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EFFECTIVENESS OF A NUTRITION EDUCATION INTERVENTION TO IMPROVE COMPLEMENTARY FEEDING PRACTICES:

A RANDOMIZED CONTROLLED TRIAL IN CAMBODIA



DISSERTATION

submitted to the Faculty of Agriculture,
Nutritional Sciences, and Environmental Management
Justus Liebig University Giessen
for the degree of **Dr. oec. troph.**



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and Environmental Management
Institute of Nutritional Sciences

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by

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Giessen, 2015

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Abbreviations

ARI	Acute Respiratory Infections
BFCI	Baby Friendly Community Initiative
CDDS	Child Dietary Diversity Score
CDHS	Cambodian Demographic and Health Survey
CFI	Child Feeding Index
CFI-sq	Child Feeding Index squared
CNP	Community Nutrition Promoter
DDS	Dietary Diversity Score
DiD	Difference-in-Differences Model
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization of the United Nations
FBS	Farmer Business School
FFS	Farmer Field School
FFQ	Food Frequency
FGD	Focus Group Discussions
HAZ	Height-for-Age Z-score
HH	Household
IMCF	Improving dietary intakes and nutritional status of infants and young children through improved food security and complementary feeding counselling
IYCF	Infant and Young Child Feeding
JLU	Justus Liebig University Giessen
LAZ	Length-for-Age Z-score
MALIS	Improving Market Linkages for Smallholder Farmers
MAD	Minimum Acceptable Diet
MDD	Minimum Dietary Diversity
MMF	Minimum Meal Frequency
MNP	Micronutrient Powder
NE	Nutrition Education
NGO	Non-governmental Organization
SD	Standard Deviation
TIPs	Trials of Improved practices
UNICEF	United Nations Children's Fund
WAZ	Weight-for-Age Z-score
WHZ	Weight-for-Height Z-score
WLZ	Weight-for-Length Z-score
WHO	World Health Organization

1 Introduction

Background

Poor nutrition in early infancy leads to undernutrition and is known to be one of the major contributors to stunted growth and child mortality. [1] Reasons for poor nutrition are multifaceted and so are interventions against it.

The UNICEF framework gives a comprehensive picture on the complexity of immediate, underlying, and basic causes of undernutrition. [2] Starting from the individual level, immediate causes of undernutrition can be inadequate dietary intakes and diseases. Both often occur at the same time and mostly result in a vicious cycle of infection and malnutrition which further weaken the individual. Looking at children under 2 years of age in Cambodia, prevalence of diarrhea is high according to the 2010 Demographic and Health Survey (21%). [3] If the child's immune system is weak due to poor nutrition, infections like diarrhea are more likely to be more severe which furthers the loss of nutrients as well as appetite and malabsorption of nutrients in the long run. Consequently, this leads to increased severity of undernutrition. Diseases further weaken the child and contribute to a manifestation of malnutrition and increase prevalence of mortality. [4]

Underlying these immediate causes of undernutrition are causes located on household and community level and include household food insecurity, inadequate care, and unhealthy household environment as well as lack of health services, and income poverty. Food insecurity is characterized by low access to, availability, and affordability of food. The majority of rural Cambodian households live on subsistence farming mainly producing food for their own consumption rather than for sale. Food security among households in rural Cambodia is highly dependent on the season. With one harvest season of the main staple crop, rice, in December/January, the prevalence of food insecurity rises steadily from March to November. [5] Some families move to the forest for several weeks each year to nourish from indigenous foods. Sometimes members of the household migrate to other parts of the country or neighbouring countries to financially support their family. Scenarios like this increase the risk for individual undernutrition: When a household's access to food is limited, it is women and children who are affected the most. Women's diets decrease with regard to amounts per meal, day, and diversity. Monotonous diets in particular negatively affect

women during pregnancy and lactation and thus, the infant's diet as it is highly dependent on its mother's diet. Therefore, the growing infant's diet will not meet the nutrient requirements of the first 1,000 days which are regarded as critical to a child's healthy development. [6-8] In the Cambodian context, however, migration and food insecurity are but two causes of malnutrition in addition to a lack of general knowledge on nutrition and awareness of importance of complementary feeding, both leading back to a low education level as underlying cause. Insufficient health service and health behaviour contribute to the increased risk of undernutrition. [3] In rural Cambodia, more than 66% of all households do not have access to improved sanitation facilities. [3] All underlying causes, which are subject to seasonal variation, overlap and create the basis for immediate causes.

Basic causes of undernutrition comprise access to and control over human, economic, or organizational resources and evolve around the structure and processes of societies. In developing countries such as Cambodia basic causes are characterized by the inadequate access to education, physical, social, and natural capital. Poor infrastructure deprives not only access to information but also limits market linkages for especially the rural community. Behind these, however, political and cultural factors are weakening the situation.

Programs to address the different layers of undernutrition according to the UNICEF conceptual framework ideally include components on agriculture, nutrition, and hygiene. According to the 2013 *Lancet* series on child and maternal nutrition, appropriate complementary feeding is one among ten core interventions which have the potential to reduce child mortality by 15%. [9] Entry-points to address malnutrition can be either nutrition-specific or nutrition-sensitive. [10] Nutrition-specific actions directly target immediate causes of malnutrition whereas nutrition-sensitive actions work through different sectors which can contribute to positive nutrition outcomes and reduce harmful effects. Agriculture interventions may improve access to adequate and safe foods by improved production and linkages to farmer groups and markets. On the basis of improved food security, educational nutrition messages, including hygiene, can help to improve nutrition by diversifying diets and drawing attention to the most vulnerable persons within a household. Dietary diversification is a recommended approach to alleviate nutritional problems resulting from food insecurity and inadequate intake of micronutrients. [11] Such

food-based strategies should be given priority in order to meet macro- and micronutrient needs. [12] In Cambodia as well as in other developing countries, knowledge on infant and young child feeding practices seems to be poor. Preparation of a special complementary meal in addition to breastmilk feeds for children aged 6-23 months does not seem to be a common habit [13, 14]. Instead, children receive watery plain rice porridges which do not meet the nutrient requirements at this young age. A lack of adequate caring practices exacerbates the risk of malnutrition. Caregivers are often unaware of the importance of nutrition in the first two years of life. Thus, nutrition-sensitive actions focussing on young child nutrition should include components on care, food safety, hygiene, and sanitation. [10]

