to change the nutrient density of the first foods fed to children through behaviour change communication on this specific issue. In Cambodia respondents were given three photo choices: *Borbor Khab Krop Kroeung* (homemade, nutrient-rich, mixed thick porridge), *Borbor Kroeung* (porridge bought from market) and *Borbor Sor* (watery porridge).

Preference for the thicker porridge was highest in Cambodia (72%) and lowest in Mali (16%). The Cambodian government has had a programme for many years to teach parents about thicker and more nutrient-dense porridge, which they have named *Borbor Khab Krop Kroeung*. It was a good innovation of the Cambodian NBS team to include the exact term and photo of *Borbor Khab Krop Kroeung* as this helps specifically track the current government recommendation

Another knowledge question on infant feeding was “Please tell me some ways to make porridge more nutritious for your baby’s health” and enumerators were instructed to probe if necessary “Which foods or types of foods can be added to porridge to make it more nutritious?”. Predefined answers on the survey form included “animal source foods”, “pulses and nuts”, “orange fruits and vegetables”, “green leafy vegetables”, “energy rich foods” and in some surveys “other”. Multiple answers were possible. Results are shown in Table 14.

Table 14: Percentage of mothers who named each food group as a nutritious addition to their young child’s porridge

	Benin	BF	Cam	Eth	India	Ken	Malawi	Mali	Togo	Za
ASF	51	61	96	48	63	76	37	67	67	35
Pulses, nuts	62	70	6	46	42	1.6	90	12	69	95
Orange fruit/vegetables	7	14	78	20	11	1	4	9	8	4
Green leafy vegetables	5	20	78	24	17	0	13	4	11	6
Oil, butter	55	50	83	90	78	96	27	28	13	37
Other						68		27		

The respondents’ answers to the question “What should we do to prevent malnutrition among young children (6-23 months)?” are shown in Figure 5.

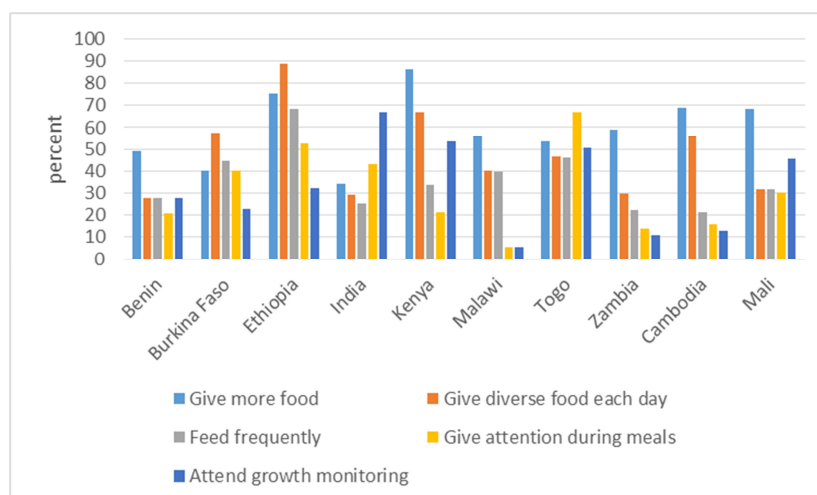


Figure 5: Percentage of mothers mentioning ways to prevent malnutrition

The results are difficult to synthesize across countries because of a lack of consistency in possible responses. A general pattern emerged in which higher recall of the behaviours “give more food” and “give diverse foods each day” were given, while fewer respondents across the countries mentioned “feed more frequent meals”, “provide special attention to the child during meals”. The response “attend growth monitoring” was relatively high in India and Kenya.

Ethiopia stands out among the countries with the greatest percentage of respondents indicating the need to give diverse food every day, yet dietary diversity is very low among children. This raises a question of the drivers of such low diversity in Ethiopia, if we consider that knowledge of the importance of diversity is not greatly lacking. Respondents in Kenya also indicated a high percentage of knowledge on the importance of giving more food and giving diverse food each day, yet MDD in Kenya was 22 percent. Gaps between knowledge and practice need to be further explored in follow-up qualitative research.

3.7 Dietary diversity of women

The IDDS-W ranged from 3.1 (Ethiopia) to 4.7 (Zambia) with the percentage of women achieving MDD ranging from 7 % in Ethiopia to 57 % in Zambia. Table 15 summarizes the results of the IDDS-W and MDD-W. The pattern of MDD-W increasing with IDDS-W is consistent across countries, with MDD-W increasing as IDDS-W increases.

Table 15: Individual Dietary Diversity Score Women (IDDS-W) and Minimum Dietary Diversity Women (MDD-W) by country

	IDDS-W	MDD-W (%)*
Ethiopia	3.1	7
Mali	3.2	8
Kenya	3.2	12
India	3.6	20
Malawi	3.9	27
Togo	3.9	28
Benin	4.1	34
Burkina Faso	4.2	38
Cambodia	4.6	53
Zambia	4.7	57

*Rounded to nearest whole percentage

In addition to looking at IDDS-W and MDD-W, it is of particular interest to analyse intakes of individual food groups. This helps to understand the food groups consumed by most women and those which are globally or regionally neglected. In order to synthesize such a large table of information the dashboard method was used (Table 16). Scanning down by column indicates whether the food group was commonly or uncommonly consumed in the previous 24 hours across the countries. Reviewing the data by row shows which food groups out of the ten are most commonly consumed within each country.

Only the food group “grains roots and tubers” was consumed by most women in all countries, followed by other vegetables, which include foods like tomato, onion, eggplant and cucumber consumed by most women in five countries. Patterns for food groups rarely consumed also emerge, with eggs, vitamin A fruits and vegetables and other fruit, not commonly consumed by women during the previous 24 hours in any of the ten countries.

Region-specific patterns, for example higher consumption of beans and peas appear for the two countries in East Africa, Kenya and Ethiopia. Dark green leafy vegetables are widely consumed in West and Southern Africa. Non-region specific patterns, such as higher dairy consumption in Kenya, Mali and India, are specific to more localized cultural traditions. This could reflect increased agriculture research efforts, for example of the International Livestock Research Institute (ILRI) in Kenya, to improve availability of safe and affordable milk.