Complementary feeding comprises different components of importance (Table 1) and is defined as food which is especially given in addition to breastmilk from 6 months of age onwards. [15] In the first place, complementary foods need to be timely, adequate, safe, and properly fed. Dietary diversity is defined as the number of different food groups consumed over a given reference period. The World Health Organization (WHO) of the United Nations recommends a consumption of more than 4 different food groups per day from 6 months of age onwards. [15] Dietary diversity, often measured using a 24-hour recall method, can provide information on individual food access, seasonality, and dietary patterns. It is essential to nutrient adequacy to maintain good health and nutritional status as there is no single food other than breastmilk for the first 6 months of life that contains all of the nutrients required. [16] A recommended strategy to ensure sufficient supply with micronutrients is to consume a wide variety of foods among and within food groups. [17, 18] Another important aspect of complementary feeds is its frequency. Meal frequency increases with age and replaces breastmilk feeds linear to increasing age of the child. Food frequency addresses the number of different foods consumed over a period of time exceeding 24 hours. A growing infant requires increased amounts of food per meal with increasing age. Starting with ~30 ml (200 kcal) per meal at 6 months of age, the young child should receive ~250 ml (550 kcal) per meal when aged 1 year or older. [15] The way the food is given is important, too. Responsive feeding behaviour contrary to forceful feeding or unattended meals is desired and recommended to encourage the young child to eat and try out new foods, minimize distractions during meals, and create regular feeding patterns. In recent years more and more development projects have focussed on nutrition-specific

interventions to particular address such infant and young child feeding (IYCF) practices as presented in Table 1.

Table 1: Infant and young child feeding practices [15, 19]

	Sub-indicators	Recommendation
Breastfeeding	initiation	within 24 hours
	exclusiveness	for the first 6 months
	duration	continued until 2 years of age
Complementary Feeding	introduction	from 6 months of age on when the need for energy and nutrients exceeds what can be provided through exclusive and frequent breastfeeding
	dietary diversity	≥ 4 food groups
	meal frequency	meals of complementary foods should be provided 2-3 times/day at 6-8 months of age 3-4 times/day at 9-11 and 12-24 months of age additional nutritious snacks can be offered 1-2 times/day
	amounts fed	the energy needs from complementary foods for infants with “average” breast milk intake in developing countries are approximately: 200 kcal/day at 6-8 months of age 300 kcal/day at 9-11 months of age 550 kcal/day at 12-23 months of age
	food consistency	food consistency and variety should gradually increase as the infant gets older, adapting to the infant’s requirements and abilities
	responsive feeding	feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues; feed them slowly and patiently, and encourage children to eat, but do not force them; minimize distractions during meals, and talk to children during meals
	safe preparation	good hygiene and proper food handling; avoid use of feeding bottles

Approaches differ and include educational interventions as well as supplementation and fortification interventions. However, evidence on best practices remains rare. [9, 20] The importance of nutrition in the first 1,000 days of life for children’s growth, motor, and mental development is well recognized. [15] It is also well recognized that growth failure is not only linked to one IYCF indicator of the caregiver’s caring and feeding behaviour. [6] The Cambodian sample group of this study is characterized by deprived access to education, post-war-trauma, weak economy and linkage to markets, corruption, and food insecurity.

Nutrition education linked to an agriculture intervention could be one solution to improve complementary feeding practices and prevent malnutrition.

Scope of this thesis

Research studies over the past years have aimed at providing evidence for best approaches to combat malnutrition among children using educational interventions. With a focus on the above mentioned IYCF practices, community-based approaches were carried out in various developing countries with various developing partners. However, it is important for program designers, implementers, and researchers to understand the relationship between feeding practices and children's nutritional status before expecting a certain impact of an intervention.

IMCF research project

This thesis was embedded in a larger research trial carried out in Malawi and Cambodia. In both countries the "Improving dietary intakes and nutritional status of infants and young children through improved food security and complementary feeding counselling" (IMCF) research project was attached to a food security project of the Food and Agriculture Organization (FAO) of the United Nations with a nutrition education component further referred to as the intervention. IMCF activities in Cambodia commenced in May 2012 and were concluded in November 2014. A flow chart on activities is shown in figure 1.

After the IMCF cross-sectional baseline survey in September/October 2012, a restricted randomization selected intervention and comparison clusters taking height-for-age Z-score, child dietary diversity, maternal education, and household wealth into account. The 2 : 1 design followed the nature and time schedule of the FAO project enabling the comparison clusters to also receive nutrition education after conclusion of the research activities.

In addition to the cross-sectional surveys, a longitudinal study was conducted from August 2013 to August 2014. Furthermore, focus group discussions (FGD), in-depth interviews, and observations generated qualitative data. In addition to quantitative and qualitative data collection, a Geographical Information System (GIS) mapping exercise was conducted and data on nutrition project activities besides the intervention in the research area were mapped - geographically and content-related.

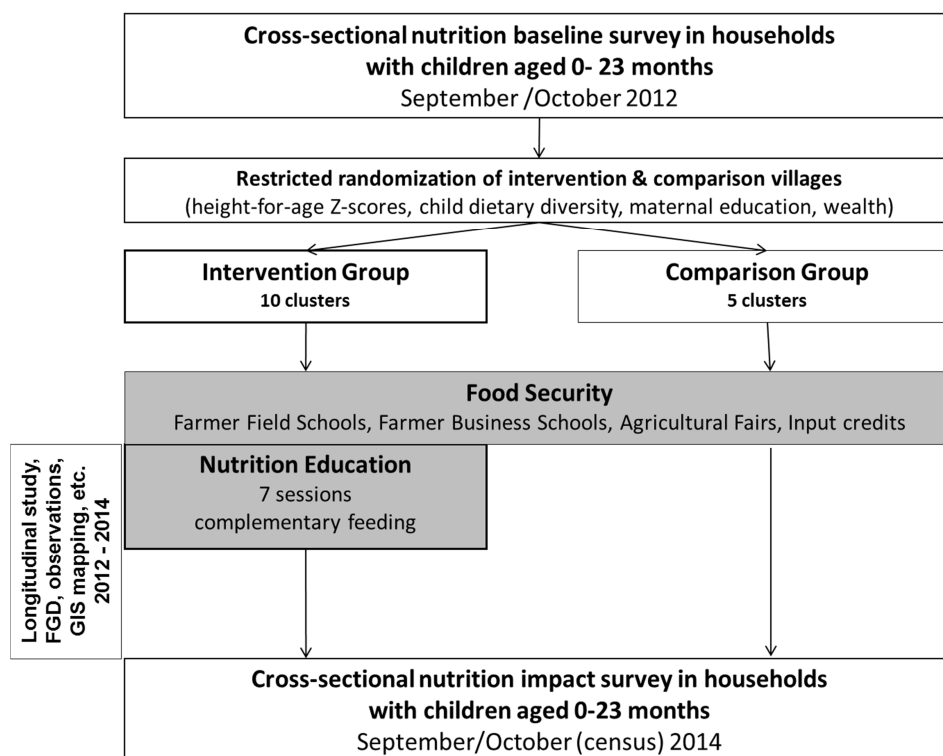


Figure 1: Time flow of research activities (white boxes) and intervention (grey boxes)

The design of IMCF activities was based on FAO's initial project time schedule. Thus, FAO activities started right after baseline data collection was concluded. Contrary to the initial design, only food security activities started in 2012 whereas nutrition education activities were delayed and did not start before August 2013 (Figure 1).

Overall IMCF objectives as stated in the IMCF research protocol [21] from May 2012 were:

- 1) Child's nutritional status has improved;
- 2) Infant and young child feeding practices of caregivers have improved and meet recommendations;
- 3) Availability and accessibility of nutritious foods at household level have improved and utilization of these foods for complementary foods has improved.

FAO project - the intervention

To contribute to reducing child mortality by addressing malnutrition among children 6-23 months, FAO implemented a nutrition-sensitive agricultural project with nutrition-specific actions: a nutrition education intervention was embedded in a food security project in two provinces in Northern Cambodia, Preah Vihear and Oddar Meanchey. By creating market

linkages and food security, FAO worked with existing farmer groups. Besides technical training on rice, vegetables, chicken, and cash crops, FAO provided input credits and organized agricultural fairs in the region. After 6 months of agriculture intervention, a nutrition education component was rolled out targeting smallholder farming households with children aged 5-18 months in the same villages in the region. Priority was given to those from households already participating in the agricultural intervention. Primary caregivers and their child in the respective age range were invited to take part in 7 participatory nutrition education sessions starting in August 2013. A group of 10-15 caregiver-child pairs per village gathered weekly or bi-weekly and gained knowledge on topics around IYCF including hygiene and sanitation, food safety, preparation of a complementary meal, healthy snacks, dietary diversity, feeding frequency, feeding age-appropriate amounts, and continued breastfeeding. Chapter 3 elaborates on more details of the intervention.

Figure 2 illustrates activities in the districts that were pre-selected by the FAO project: 4 in Oddar Meanchey and 2 in Preah Vihear. Intervention clusters are coloured yellow and comparison clusters are coloured red. Following the IMCF randomization, food security activities (FFS= farmer field schools, FBS= farmer business schools) were conducted in the comparison and intervention clusters whereas nutrition education (NE) was implemented in the intervention clusters only.

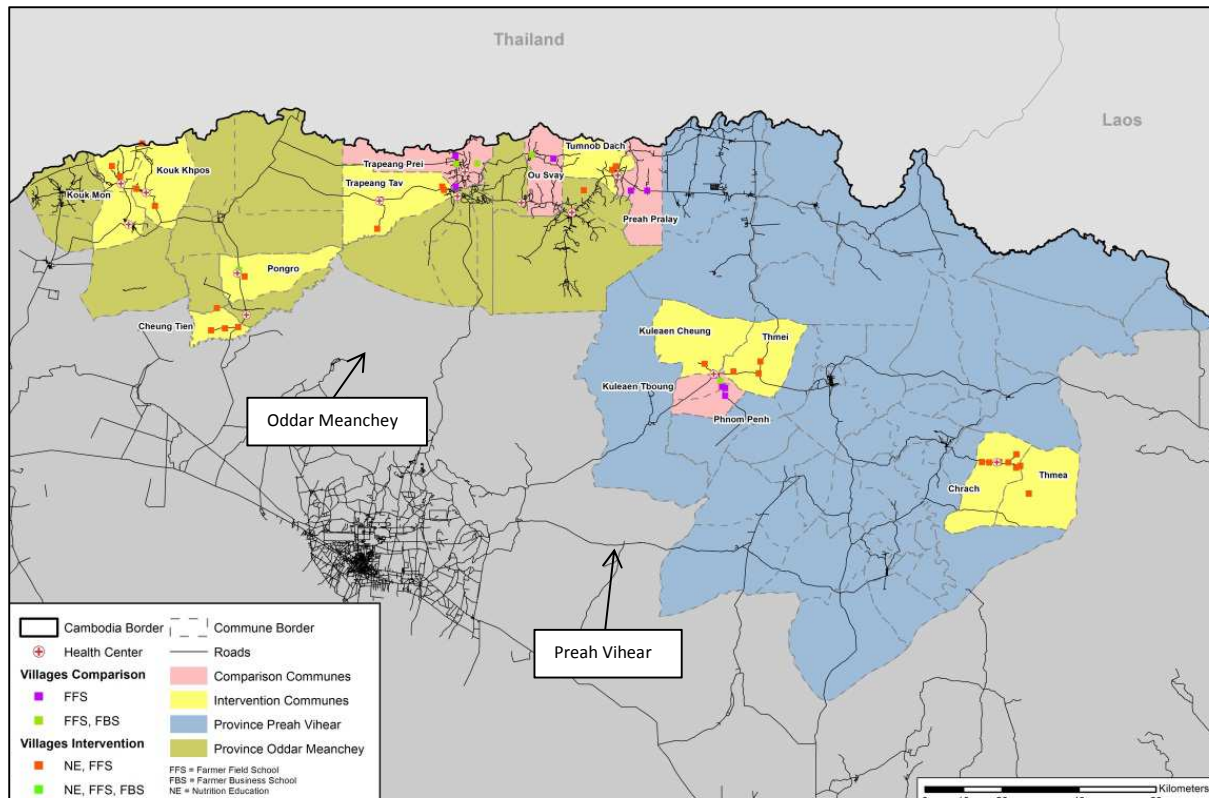


Figure 2: Map of IMCF and FAO project region in Northwest Cambodia

Objective of this thesis

The aim of this thesis is three-fold: i) to assess associations between nutritional status of Cambodian infants aged 6-23 months and caregiver's feeding behaviour comprised in a child feeding index; ii) to evaluate the effectiveness of a nutrition education intervention and its impact on children's diet and nutritional status; and iii) to put the results in the context of current nutrition-specific actions.