Table 16: Dashboard synthesizing the percentage of women’s food consumption by food group

	GRT	BP	NS	Dairy	MFP	Eggs	DGLV	VitA F_V	OVeg	OFruit
Ethiopia	100	55	0	12	35	13	2	2	89	4
Kenya	96	56	2	85	16	3	15	3.5	36	3
Mali	100	19	25	72	100	0	59	28	100	16
Cambodia	100	11	14	12	98	29	55	36	74	35
India	99	54	16	76	3	2	23	9	66	10
Malawi	99	30	26	8	37	6	78	9	63	28
Togo	100	23	20	3	86	3	67	3	90	4
Benin	100	28	29	34	76	2	94	1	60	6
Burkina Faso	98	11	57	7	69	1	79	7	91	11
Zambia	100	26	59	8	32	6	85	15	89	53

Table legend

GRT	Grains, roots and tubers	DGLV	Dark green leafy vegetables
BP	Beans and peas	VitAF_V	Vitamin A rich fruits and vegetables
NS	Nuts and seeds	OVeg	Other vegetables
MFP	Meat, fish and poultry	OFruit	Other Fruit

Animal source food intake by country

Consumption of animal source food is often considered an important indicator of food-based iron intakes. Figure 6 shows large differences in the percentage of women consuming dairy and flesh foods, including fish. Fewer than 30% of women consumed eggs in any country.

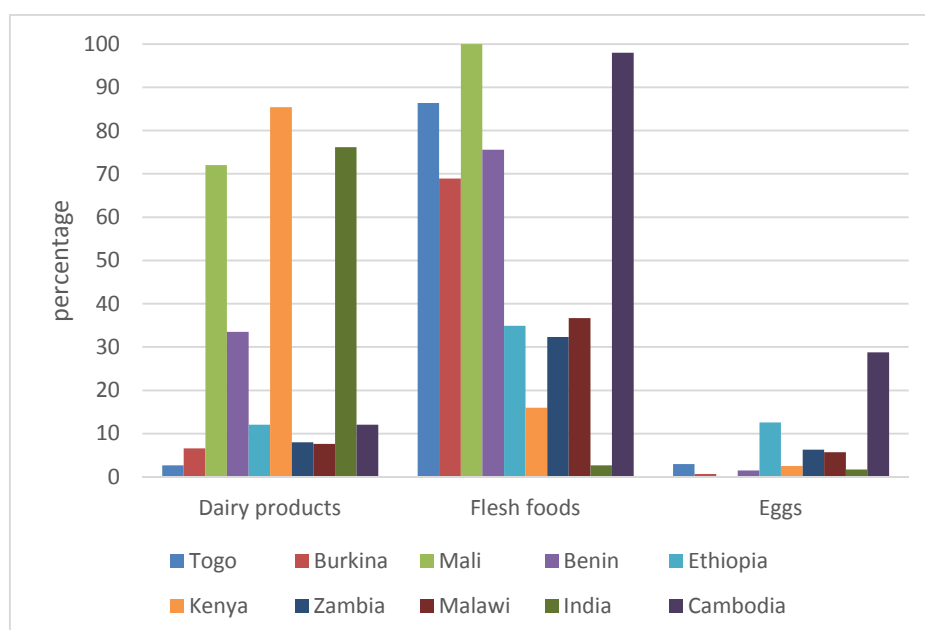


Figure 6: Percentage of women consuming animal source foods by country

Dashboard comparison of MDD and MDD-W

The dashboard method (Table 17) is also useful for a visual comparison of MDD of infants and children and MDD-W. MDD is “very low” for both women and children in Ethiopia, Kenya, India and Mali. MDD-W is “very low” for women in Togo, while MDD is only “low” for infants and children. In five other countries, even though the colour of the dashboard corresponds, MDD is higher than MDD-W, this is likely due to the lower food group cut-point of four as compared to five used to define minimum dietary diversity for infants and children. These findings indicate that messaging advocating the importance of diet diversity needs to target both children and women as in the majority of countries similar patterns were observed. This analysis does not indicate if women and children are consuming similar food groups, this would be something that could be investigated in a deeper analysis of the data.

Table 17: Dashboard comparison of MDD and MDD-W

	ETH	KEN	IN	MALI	BEN	MALAWI	TO	CAM	BF	ZA
MDD	19	22	23	27	33	43	43	47	50	55
MDD-W	7	12	20	8	34	43	28	53	38	57

3.8 Nutrition and hygiene counselling and visits to health services

The questions in the NBS on nutrition counselling were: “Do you have a counselling structure for nutrition in your village? If yes, which one?”. Followed by “Did you receive any counselling?”. The responses indicate that there were potential problems in the interpretation of these questions. One would expect the percentage of women answering “yes” to the first question regarding the presence of a counselling structure to be higher than the answer to the question asking if they actually received any counselling from one of the “structures” assuming that counselling is dependent on the presence of a counselling structure. For example, in Benin 40% of women indicated that there was a structure for nutrition counselling, yet 54 % (a higher percentage) responded that they received counselling. It could be that respondents did not understand the term (or translation of the term “structure”).

Due to difficulty in interpreting the responses, only the question: “Did you receive any nutrition counselling?” is presented in Table 18. In six countries, more than half of the women interviewed responded “yes” to receiving nutrition counselling, mainly from health workers/agents. In Benin, Cambodia, Kenya and Malawi, fewer than half the women responded “yes” to receiving counselling. This is an important finding for the programme, particularly for those programmes with behaviour change communication interventions. The intervention strategies of a few countries also mentioned using mass media to transfer messages, changes in this response could be important to track for those country packages using media to transmit behaviour change messages.

Table 18: Percentage of women receiving nutrition counselling by source of counselling

	Health centre/ agent	Volunteer group	NGO*	Agr. extension agent	Media	Grandmother/ relative
Benin	35	9		0.2		
Burkina Faso	62	11		0.9	1	
Cambodia	33	13		0.8		
Ethiopia	78	37		5.3		
India	58 (ICDS)		0.1			
Kenya	21	3		0.0		
Malawi	44	2		0.2		
Mali	37		18	2	12	20
Togo	56	2			7	
Zambia	53	12		0.3		

*NGO: Non-governmental Organization

Country-specific adaptation occurred for some countries such as India where most of the respondents mentioned they received counselling from Integrated Child Development Services (ICDS), or Mali where Non-governmental organizations were an important source of nutrition counselling.

The average number of antenatal care (ANC) and under-five clinic visits are presented in Table 19. The average numbers are not as useful as a cut-point to determine if an adequate number of visits were achieved. With ANC visits the WHO recommends at least four visits throughout the pregnancy (Lincetto et al.2006). A better use of the data would be to report on the percentage of women with at least four ANC visits. This was reported in some, but not all of the NBS. The average number of under-five child clinic visits depends very much on the age of the child and therefore the age distribution within the sample. It is, however, of interest that Malawi and Zambia report higher average numbers of under-five child clinic visits than other countries.