The central part of this thesis focusses on IYCF practices prior to and after a nutrition education intervention in Northern Cambodia. The baseline survey data was used as background information on current child feeding practices in the project region and put into context with children's nutritional status. The importance of considering not only one indicator when impact on growth is expected but to take a range of IYCF practices into account was elaborated. An analysis tested the ability of WHO IYCF indicators to explain height-for-age Z-scores of children against a composite child feeding index (chapter 2).

The second analysis focussed on the assessment of the effectiveness of the nutrition education intervention carried out by FAO as described above. Treatment effects of the

intervention were analysed and specifically focussed on associations between improved child's dietary diversity and nutritional status (chapter 3).

Additionally, data collected alongside the two surveys was used in the discussion to support the overall picture and set the two publications into context. Specifically, results of the mapping exercise were necessary to explain results and limitations of this study, and to better understand the results against the background of the Cambodian context (chapter 4).

The discussion chapter puts the research into a wider context and concludes with recommendations for future nutrition education interventions and future nutrition research projects (chapter 5).

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2 A child feeding index is superior to WHO IYCF indicators in explaining the retardation of growth of young children in rural Cambodia

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Ellen Muehlhoff, Ou Kevanna, Michael Krawinkel

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Abstract

Adequate young child feeding practices are influenced by a multitude of factors which affect growth and development. A combination of indicators is needed to explain the role of complementary feeding practices in growth retardation.

A cross-sectional nutrition baseline survey was conducted in rural Cambodia in September 2012. Villages in pre-selected communes were randomly selected using stunting as a primary indicator. Data were collected from 803 randomly selected households with children aged 6–23 months, based on a standardized questionnaire and on length/height and weight measurements of mother and child. WHO Infant and Young Child Feeding (IYCF) indicators [minimum dietary diversity (MDD), minimum meal frequency (MMF), minimum acceptable diet (MAD)] and a child feeding index (CFI) were created. The latter consisted of five components: breastfeeding, use of bottle, dietary diversity, food frequency and meal frequency which were adjusted for three age groups: 6–8, 9–11 and 12–23 months. The highest possible score was 10. Associations between length-for-age Z-scores (LAZ) and WHO indicators or CFI were explored.

Mean (SD) LAZ was -1.25 (1.14) (n=801). Mean (range) CFI was 6.7 (1–10) (n=797). Mean CFI was highest in the 9–11-months age group (7.93) and lowest for those aged 12–23 months (5.96). None of the WHO IYCF indicators was associated with LAZ, whereas CFI showed significant association with LAZ ($P<0.01$). The association between higher CFI scores and LAZ became weaker as age increased.

The results highlight the need to include a wide range of information in the analysis in order to understand the association between appropriate infant feeding practices and child growth.

Introduction

Improving the nutritional status of infants and young children through age-appropriate complementary feeding and caring practices among caregivers remains a challenge especially in low income countries. [1] Bhutta *et al.* estimated that scaling up of community based nutrition approaches which aim to improve infant and young child feeding (IYCF) practices would not only reduce the overall burden of childhood mortality but also substantially reduce existing disparities. [2] Various interventions aimed specifically at improving the diet of children under two years of age as this period is characterized by high

growth velocity and increased vulnerability. [2, 3] Hence, inappropriate feeding practices during this critical period can lead to chronic undernutrition, and result in stunting of infants. [4-6] Young child feeding practices are influenced by a multitude of factors such as maternal health and education, household wealth and food security status. These factors are also known to have an impact on growth. [6, 7] Over the years research has measured and assessed feeding practices in different ways. [8-10] A set of indicators is associated with growth, and a combination of feeding indicators seems to be crucial to provide sufficient information on IYCF practices. [8, 11] The IYCF indicators for children 6-23 months suggested by the World Health Organisation (WHO) include minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum adequate diet (MAD) (Table 2). [11] Due to the need of simple, valid and reliable indicators to assess IYCF practices, these three indicators were created in 2007 among others. They proved to be useful in Demographic and Health Surveys (DHS) in the past years. A pooled DHS analysis from 14 countries showed that non-achieved MAD was found to be significantly associated with stunting among children aged 6-23 months whereas there was no relationship between subnormal MMF and stunting. [10] Using DHS data from Latin America, Ruel & Menon applied a child feeding index (CFI) that combines single WHO IYCF indicators as breastfeeding, use of a bottle, dietary diversity (24 hours recall), food frequency (past 7 days), and meal frequency (24 hours recall) to look at associations of IYCF and growth. Their results showed significant positive associations between the CFI and length-for-age Z-scores (LAZ). [8] Another study from Senegal showed similar results: LAZ was strongly and positively associated with the CFI among infants younger than one year of age though less strongly for one- and two-year-old children. [11]

Stunting rates in Cambodia are the second highest among Southeast Asian countries. Data from the 2010 Cambodian DHS (CDHS) showed a 8% decrease in prevalence among children aged 0-23 months compared to 2000 (36% in 2010 vs. 28% in 2000). [14-16] However, stunting remains a major public health issue in the country and is one of the leading causes of morbidity and mortality among children. [17] It was found to be less likely among infants younger than six months but rapidly increasing up until 12-23 months of age. [18] According to the 2010 CDHS 33.5% of children aged 6-23 months achieved the MDD, 78.6% MMF, and 28.2% MAD. [13, 15] In an analysis of DHS data from 14 low income countries including

Cambodia higher dietary diversity was strongly associated with higher LAZ scores. The same study that more than half of the Cambodian children aged 18-23 months received four or more food groups. [10]

The objective of this study is to explore the relationship between feeding practices and LAZ scores in a population from two provinces in north western Cambodia. The ability of MDD, MMF, and MAD to explain retardation of growth in this sample will be compared with a CFI. The latter will be created following Ruel & Menon. [8] Assuming an interaction of various indicators the hypothesis of this study was the more child feeding recommendations were met, the higher the CFI score and the higher the LAZ of the child. However, the impact of various other confounding factors on CFI and LAZ had to be taken into account, such as maternal height, household wealth, and child's age and sex. [9]

The study was approved by the Institutional Review Board at the Justus Liebig University and by the National Ethics Committee for Health Research in Cambodia, and registered at the German Clinical Trials Register. Informed consent was obtained from each caregiver prior to data collection after the purpose and following procedure was explained.