Table 19: Average number of Antenatal (ANC) and under-five child clinic visits

	BEN	BF	CAM	ETH	IN	KEN	MALAWI	MALI	TO	ZA
ANC	3.3	4	6.7	4.1	3.1	3.2	3.9	NA	NA	4.2
Under-five child visits	4.5	7	NA	4.2	3.4	4.7	10.8	NA	NA	11.2

3.9 Comments on the “Conclusions and recommendations” sections of each NBS

Each NBS had a section on “Conclusions and Recommendations”. Bioversity International was specifically requested by GIZ to critically review this section in each of the NBS and provide general recommendations and observations. Our overall observation is that the individual country-specific NBS results and contexts were not consistently referred to during the formulation of recommendations. For example, it was surprising to note that, in this section of the NBS reports for each country, certain recommendations were exactly the same, even identical for several countries. Some examples from specific country reports are provided below.

- Ethiopia, India, Malawi and Zambia:
 - All four reports make exactly the same recommendation, namely that “The project should investigate the specific causes of the food insecurity situation” and then examples are named such as “maize (or other staple) dependence, low income for women, crop diversity, availability of food in the market, knowledge to buy adequate food etc.” And yet the surveys had already investigated, for example, crop diversity and, through this therefore, partly the dependence on staple foods and access to markets in general could be analysed to provide better tailored recommendation to the situation in the country.
- Kenya, India, Malawi and Zambia:
 - All reports quote Aubele 2012 stating “Grandmothers can have a big influence on decisions related to child feeding and general care” as a conclusion in the “care behaviour” section. The percentage of grandmothers assisting women in child care was 36% for Kenya, 33% for India, 11% in Malawi, 50% in Zambia. In all reports the same recommendations are made, namely that it is suggested to “invite women, their husbands and grandmothers to cooking demonstrations”. While this might be a valuable recommendation in general, the recommendation for Malawi could be for example to encourage fathers to assist more with child care, while in Zambia, where grandmothers were very active, a special behaviour change communication might be needed for them, simply inviting grandmothers to attend the same cooking demonstrations as women and husbands may not be the best way to bring about the needed change in KAP of grandmothers.
- Ethiopia, Kenya, India, Malawi and Zambia:
 - Breastfeeding rates were high in all countries. Still detailed recommendations are given regarding continued breastfeeding. While continued breastfeeding is important this should be mentioned here as a general recommendation and not a specific challenge within the context of the country and based on the findings in the NBS.
- Most countries suggest “Information of benefits of diverse diets should be provided to all household members in order to avoid conflicts between income generation and own consumption”. This is a very valid and important recommendation and we would like to suggest to even go beyond “all household members” but also include agriculture extension workers and – depending on the specific country situation – other extension workers or stakeholders along the food value chains (e.g. food sellers, seed vendors/suppliers etc.) to spread this knowledge also among those who will promote diverse diets or who are somehow involved in food production.

Some general recommendations to ensure better interpretation of results are provided below.

Linking agriculture and nutrition

- The link between agriculture and nutrition could be strengthened in the country reports. Connections between agricultural production and dietary intakes are not always clearly made. For example, reports indicate generally that low dietary diversity scores were found and it is stated that specific foods are not available during certain seasons, yet no recommendation regarding investigation of year-round food availability, for example by conducting a seasonal food availability assessment as a solution to this challenge is made.

- Access to land for agriculture was reported as high for all countries except Kenya. However, “land access” as a stand-alone piece of information could be supplemented with information on the landholding size as well as access to markets (distance and frequency of market).
- Similarly, “access to fruits” through own production or access to communal fruit trees was reported. An aspect that is missing **is access to fruit through the market**. This needs to be investigated in more depth e.g. through an additional agriculture survey.
- Agricultural production data, especially regarding fruits and vegetables, are very vague. Although it is usually stated what share of foods produced by the study participants are consumed and sold (e.g. half-half) this data is not particularly useful, as actual quantities of fruits and vegetables produced are not known. While it is acknowledged that to assess this data would have been beyond the scope of present survey, it would be important for the general course of the programme and intervention to survey more detailed data on agricultural production and link them to the nutrition data.
- All reports recommend “nutrition education to improve dietary diversity”, however, a deeper analysis should be undertaken within the specific context of each country using a triangulation of the country-level results to determine underlying causal factors for poor dietary diversity of women and children.
 - For example, it was seen in Kenya that maternal knowledge related to prevention of malnutrition by giving more food (86%) and diversifying food (67%) is much higher than practices where only 22% of children met MDD. However, despite this high level of maternal knowledge, the first bullet of the main recommendations under infant and young child feeding practices states “there is a need for nutrition education strategies to improve the overall dietary intake and diversity of children 6-23 months”. In the section of the conclusions and recommendations that discusses agriculture and food production, the main recommendation is “the project has only a low potential to invest in nutrition-sensitive agriculture since only a few households have access to land or home gardens”, but later suggests increasing household access to land and encourage home gardening”.
 - What could perhaps be a more useful recommendation is to begin with qualitative research on the barriers and alternatives to diversifying diets within the specific context of this population group in Kenya. For example, by investigating the causes for the gap between knowledge and practice. This type of country specific analysis would be more useful than generic recommendations (that might not succeed in a specific context).

Food intake/ food security

- The large differences between the percentages of severely food insecure households among the countries were remarkable, and therefore all the more surprising that “social and cash transfer programmes” are suggested in recommendations section of a majority of the reports (e.g. Ethiopia, where 1% were severely food insecure). This recommendation does not seem well adapted to each country’s specific situation, or is otherwise based on sources of information other than the actual survey results.
- Some conclusions are drawn for the whole household, e.g. “food distribution within the household”. This is misleading, as data was only collected for women and children under two years of age and, thus, many other household members are left out and no complete picture can be drawn. It is suggested to report about “mother-child pairs”.
- In addition to the consumption of vitamin A-rich fruits and vegetables, the conclusions and recommendations could have included country specific information on vitamin A supplementation, which is quite common practice in most of the surveyed countries and needs to be taken into account when recommendations about vitamin A-rich foods are being made.

Gender

- Regarding care behaviour, the time burden of mothers, and the often challenging time management of women in general, is not considered. Even if the survey did not include this topic, women's/mothers' availability (which will differ in the various countries) should be considered when making recommendations that may create more tasks and duties for them.

Qualitative vs. quantitative research/survey methods

- Qualitative interviews are often mentioned as a recommendation to investigate different topics that are not well understood. This is a useful recommendation and demonstrates that in order to draw conclusions and make well-informed recommendations data collection needs to go beyond a one-time quantitative survey, although the latter forms a good basis for further investigations.

Significance of the data

- The NBS, in most cases, only provide information for one area/region of very diverse countries. This should be highlighted more and made very clear that no general recommendations for the whole country can be made based on the surveys. However, this is only done for the specific "programme area", where the intervention apparently takes place. As many smaller projects already work in single areas or regions of a country in several case studies, it would have been possible for this large and well-funded project – or can still be done during a final survey or second phase – to survey a wider range of different areas similar to those where the demographic and health surveys were conducted in order to have representative data for the whole country.

3.10 Linking agriculture and nutrition knowledge, attitudes and practices with key food-based indicators: Results of in-depth statistical analyses

Using the primary data sets provided by GIZ, logistic regression models were run to test the hypothesis that women's dietary diversity, measured by the Individual Dietary Diversity Score Women (IDDS-W) or Minimum Dietary Diversity Women (MDD-W), is higher for households with a more diverse agricultural production pattern and a better knowledge of adequate nutrition. The second hypothesis tested was that children aged 6-23 months are more likely to receive a minimum acceptable diet (MAD) the more diverse the household's agricultural production and the higher the household's level of nutrition knowledge.

With this analysis, the study aims to address the following questions:

- (1) *Which of the agricultural, nutrition KAP and socio-economic variables are related to women's dietary diversity and what is the direction of association?*
This question will identify those independent variables that are relevant predictors of women's dietary diversity. This will enable us to draw conclusions on what future interventions to improve women's food security and nutrition status should focus on.
- (2) *Which of the agricultural, nutrition KAP and socio-economic variables are related to the minimum acceptable diet of children aged 6-23 months and what is the direction of association?*
This question will identify those independent variables that are relevant predictors of the minimum acceptable diet of children aged 6-23 months. This will enable us to draw conclusions on what future interventions to improve children's food security and nutrition status should focus on.

There were some inconsistencies among the ten country data sets with respect to labelling and some data sets include more and/or different variables than others. This did not allow us to run a generalized statistic script for all countries since country-specific adaptations needed to be undertaken. Furthermore, a series of new dummy variables that were important for this study were generated, such as vegetable production all year round – yes/no, fruit production all year round – yes/no, etc., in order to further refine the models.

Dependent variables

For the binary logistic regression model (MAD and MDD-W as dependent variables) we used the *logit* command in Stata. In order to test that no relevant variable is omitted, we ran *Pregibon's linktest*. If this test is not significant, we know that the model fits well since no relevant variable was omitted statistically. In the case of the ordered logistic model we used the *ologit* command in Stata. If the specified model violated the proportional odds/parallel lines assumption (which can be tested by using the *omodel logit*, which performs a likelihood-ratio test of proportionality of odds across response categories, or *brant* command in Stata) we re-ran the model using the *gologit2* command (Williams, 2006). *Gologit2* is able to identify a (partial proportional) model that fits the data (Williams, 2006). The proportional odds assumption (or parallel regression, or parallel lines assumption) implies that "the relationship between each pair of outcome groups is the same" (UCLA Statistical Consulting Group, n.d., p.1). This means that the coefficients that describe the relationship between the lowest (zero) against all higher categories (one to ten) of the IDDS-W are the same as those that describe the relationship between the next lowest category (one) and all higher categories (two to ten) (Long & Freese, 2001; UCLA Statistical Consulting Group, n.d.). In the event that even *gologit2* failed to yield good results, we used the MDD-W as the dependent variables and performed a binary logistic regression.

Selection criteria of independent variables and overall model fit

The overall model includes three types of independent variables: agricultural variables, such as information on home gardens or vegetable production, knowledge, attitudes and practices variables (KAP), such as nutrition counselling, and socio-economic variables such as age of child or number of income sources. We primarily focus on variables that can change within a three-year project period, which is possible for many agriculture and KAP variables, but which is harder or even impossible for socio-economic variables such as household size, sex of head of household, age, etcetera. After inspection of the ten country data sets, we compiled the following table (Table 20) with agriculture, KAP and socio-economic variables that are of interest for the analysis. Some of these variables appear as they are shown in the table, some others, especially some of the dummy variables, have been computed based on (mostly) categorical variables available.

For each country a unique model was set up by using direct, hierarchical and/or forward/backward-stepwise regression model building strategies (Stoltzfus, 2011). The direct approach enters all predictors into the model at the same time and does not make any assumptions about the order or relative worth of those variables. Hierarchical regression adds variables sequentially to check if they further improve the model based on their predetermined order. Stepwise regression identifies predictors to remove or keep from the model based on predefined statistical criteria. Variables are entered into the model one at a time and only those that contribute significantly to the outcome (forward selection) or all variables are kept and entered into the model; variables with a non-significant contribution to the outcome are dropped one at a time (backward elimination) (Stoltzfus, 2011).

The aim of setting up individual models with slightly different sets of predictors for each country was to specify a model for each country that fits the country's data best. This means that a set of predictors was chosen that included variables of highest interest, maximized the Pseudo-R²¹ (overall model fit), yielded the highest Chi² significance level, and did not include meaningless variables, while at the same time not violating the model assumptions (proportional odds assumption in case of ordered logistic regressions) and/or passing the *Pregibon's linktest* (in case of binary logistic regression). Thus, many different combinations of independent variables were tested in order to come up with a unique and statistically sound model for each country. Statistically significant variables were then cross-checked by running simple correlations between each statistically significant variable and the outcome variable. By doing so, discrepancies or model misspecification can be detected.

¹ In comparison to linear regression models, the Pseudo R² has to be interpreted in a less strict way regarding logistic regression models. Thus, a low Pseudo R² value does not necessarily mean that the model is "bad" or not well specified. Furthermore, by only including agricultural, socio-economic and KAP variables, we might miss to capture some dimensions of dietary diversity, yet, our goal is not to have a perfect model for prediction. We rather want to know how dietary diversity is explained by agricultural, KAP and socio-economic variables.