Methods

A cross-sectional nutrition baseline survey was conducted in mid-September/early October 2012 in collaboration with a food security project of the Food and Agriculture Organization (FAO) of the United Nations. The FAO project includes a component of nutrition education on infant and young child feeding practices linked with components on improving farming systems and building up market linkages to increase and diversify production, and improve food security amongst smallholder farmers.

Study Sites and Study Population

The survey was carried out in the 2012 target area of the FAO project in Preah Vihear and Oddar Meanchey provinces. In total 16 communes from six districts were selected by the project at that time and consequently included in the baseline survey. About 17,650 possible beneficiaries of the FAO project consisting of rural farming households lived in this area. Only households with children aged 0-23 months were eligible to participate in the survey. Other inclusion criteria were: being resident in the sampled area, being randomly selected, and willingness to participate in the survey.

Design

Using Emergency Nutrition Assessment (ENA) for Smart sample size calculator and considering a population size of 15,000 children under two years of age in the surveyed area, 50% of stunting (primary indicator), a desired precision of $\pm 5\%$ and a design effect of 3, the sample size calculation resulted in 1,124 children. [19] The sampling was conducted using a two-stage probability sampling strategy. Initially three villages per commune were sampled proportional to population size. At the second sampling stage, 23 households with children age 0-23 months were randomly selected in each village if more than 23 children in the respective age range lived in the selected village. If there were exactly 23 children in the required age range, all caregiver-child pairs were asked to participate. If the village was very small and less than 23 suitable children lived in the selected village, eligible households were selected at random in the nearest adjacent village to complete the required sample.

Data Collection Procedure in the Field

In each village the selected primary caregivers with their children were invited to a central meeting point to participate in the survey. Age verifications of the children were conducted at this point by cross checking the birth dates indicated on village lists with the vaccination cards or birth certificates. In seven cases, where no information about the age of the child was indicated, the age was estimated by using a local events calendar and later dated to the 15th of the named month. Only children between 0 and 731 days¹ of age were included. Semi-structured questionnaires included a household, child, and caregiver section and were administered in face-to-face interviews with the primary caregiver of the under two-year-old child in the selected household. Data collected included socio-economic and demographic information of the household, household and child dietary diversity based on a 24 hour recall, child's seven days food frequency, child's health, feeding and caring practices as well as hygiene practices. Anthropometric measurements were taken with standardized equipment from Seca with mother and child function (Seca GmbH & Co KG, Hamburg, Germany; $d = 0.05$). Weight and height of the mothers were collected as well as weight and length of the child following the FANTA protocol. Height/length and weight were assessed to the nearest 0.1 cm and 0.1 kg, respectively. [20] All measurements were taken

¹ As year 2012 was a leap year with 366 days, children aged 731 days were counted as children aged 0-23 months.

twice and the mean was used for further analysis. All data collection tools were pre-tested in the field. Quality controls of data collection were conducted on a regular basis.

Wealth Index

Socioeconomic data was used to develop a wealth index based on the results of a principal component analysis. Variables included in the wealth index were: number of persons per rooms used for sleeping, floor composition, type of sanitation facility, drinking water source, and ownership of land and certain assets (e.g. radio, television, mobile and non-mobile phone, wardrobe, sewing machine or loom, CD/DVD player, generator/battery/solar panel, watch, bicycle, motorcycle, motorcycle-cart, car/truck/van, boat, ox/horse-cart, and hand-tractor). [21, 22]

Indicators for Infant and Young Child Feeding and Child's Nutritional Status

Feeding practices were assessed using the following WHO IYCF indicators for children aged 6-23 months: continued breastfeeding, introduction of solid, semi-solid, and soft foods, MDD, MMF, and MAD. [13] These indicators look at the percentage of children meeting the recommended criteria. The definition of MDD, MMF, and MAD is found in Table 2.

Table 2: WHO IYCF indicators: Minimum Dietary Diversity, Minimum Meal Frequency, and Minimum Acceptable Diet [12]

WHO IYCF indicator	Definition
Minimum Dietary Diversity	Proportion of children 6–23 months of age who receive foods from 4 or more food groups
Minimum Meal Frequency	Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more
Minimum Acceptable Diet	Proportion of children 6–23 months of age who receive a minimum acceptable diet (apart from breast milk)

The CFI was created for children 6-23 months following Ruel & Menon as well as Arimond & Ruel. [8, 9] It consists of five different components based on current national and international young child feeding recommendations (Table 3). Scoring points were given when the child was still breastfed and not bottle fed². Dietary diversity score (DDS) based on a 24-hours recall emphasized on six different food groups which resulted in a maximum of 6

² No bottle feeding does not mean no liquids were fed. Liquids besides breastmilk are not considered this index. Bottle feeding is regarded as harmful mainly with regard to hygienic factors.

scoring points. Food frequency (FFQ) reflected the consumption of certain foods in the past seven days, which were then summed up in a combined score. Meal frequency assessed the intake of solid, semi-solid and soft foods in the past 24 hours and resulted in scoring points for a certain number of meals given. DDS, FFQ, and meal frequency were matched to the different requirements for each age group (6 to 8.9 months, 9 to 11.9 months and 12 to 23.9 months) as indicated in Table 4. The CFI could reach a maximum of 10 scoring points. Following Ruel & Menon and others the index was treated as continuous variable. [8, 23, 24] However, most other publications did mainly use and present results from models with the CFI included as dichotomous variable or as terciles rather than presenting means or regression models outlining that the CFI used as a categorical variable is useful for graphic models and a strong advocacy tool. [9, 11, 24] In this study creating terciles would have led to a loss of information. Important results such as the quadratic relationship between CFI and LAZ would not have been explored.

Table 3: Current infant and young child feeding recommendations in Cambodia (WHO 2003)

6 to 8 months	9 to 11 months	12 to 23 months
Continue breastfeeding (8 times per day)	Continue breastfeeding (6 times per day)	Continue breastfeeding (on demand)
	cup feeding (no bottle)	
2-3 meals per day Gradually increase amount per meal from 2 table spoons to ½ bowl	3 meals per day ½ - 1 bowl per meal	3 meals per day 1 bowl per meal
	1 snack/day	2 snacks/day

Statistical Analysis

All data was entered into EpiData (version 3.1) twice and analysed with SPSS (IBM SPSS Statistics version 20.0.0.2). [25, 26] Before testing for associations between different indicators and LAZ, the data was tested for dependencies, intra-class correlations (ICC), and clustering effects between the different regions (e.g. provinces, districts, and communes). [27] No considerable clustering effects were present in the sample. Heteroscedasticity was precluded as both the Koenker test and the Breusch-Pagan test were not significant. [28]

In order to compare mean LAZ values between different groups (e.g. sex, IYCF indicators achieved vs. not achieved) independent t-tests as well as one-way ANOVAs were performed.