Table 20: Variables present in the data sets and considered for statistical analysis

Key nutrition data	Agriculture data	KAP data	Socio-economic data
IDDS-W (Individual Dietary Diversity Score – Women; based on a total of 10 food groups) MDD-W (Minimum Dietary Diversity – Women; minimum dietary diversity is achieved when eating ≥5 food groups) MAD (Minimum Acceptable Diet); breastfed children age 6-23 months receiving the minimum dietary diversity and the minimum meal frequency. Non-breastfed children require at least two milk feedings and furthermore minimum dietary diversity has to be achieved without including milk feeds, and the minimum meal frequency has to be met)	HH has access to land that can be used for agriculture (yes/no) Crop diversity (number of crops grown by HH) HH has home garden (yes/no) HH grows vegetables (in home garden) (yes/no) HH grows vegetables (in home garden) during dry season (yes/no) HH grows vegetables (in home garden) during wet season (yes/no) HH grows vegetables (in home garden) year-round (yes/no) HH grows vegetables anywhere else outside a home garden or vegetables are accessible to HH (rent and share, not buying at the market)? (yes/no) Types of vegetables grown or accessible (dummy coding for each vegetable) (yes/no) Number of types of vegetables grown Main use of vegetables (dummy coding): mainly own consumption (yes/no), mainly for sale (yes/no), for sale and for own consumption in approx. equal amounts (yes/no), other (yes/no) HH collects indigenous vegetables or leafy vegetables from the surrounding areas (yes/no) Number of types of indigenous or leafy vegetables collected HH has fruit or fruit trees at home garden or has access to fruit or fruit trees (rent and share, not buying at the market) (yes/no) Types of fruit grown or accessible (dummy coding for each type of fruit) (yes/no) Number of types of fruit grown Main use of fruit (dummy coding): mainly own consumption (yes/no), mainly for sale (yes/no), for sale and for own consumption in approx. equal amounts (yes/no), other (yes/no) HH owns animals (livestock, farm animals, poultry or fishponds) (yes/no) Types of animal owned (dummy coding for each type of animal) (yes/no) Main use of animal produce (dummy coding): mainly own consumption (yes/no), mainly for sale (yes/no), for sale and for own consumption in approx. equal amounts (yes/no), other (yes/no)	Counselling structure for nutrition in village existent (yes/no) Respondent received nutrition counselling (yes/no) Knowledge score enriching porridge	HH size (number of people living permanently in the HH) Ethnicity Age of respondent Household head (male/female) Education (total years of schooling) Income sources (as dummy variables for each income source) HH benefits from school feeding programme (yes/no) HH benefits from agricultural development programme (yes/no) HH benefits from cash transfer programme (yes/no) HH benefits food aid programme (yes/no) HH benefits from food for assets/work programme (yes/no) HH benefits from supplementary feeding programme (yes/no) HH benefits from public work programme (yes/no) HH benefits from microfinancing programme (yes/no) Number of sources HH benefits from

Remarks: Variables in orange have some country-level variation in the number or type of responses in the GLZ Nutrition Baseline Surveys

Source: own illustration based on NBS data sets

Table 21 provides an overview of the statistically significant associations between the outcome variables IDDS-W/MDD-W/MAD and the predictors included in the country models.

Table 21: Summary of statistically significant variables (at least significance level of 0.05) per country and model and their direction of influence on the dependent variables

Country	IDDS-W / MDD-W (ordered) logistic regression model	MAD logistic regression model
Benin	Crop diversity (+) Income score (+) Commune Pehunco (-)	Breastfeeding status (-)
Burkina Faso	Crop diversity (+) Nutrition counselling (-) Secondary education (+) Ethnicity: Dagara (-)	Infant's age (+) Under-five clinic visits (+) Commune: Diebougou (-)
Cambodia	Home garden (+) Nutrition counselling (+) Commune: Totong (+) Commune: Mean Rith (+) Commune: Typo (+)	Breastfeeding status (+) Infant's age (+) Sex of household head (+) Vegetable diversity (+)
Ethiopia	Crop diversity (+) Fruit production in homestead (+) Vegetable production in home garden year-round (+)	Infant's age (+) Sex of household head (-) Vegetable diversity (+) Crop diversity (+)
India	Home garden (+) Access to fruit (+) District (-)	Breastfeeding status (+) Under-five clinic visits (+) Infant's age (+) Home garden (+) District (-)
Kenya	Home garden (+) Fruit diversity (+) Nutrition counselling (+) Secondary education (+)	Breastfeeding status (+) Under5 clinic visits (+) Infant's age (+) Vegetable diversity (+)
Malawi	Home garden (+) District (+) Ethnicity: Ngoni (+) Ethnicity: Lomwe (+)	Sex of household head (-) Infant's age (+) Number of programmes participating in (+) District (+)
Mali	Vegetable diversity (+) Animal production for own consumption (-) Sector: Gourma Rharous (+)	Breastfeeding status (+)
Togo	Access to fruit (-) Prefecture: Vo (-)	Crop diversity (+) Breastfeeding status (+) Infant's age (+) Prefecture: Vo (-)
Zambia	Crop diversity (+) Income score (+) District (-) Secondary education (+)	Nutrition counselling (+) Breastfeeding status (+) Under5 clinic visits (+)

Remarks: (+) predictor positively affects the dependent variable, (-) predictor negatively affects the dependent variable

Source: own calculation (Stata 13) based on NBS data sets

Conclusions

With respect to women's dietary diversity we found that in all country models (except Togo) at least one and a maximum of three agricultural variables per model have a statistically significant positive association with the Individual Dietary Diversity Score or the Minimum Dietary Diversity for women, namely crop diversity, home garden, access to fruit/fruit production in homestead, year-round vegetable production, vegetable diversity, and or fruit diversity. Among all the significant agriculture variables, we found the following to have the strongest influence on the outcome variable MDD-W (coefficients >0.7 corresponding to a $>100\%$ increase in the odds of achieving a minimum dietary diversity if the dependent variable is increased by one unit, *ceteris paribus*, since $\exp(0.7) = 2.0$): growing fruit in homestead and growing vegetables year-round in Ethiopia (coefficient: 1.024 and 2.351, respectively), home garden in India (coefficient: 0.997), home garden in Kenya (coefficient: 1.113), and home garden in Malawi (coefficient: 0.972). In comparison to agricultural variables, the other significant variables are highly country-specific and do not occur consistently amongst countries (nutrition counselling, secondary education, geographical location, ethnicity, income score). For example, nutrition counselling had a significant positive effect on women's dietary diversity only in Kenya and Cambodia.

The results of regression models with infants' minimum acceptable diet as a dependent variable show that in five (Cambodia, Ethiopia, India, Kenya, Togo) out of ten countries at least one and a maximum of two agricultural variables have a statistically significant positive effect on infants' MAD (vegetable diversity, crop diversity, home garden). Their coefficients range between 0.112 (crop diversity, Togo) and 0.522 (home garden, India).

Interestingly, other results show that infant's age in seven out of the ten countries, under-five child clinic visits in four out of the ten countries and breastfeeding status in six out of ten countries are significant and positive predictors of MAD. The coefficients for breastfeeding status range from 0.162 (Burkina Faso) to 4.066 (Zambia), for infant's age from 0.002 (Kenya) to 0.157 (India), and for under-five child clinic visits from 0.003 (Mali) to 0.269 (Kenya). Thus, especially breastfeeding status has a major impact on an infant's minimum acceptable diet.

Summary of associations for Individual Dietary Diversity Score Women (IDDS-W) and Minimum Dietary Diversity Women (MDD-W)

- In the regression models, in nine out of ten country models, at least one and maximum of three agricultural variables have a causal positive effect on women's dietary diversity (crop diversity, home garden, access to fruit/fruit production in homestead, year-round vegetable production, vegetable diversity, fruit diversity)
- Nutrition counselling was significant in some but not all countries
- Other significant predictors were country-specific (secondary education, geographical location, ethnicity and income score)

Summary of associations for Minimum Acceptable Diet (MAD)

- In five out of ten country models, at least one and maximum two agricultural variables had a causal positive effect on infants' MAD (vegetable diversity, crop diversity and home garden)
- In nine out of ten country models, infant's age, and/or under-five child clinic visits positively and significantly influence MAD
- Within countries, *district* was also often a significant predictor

Based on the results of the (ordered) logistic regression models with the IDDS-W or the MDD-W as an outcome variable, the following **general recommendations** can be made.

Women's dietary diversity (IDDS-W and MDD-W as outcome variables):

- Interventions should generally focus on the promotion of crop diversity and home gardens with diverse vegetable and fruit production. This can be done, for example, through distributing crop, vegetable and fruits seeds, training farmers on home gardening and the importance of crop diversity, conducting study trips for farmers to learn about home gardening and setting up model home gardens for community learning.
- In a few cases, namely Cambodia and Kenya, providing nutrition counselling on healthy and diverse diets can also have a positive effect on women's dietary diversity, since nutrition counselling is a statistically significant predictor in these country models.
- It is recommended to initiate further investigations on why some of the districts and ethnic groups happen to have a significant positive or negative influence on women's dietary diversity, such as in the case of the ethnic groups of Ngoni and Lomwe in Malawi (positive effect) or the commune Pehunco in Benin (negative effect). Findings from districts and ethnic groups with a positive influence on women's dietary diversity can thus serve as a blueprint for disadvantaged districts and ethnic groups.

Minimum Acceptable Diet (infants and children 6-23 months)

- Interventions should partly focus on an agricultural pillar, in particular for Cambodia, Ethiopia, India, Kenya and Togo where vegetable diversity, home gardens or crop diversity were found to be significant predictors of MAD.
- Another perhaps even more important pillar for intervention is the promotion of breastfeeding (Cambodia, India, Kenya, Mali, Togo and Zambia) and under-five child clinic visits (Burkina Faso, India, Kenya and Zambia). For instance, if women do not breastfeed their infants, at least two milk feedings and an achievement of the infant's minimum dietary diversity without counting milk feeds are required in order to meet the MAD. In other words, breastfeeding the infant decreases the number of complementary feedings needed and increases the likelihood of an infant to achieve his/her MAD. Our results indicate supporting countries with already high rates of breastfeeding to continue positive policies and messaging and further promoting breastfeeding where needed is crucial. Increasing a woman's under-five child clinic visits with her infant through highlighting the importance of these visits and making sure that women have access to under-five child clinics is also an important approach.
- We also recommend putting special emphasis on the youngest infants when designing interventions to increase the number of infants achieving the MAD. The model results show that young infants in all countries except Benin, Mali and Zambia are significantly less likely to meet their dietary needs than older infants.



4. Country overview and programme interventions

GIZ country package reports were provided to Bioversity International for review and assessment of country package fit with the indicators chosen for the NBS. For each country package a review was made of the output, in addition to a brief summary of the planned activities (measures) and indicators that could be expected to change over the course of the project, followed by recommendations for further monitoring. A summary of the full report that reviews each country package in relation to the baseline indicators was provided in a supplementary report. The highlights of the main findings are presented below.

The stated objective in nearly all the projects can be summarized as “The food and nutrition situation of those vulnerable to food and nutrition insecurity, especially women of childbearing age and young children, has improved”. In Malawi this objective includes primary and pre-school children and Mali mentions a specific reference to resilience to food crises at household level of people vulnerable to food and nutrition insecurity. The groups of activities were summarized into five categories: (i) direct support to agriculture (e.g. provision of inputs including seeds, cultivation of home gardens, processing and utilisation of important highly nutritious crops), (ii) nutrition education (e.g. training on nutrition for mothers, dietary diversification, food preparation, hygiene, nutrition requirements for women during pregnancy, and for infants and young children, cooking demonstrations), (iii) support to extension staff to provide education, (iv) support to multi-sectoral coordination bodies and (v) “other”, which is a miscellaneous grouping of a range of activities including for example water and hygiene activities, primary school activities and improving Targeted Public Distribution System (TPDS) (Table 22).

Nine country packages included a focus on agriculture and support to extension staff to provide nutrition education. Eight packages included support to multi-sectoral coordination mechanisms, such as the Scaling up Nutrition (SUN) movement. Six country packages will provide direct nutrition education in the form of development of key messages, cooking demonstrations and similar activities. Several of the country packages also included an additional focus, for example hygiene messaging (Malawi) or support to the TPDS (India).

Table 22: Categories of interventions described in country package reports

Country	Agriculture production (9/10)	Direct nutrition education (6/10)	Support to extension staff (9/10)	Multi-sectoral coordination (8/10)	Other (media campaigns, WASH, Social transfers)
Benin	X	X	X	X	X
Burkina Faso	X	X	X	X	X
Cambodia	X	X	X	X	X
Ethiopia	X		X	X	X
India			X		Improve efficiency of TPDS
Kenya	X	X	X	X	
Malawi	X	X	x	X	Support to education and health facilities Mobile advisory services via telephone for pregnancy and post-pregnancy
Mali	X				X
Togo	X		X	X	X
Zambia	X	X	X	X	X

The key indicators of IDDS and MAD collected in the NBS are well suited for the eight projects that will support more diversified agriculture production combined with support to extension staff and/or support to multi-sectoral coordination bodies and/or direct nutrition education. It is also plausible that these activities, particularly those focussed on increasing access and availability of food will also lead to improvements in FIES-H. In India, where the project will focus on digitalisation and computerisation of the TPDS and improved awareness about the importance of diversified nutrition and about the TPDS through support to the Village Health Sanitation & Nutrition Committee, the impact pathway to improve IDDS and MAD is less clear. However, improvement in FIES-H could be an outcome, should the scheme to improve the functioning of the TPDS be successful.

Through the review of both the planned country package interventions and results from the NBS several issues have been identified that could be addressed by the country teams in order to improve dietary indicators over the course of the programme. An overview of the issues that are not yet explicitly addressed in the country project proposals, but could be useful to explore include:

Balance between own consumption and sale of on-farm production

For certain countries there would appear to be an opportunity to increase consumption of certain nutrient-dense crops. For example in Togo 66 and 58 percent of hh reported growing beans and groundnuts, while the consumption of the food groups nuts/seeds and beans and peas was below 25 % for both women and children. Similarly in five countries more than 75% of hh had access to fruit, but consumption of fruit was below 50%. It is possible that seasonal availability was a barrier to greater consumption of own-production, but the barriers and opportunities for increasing consumption of foods available on-farm should be explored.