Linear regression models were used for several continuous variables such as age, height/length, education in years, and wealth index, to act as covariates to test their impact on the LAZ score.

Table 4: Scoring System for Child Feeding Index by age group (adjusted by the authors based on Ruel & Menon (2002))

	6 to 8 months	9 to 11 months	12 to 23 months
Breastfeeding	No = 0 Yes = +2	No = 0 Yes = +2	No = 0 Yes = +1
Use of bottle	No = +1 Yes = 0	No = +1 Yes = 0	No = +1 Yes = 0
Dietary Diversity (past 24 hours)	<i>Sum of: (grains/tubers + meat/fish + eggs + legumes + beta-carotene rich foods + other fruits/veg.)</i> 0 = 0 1-3 = +1 4+ = +2	<i>Sum of: (grains/tubers + meat/fish + eggs + legumes + beta-carotene rich foods + other fruits/veg.)</i> 0 = 0 1-3 = +1 4+ = +2	<i>Sum of: (grains/tubers + meat/fish + eggs + legumes + beta-carotene rich foods + other fruits/veg.)</i> 0 = 0 1-3 = +1 4+ = +2
Food frequency (past 7 days)	<i>For egg/fish/meat</i> 0 times in past 7 d = 0 1-3 times in past 7 d = 1 4 times in past 7 d = 2 <i>For staples (grains or tubers)</i> 0-2 times = 0; 3+ times = 1 <i>Food Frequency = sum of scores for staples + egg/fish/meat</i>	<i>For egg/fish/meat</i> 0 times in past 7 d = 0 1-3 times in past 7 d = 1 4 times in past 7 d = 2 <i>For staples (grains or tubers)</i> 0-3 times = 0; 4+ times = 1 <i>Food Frequency = sum of scores for staples + egg/fish/meat</i>	<i>For each of milk and egg/fish/meat</i> 0 times in past 7 d = 0 1-3 times in past 7 d = 1 4 times in past 7 d = 2 <i>Food Frequency = sum of scores for milk + egg/fish/meat</i>
Meal frequency¹ (past 24 hours)	0 meals/d = 0 1 meal/d = 1 2 meals/d = 2	0 meal/d = 0 1-2 meals/d = 1 3+ meals/d = 2	0-1 meal/d = 0 2-3 meals/d = 1 4+ meals/d = 2
Total Score	10 points	10 points	10 points

¹ meal frequency does not include breastmilk feeds or any other liquids and only refers to solid, semi-solid or soft foods received in the past 24 hours.

Correlations between age of the child and the different CFI components for each different CFI age group were explored. In order to determine the magnitude of association of each of the CFI components and LAZ scores bivariate correlations were done stratified by CFI age group. A regression analysis was performed with LAZ as the dependent variable and CFI as the independent variable. In accordance with Ruel & Menon, the following covariates were included in the model: age and sex of the child, age, height, BMI, and education in years of the mother, wealth index, and the number of children below 2 years of age in a household. [8] Besides a linear regression, an additional non-linear regression analysis (quadratic

model) was conducted. A univariate analysis was performed with and without covariates. Estimates of marginal means were calculated for each CFI scoring point. Moderator and mediator models were applied to assess the role of different moderators and mediators on the relationship of CFI and LAZ.

Results

Background Characteristics

Overall, 1,028 household with a child under 2 years of age participated in the survey. For this analysis 225 households were excluded having a child younger than 6 months which resulted in a final sample size of 803 households. The main household and child characteristics are presented in Table 5. The literacy rate of caregivers was low (53%). Unimproved sanitation facilities were common in 82% of the households whereas only 13% had an unprotected source of drinking water. Household diet mainly consisted of a variety of between five to eight food groups (75%). There were no significant correlations between homegarden ownership, wealth and household dietary diversity in the sample. The nearest health facility was within one hour one-way distance for 87% of the households.

In the sample of children, 56% were male (n=447), and 44% were female (n=356). Mean (min, max) age of the children was 14 (6, 24) months. The majority were born in a health facility and/or with attendance of trained health staff (76%) and were fully vaccinated according to the WHO definition (88%). During the two weeks prior to the survey, 69% suffered from fever, 39% from diarrhoea, and 5% from acute respiratory infections (ARI) as expected during the wet season.

Infant and Young Child Feeding Practices

Almost all the 803 children had ever been breastfed (99.8%) and were still breastfed at the time of the survey (82%). Breastfeeding was continued for 93% of 186 children aged 12-15 months. Solid, semi-solid, or soft foods were introduced to 94% of the 163 children between 6-8 months. The diet of all children consisted on average of 3.2 food groups. Overall, MDD was achieved by 44%, MMF by 70%, and MAD by 28%. [13]

Table 5: Selected household characteristics, WHO IYCF indicators and child nutritional status

Characteristics	%	n	N
mean n members per household (min, max)	5.09 (2,13)		803
mean n children < 2 years in household (min, max)	1.03 (1,3)		803
literacy rate respondents (in %)	52.8	424	803
main income sources (in %)			803
agriculture	70.7	568	
employment/salary	14.4	116	
home garden ownership (in %)	70.4	565	803
hh grow vegetables	63.5	510	803
sanitation facilities (in %)			803
improved	18.3	147	
unimproved	81.7	656	
drinking water source (in %)			803
protected	86.6	695	
unprotected	13.4	108	
mean household dietary diversity score (min, max)			803
household dietary diversity (in %)	6.78 (2,12)		
low	10.2	82	
medium	74.5	598	
high	15.3	123	
WHO indicators achieved (in %)			
Minimum Dietary Diversity (MDD)	43.9	352	801
Minimum Meal Frequency (MMF)	69.9	540	773
Minimum Acceptable Diet (MAD)	28.3	226	798
mean child dietary diversity score (min, max)	3.24 (0,7)		798
child's nutritional status			
Mean Length-for-Age Z-Score (min, max)	-1.250 (-5.82, 4.15)		
Prevalence of stunting (< -2 SD LAZ) (in %)	25.1	201	801
Mean Weight-for-Length Z-Score (min, max)	-0.767 (-4.04, 4.54)		
Prevalence of wasting (< -2 SD WLZ) (in %)	9.7	78	802
Mean Weight-for-Age Z-Score (min, max)	-1.216 (-5.44, 2.88)		
Prevalence of underweight (< -2 SD WAZ) (in %)	22.8	183	803