- Promote a balance of own consumption and sale
- Investigate reasons for mainly selling crop/fruit and not consuming a portion (is it linked to low storage capacities and knowledge or is it primarily income-related?)

- Increase knowledge about the benefits of dietary diversity for children and mothers and provide mothers with recipes, and include eggs, vegetables, pulses, nuts and seeds and fruit in nutrition education and cooking demonstrations
- Promote using income derived from sale of crops/livestock to diversify food purchases

Own consumption of animal source foods (ASF)

Animal source foods warrant special mention because of their nutrient density, making them a good source of protein and bioavailable nutrients but also there could be cultural factors or intra-household food distribution norms that might inhibit greater consumption of ASF, particularly by women and children. The availability of ASF at household level does not necessarily imply that they are consumed by children and mothers. In fact, despite a large percentage of households engaging in livestock rearing, ranging (44-91 percent of HH) ASF consumption was generally low in many countries, Egg consumption for both women and children is particularly low, despite the fact that many households raise poultry. Community-wide behaviour change communication is needed to emphasize the nutritional value of ASF for children and mothers. In order to successfully address the low consumption of dairy, flesh foods and eggs, we recommend investigating the barriers and drivers of ASF consumption. It is important to understand HH decision making dynamics related to sale or consumption of ASF so that messaging and other interventions can be appropriately targeted toward the HH decision maker. Discussions may need to take place to achieve a balance between consumption and sale that is acceptable to all household members. Cultural barriers should be sensibly addressed and local leaders and authorities can also be engaged as champions for change.

- Promote consumption of ASF₁ as they form three (eggs, flesh foods, dairy) out of seven food groups for children
- Increase knowledge about the benefits of ASF to child diets and provide mothers with recipes; include ASF in cooking demonstrations

Gender-sensitive aspects

The sale of ASF and other crops produced has a high likelihood of being decided by male members of the household, mainly due to the fact that most households are male headed. Therefore mothers might not have the power to decide about keeping ASF and crops for own consumption. Low female education in several of the project areas should also be considered as a factor in decisions taken within the household.

- Address men in nutrition measures and address the importance of ASF and nutritious crops for children's and mother's diets
- Investigate food distribution patterns: (a) who is eating which foods in the households? and (b) who decides whether to use crops/livestock for own consumption or sale?

Feeding patterns during episodes of illness

Most of the respondents reported offering less fluids and foods to their children during episodes of illness. During illness children should be offered food and liquids frequently to avoid dehydration to ensure that they receive adequate nutrients.

- Promote the adequate supply of food and fluids to young children during episodes of illness. This is particularly important as occurrence of diarrhoea is a serious issue among the surveyed children

Hygiene practices

Most of the respondents reported very poor hygiene practices:

- Investigate if use of ashes is a more common practice. The use of ashes in hygiene practices was not asked about in the surveys, but it is also an appropriate way to clean hands.
- Investigate the drivers and barriers of using soap; conduct focus group discussions with primary caretakers, and interviews with local leaders

Seasonality of food availability

In general all of the country programmes would benefit from looking at seasonality of food production and identifying strategies that can be used to broaden year-round food production. This is hardly mentioned in the recommendations of the NBS. The World Agroforestry Center (ICRAF), for example, has a method called “Fruit tree portfolio” which identifies combinations of fruit tree species that can be planted so that at least one fruit species is available every month of the year, enabling year-round supply. There are also guidelines such as those developed by the International Fund for Agriculture Development (IFAD) that discuss “Integrated Homestead Food Production”, which work towards integrating small livestock, fruits and vegetables into homestead food production systems.



5. Recommendations

Recommendations follow the same sequence as the report, beginning with recommendations for the survey design and questionnaire tool, recommendations for reporting and conclusions presented within the NBS and recommendations for creating stronger linkages and synergies between the country package proposals and NBS results.

5.1 Survey design

All of the surveys used a cluster sampling methodology, however, this was not accounted for in the analysis phase. It is generally recommended to apply sampling weights when using a cluster survey design, however, as different stages of sampling were used, it is recommended to check with a statistical department regarding the correct weighting scheme to be applied, as it is likely that methods will differ by country.

The use of a standard questionnaire for collecting the baseline data was very useful and greatly assisted in enabling cross-country comparisons. It is recommended to use a standardized questionnaire tool again for the endline surveys in all countries, where key project indicators and underlying determinants remain consistently collected, while also allowing flexibility in adding or removing questions deemed important for the country interventions. For example, if in a country an activity including grandmothers and men in nutrition education is implemented, it is crucial to capture the extent to which they were reached, even if only from the survey respondent's point of view, which, for the sake of consistency, should remain the woman of reproductive age.

While most of the questions asked were standardized, there were some that perhaps did not capture concepts well or the information was not used to inform any action. Examples are the question on "Why did you settle in this area?" and "Do you have a counselling structure in your village?". It is recommended to review each question for inclusion in the endline, as certain questions were perhaps not useful or gave results with a high level of uncertainty.

The question on number of under-five clinic visits needs careful review. This variable had significant associations with MAD, however, in reporting of results within the NBS, the average and sometimes range, median and mode are presented. While it is useful to present the results using central tendency, it is more important to standardize the interpretation based on the age of the child in months. One potential way to do this would be to use three-month age groupings and report the mean number of visits by small age group categories. The number of children per small age grouping might not, however, be statistically valid.

Perhaps another technique would be to analyse only children of 18-23 months with a dichotomous cut-point (e.g. three or six visits) and come up with the prevalence of under-five clinic attendance. It is also important for the interpretation of the results that it is clear to enumerators and the respondents that under-five clinic refers to well-child visits and does not include clinic visits when the child is ill. Misreporting on this point will lead to uncertainty on the reasons for the under-five clinic visits, with a possible bias towards believing that children fall ill more often and are taken to the health clinic for medical assistance, compared to those who are healthy and are attending regular monthly growth monitoring and promotion visits.

5.2 NBS summary results

Results in the NBS are presented in a standardized and thorough way and follow recommended procedures for reporting. For example MAD, MDD and MMF results are reported separately for breastfed and non-breastfed children in most reports. It is **very important to note that for the purposes of this cross-country synthesis values for FIES-H were recalculated**. As such, they are not comparable with country-level estimates that appear in the NBS. It is recommended to always use the full name of the indicators “*Prevalence of Experienced Food Insecurity at moderate or severe levels (mod+sev)*” and “*Prevalence of Experienced Food Insecurity at severe levels (sev)*”, in addition to indicating that this is a household and not individual indicator, by using the demarcation, FIES-H.