The CFI showed a mean (min, max) score of 6.7 (1, 10) (N= 797) (Table 6). Mean CFI was highest among the 9- to 11-months age group (7.9, N= 169) followed by the 6- to 8-months-olds (7.5, N= 158). Children between 12-23 months of age achieved a mean score of 6.0 (N= 417). Bottle feeding was most prevalent among the 6- to 8-months-olds. Liquids fed in a bottle were mainly water (74%), and infant formula (17%). Breastfeeding showed a decline after 12 months of age. In the two younger age groups diet mainly consisted of three food groups and changed to three or four food groups among the 12- to 23-months-olds. An

analysis of the correlation between the components of the CFI and age showed for children aged 6-8 months that DDS, FFQ, and meal frequency increased significantly by age: $r = 0.256$ ($P < 0.001$), $r = 0.284$ ($P < 0.001$), and $r = 0.325$ ($P < 0.001$), respectively. Among the 12- to 23-months-olds age and DDS, FFQ, and meal frequency correlated significantly but less strong. There were no significant correlations between age and one of the CFI components among the children aged 9-12 months. The number of breastfed children decreased with age ($r = -0.463$, $P < 0.001$) after one year of age.

Table 6: CFI components by CFI-age groups

Component	6 to 8 months (n = 158)	9 to 11 months (n = 169)	12 to 23 months (n = 417)
Breast feeding (in %)	98.8	95.2	71.3
No bottle used (in %)	43.6	39.5	27.3
DDS (in %)			
Low	0-2 groups: 6.1	0-2 groups: 4.7	0-2 groups: 1.5
Medium	3 groups: 73.6	3 groups: 59.2	3 groups: 48.2
High	≥ 4 groups: 20.2	≥ 4 groups: 36.1	≥ 4 groups: 50.3
FFQ			
Minimum Maximum	0 3	0 3	0 4
Median	2	3	2
Mean (SD)	2.08 (1.1)	2.44 (0.9)	1.96 (0.8)
Meal frequency (in %)			
Low	0 meals/d: 6.2	0 meals/d: 3.0	0-1 meal/d: 6.4
Medium	1 meal/d: 11.7	1-2 meals/d: 25.4	2-3 meals/d: 79.8
High	2 meals/d: 82.1	≥ 3 meals/d: 71.6	≥ 4 meals/d: 13.8
CFI			
Minimum Maximum	2 10	2 10	1 10
Median	8	8	6
Mean (SD)	7.52 (1.8)	7.93 (1.6)	5.96 (1.2)

Nutritional Status

Mean (SD) LAZ score was -1.25 (1.14) for all children aged 6-23 months (N= 801), and did not differ significantly by sex. Overall, 25% of the children were stunted showing a HAZ below -2 SD and 4% were severely stunted with a LAZ below -3 SD. Weight-for-age z-scores (WAZ) below -2 SD were recorded for 23% (N= 803). Prevalence of wasting was 10% as shown by weight-for-length z-scores (WLZ) below -2 SD out of which 1.2% were severely wasted (N= 802). Five per cent of children were both, stunted and wasted. Mean LAZ scores decreased by age as shown in Figure 3.

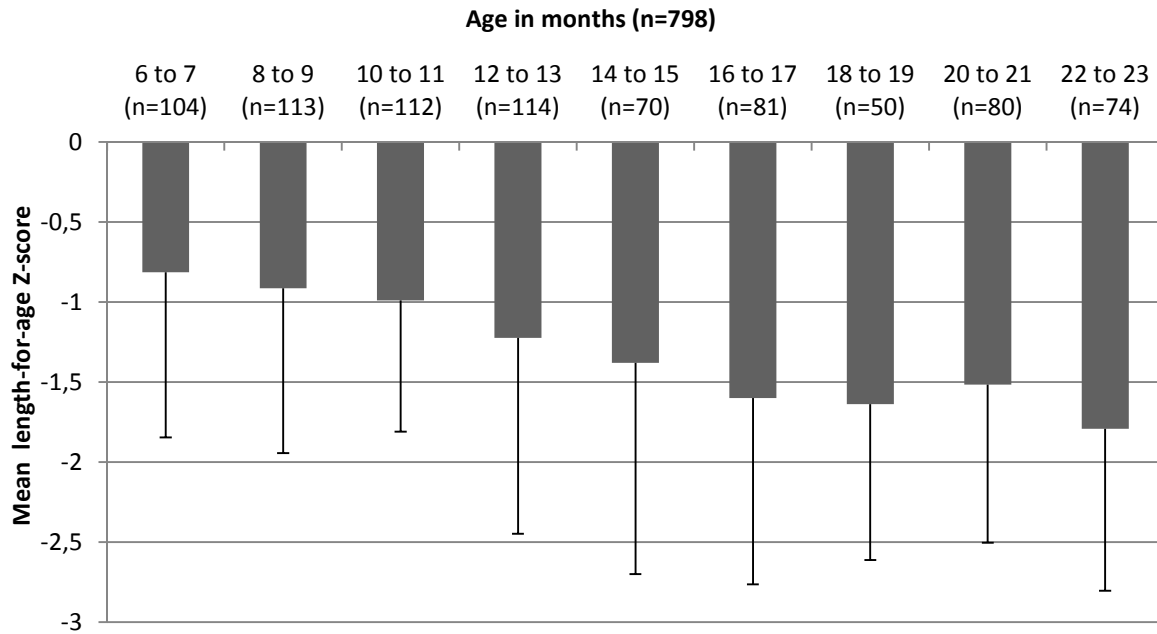


Figure 3: Mean LAZ (SD) per 2-months age group (N= 1026)

Association of LAZ with different indicators

Non-nutritional impact factors on LAZ such as the assistance of a health professional at birth or whether the caregiver ever went to school or not, both showed a weak correlation ($r=0.07$, $P=0.04$; $r=0.07$, $P=0.05$). Also the correlation with household's wealth index was weak ($r=0.06$, $P=0.088$). Stronger correlations were found between LAZ and age of the child ($r=0.28$, $P<0.001$) and maternal height ($r=0.27$, $P<0.001$). Nutritional indicators such as breastfeeding, MDD, MMF, and MAD were either not or weakly correlated with LAZ scores of all children (Table 8) and the correlation remained weak and not significant for different age groups (6-8, 9-11, and 12-23 months).