The use of a standardized reporting template for the NBS was convenient, and will facilitate comprehension for outside users, however, there was a temptation to cut and paste between reports, particularly in the NBS section on Conclusions and Recommendations. This tendency prevented a more in-depth and country-specific thought process on the linkages and barriers to improve dietary diversity.

The amount of standardized data collected that also includes three food-based dietary indicators is of great interest to the scientific community and making the data publically available can be considered a global public good. The variable names in the data sets are labelled and defined, so users can interpret the information provided in each country easily. However, for the purpose of meta-analysis, much work is still needed towards assigning each variable of interest a common variable name. For example the variable “child age” is assigned a different variable name in nearly every country dataset (e.g. “ageindays”, “agechild”, “age”, in Zambia, Ethiopia and Togo respectively). Standardized variable names make it much faster to run syntax commands, but would require an initial investment in dataset harmonization.

Prevalence levels for indicators in the reports were often accompanied by “high” or “low”, for example “high prevalence of diarrhoea (32.2)” (Ethiopia report) “low dietary diversity of children (57 % <4 food groups)” (Malawi report). It is recommended that common definitions of “high”, “moderate” and “low” be used consistently throughout the analysis.

- Action: we recommend to use a standard categorization to compare countries such as using the following percentages as thresholds:
 - 0-33% Very Low
 - 34-65% % Low
 - > 65% Better

5.3 Country packages and lessons from NBS

The Bioversity team reviewed each country package and the NBS levels of many indicators for each country.

General

- Try to assess level and intensity of participation in interventions (e.g. coverage rate and repeated education sessions for the same household). For example, see how this was done in the RAIN impact evaluation (Harris et al., 2016)

Availability and access to food

- **Own production** was a big focus of the NBS while **market and market access** was not; more exploration of market access and food availability in markets could be undertaken at mid-term
- Seasonal fluctuations in food availability should be further explored and addressed when designing interventions
- Divergence between access to fruit and vegetables and consumption should be explored using qualitative methods

Gender

- All country packages should consider the role of women and men of different age groups to understand food and nutrition security dynamics within the households as part of their gender-sensitive approach:
 - Who controls the income that determines what food is purchased?
 - Who decides what food to grow in the home garden (mother-in-law/older female in HH, male member of HH, or mother of the young child)?
 - Who decides on a daily basis the food prepared for the family (mother-in-law /older female, male member of HH, or mother of the young child)?
 - Who decides on a daily basis the food prepared for the child (6-23 months)? (There could be a difference between decision making for family and young child)
 - Who decides if it is acceptable to feed the child a new food (e.g. fruit, vegetable, egg)?

Care

- Country-specific qualitative data collection is needed to understand divergence in knowledge and practice of dietary diversity for children in Ethiopia and Kenya
- Most knowledge questions were based on maternal recall of general topics; the uptake of programme- specific messaging should be tested
- Assess different channels of communication for uptake of messages

Health/WASH

- Advocate strongly access to sanitation, as level of sanitation and practices was very low in most countries

6. Conclusions

The ten NBS collected for the Global Programme “Food and nutrition security, enhanced resilience” provide critical information that can be used to: i) understand the initial context within project areas, ii) make changes to planned project level interventions based on findings from the baseline survey and iii) track progress over time. The application of a standard questionnaire is very useful to facilitate cross-country comparisons and generate standard indicators for the Global Programme. The results of the NBS reflect a timely and relevant data collection exercise and include a unique combination of three sets of food-based indicators; FIES-H, MAD and IDDS-W.

The NBS use impact pathways framed according to the UNICEF conceptual framework. Most country package interventions follow plausible impact pathways from increased and diversified production, combined with nutrition education activities and support, to both extension and multi-sectoral action that can lead to achieving impact on dietary diversity. The chosen key indicators of IDDS-W and MAD match well with the programme intervention packages in most countries. The country programme project sites represent vulnerable areas and are appropriate sites for the proposed interventions. The project sites chosen are in locations where one or more of the key indicators, as well as several of the underlying variables need to be improved in order to further realization of food and nutrition security.

In terms of the three core indicators: FIES-H, IDDS-W and MAD, similar results were found in other studies of FIES-H. Comparing MAD for children with older studies showed that the NBS results were slightly better; this is most likely a reflection of general improvement in IYCF practices over time. There are no large-scale surveys available to compare results for IDDS-W. For the IYCF indicators, collection of information on breastfeeding, MDD, MMF and MAD helps to pinpoint specific areas of concern in infant and child feeding practices, as for example MMF was higher than MDD in all countries. A higher percentage of children meet MMF than MDD, so MDD can be considered as a main barrier to improving MAD. MAD was associated with household crop diversity, vegetable production and home gardening in some sites and also influenced by infant age and number of under-five clinic visits. Women's dietary diversity was also associated with diverse household food production strategies, as well as women's education level, geographic location, ethnicity and income. To improve both IDDS-W and MAD, interventions should generally focus on the promotion of crop diversity and home gardens with diverse vegetable and fruit production. While breastfeeding levels were already high, the associations with MAD and breastfeeding were also high, so messaging on breastfeeding should be supported and continued.

The three core indicators are complemented by a wide set of socio-demographic, agriculture production and household access to other food sources (home gardens, fruit trees), WASH and KAP information. Specific country project site findings, such as very low educational levels of women in Benin, Burkina Faso and Mali, very low land access in Kenya, very low percentage of households with access to improved sanitation in all sites except Burkina Faso and Cambodia, should be used to tailor planned interventions. There is also need at project site level to explore barriers and opportunities for consuming more of own-produced food as well as using income from sale of crops/livestock to diversify food purchases. Gender should be another area of focus to better understand intra-household decision making dynamics, particularly regarding decisions on which crops to plant, the balance between own-consumption and sale, for example of eggs and to then tailor behaviour change communication messages to the household decision maker or others with a large amount of influence within the household.

Both the NBS and choice of indicators are timely given the increased global focus on achievement of the Sustainable Development Goals (SDGs) that include goals to end poverty and malnutrition in all its forms. Furthermore, the results are also a relevant platform for testing the performance of two relatively new food-based indicators, the FIES-H, which is one of the indicators to be monitored within the context of the SDGs and dietary diversity of women. The NBS are also very relevant in the context of nutrition-sensitive programming that aims to demonstrate the impact of agriculture and multi-sectoral interventions on food security and dietary intake.

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