Table 7: Bivariate correlations between CFI components and LAZ by age group

age group	Breastfeeding		No bottle used		DDS		FFQ		Meal frequency	
	Pearson's R	N	Pearson's R	N	Pearson's R	N	Pearson's R	N	Pearson's R	N
6-23 months	0.189**	799	-0.035	797	-0.038	801	0.136**	801	0.140**	800
6-8 months	-0.019	163	0.048	163	0.097	163	0.189*	163	0.046	162
9-11 months	-0.126	167	0.093	167	0.030	169	0.202**	169	0.032	169
12-23 months	0.003	469	-0.061	467	0.003	469	0.005	469	-0.050	469

*correlation is significant at the 0.05 level (2-tailed).

**correlation is significant at the 0.01 level (2-tailed).

Children with a LAZ score below -2 SD had a lower CFI score (mean (SD)= 6.4 (1.5), N= 198) than children with LAZ scores above -2 SD (mean (SD)= 6.8 (1.8), N= 597). This difference was significant $t(386.6) = 2.95$, $P = 0.003$ with an effect size of $R = 0.181$.

Looking at the single CFI components, breastfeeding ($r = 0.189$, $P < 0.001$), FFQ ($r = 0.136$, $P < 0.001$) and meal frequency ($r = 0.140$, $P < 0.001$) correlated significantly positive with LAZ. As shown in Table 7 the correlation between FFQ and LAZ stratified by age group FFQ was significant for the two age groups below one year only. LAZ of the children aged 12-23 months was not associated with any of the CFI indicators in particular (Table 7).

Table 8: Associations of WHO IYFC indicators and LAZ - results from independent sample t-test

		N	Mean LAZ	SD	SE (Mean)	t (dF)	P	95% CI LAZ Difference
Minimum Dietary Diversity (6-23 months)	yes	351	-1.28	1.05	0.06	0.68 (788.3)	0.49	-0.10, 0.21
	no	448	-1.22	1.20	0.06			
Minimum Meal Frequency (6-23 months)	yes	538	-1.21	1.16	0.05	-1.42 (769)	0.16	-0.30, 0.49
	no	233	-1.34	1.09	0.07			
Minimum Acceptable Diet (6-23 months)	yes	225	-1.21	1.03	0.07	-0.50 (794)	0.62	-0.22, 0.13
	no	571	-1.26	1.18	0.05			

The linear regression model showed a significant positive correlation between CFI and LAZ ($R^2 = 0.035$, $B = 0.123$, $b = 0.187$, $P < 0.01$) without controlling for different confounding factors. After including specific child, maternal, and household characteristics in the model, the correlation between CFI and LAZ became weaker ($R^2 = 0.156$, $B = 0.051$, $b = 0.077$, $P = 0.04$). Maternal height and age of the child were shown to be significant in influencing the association between CFI and LAZ whereas the sex of the child, maternal age, maternal BMI, maternal education, household wealth, and number of children aged 0-23 months in the household were not significantly associated. A regression model with only the two covariates which reached significance, age of the child and maternal height, did not show a stronger association between LAZ and CFI. Since the assumption of linearity was not met, a quadratic model (CFI-sq) was considered more suitable for explaining the data: up to CFI= 4, the mean LAZ levels decrease, equal and above CFI= 5, the mean LAZ levels increase (Figure 4). Two quadratic models with hierarchic regression were applied, one without covariates, one with covariates. Both, CFI and CFI-sq were significantly associated with LAZ without

including covariates in the model ($b_{\text{CFI}} = -0.3$, $b_{\text{CFI-sq}} = 0.03$). After including covariates in the model, CFI and CFI-sq were not significantly associated with LAZ anymore but the model showed a more linear and weaker association ($b_{\text{CFI}} = -0.1$, $b_{\text{CFI-sq}} = 0.01$). Thus for further analyses the CFI was disaggregated into two groups: CFI₁₋₄ and CFI₅₋₁₀.

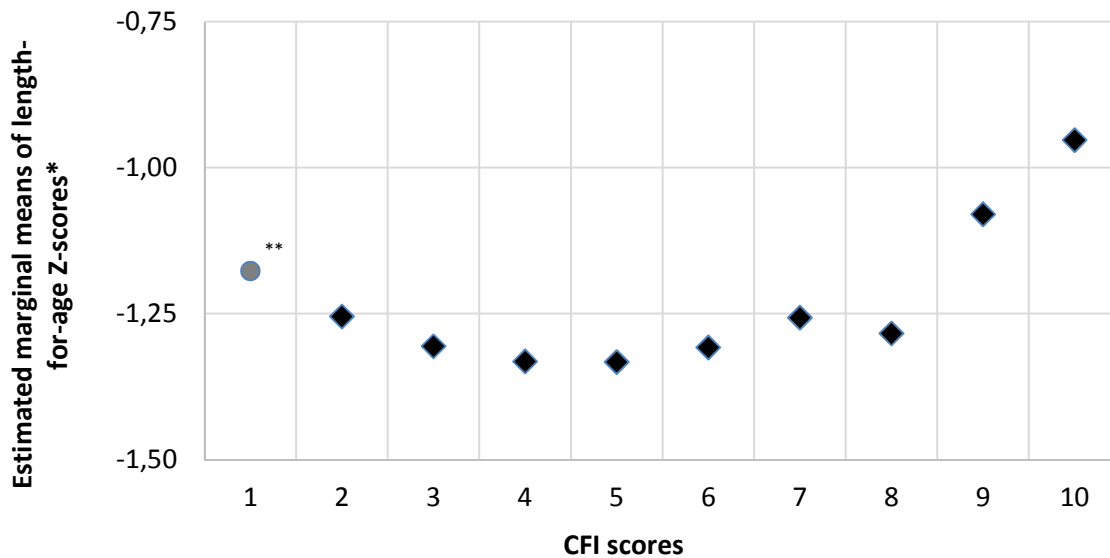


Figure 4: Estimated Marginal Means of LAZ Scores by CFI Scores

Legend of figure 4:

No. of cases: CFI 1 = 1, CFI 2 = 7, CFI 3 = 25, CFI 4 = 35, CFI 5 = 105, CFI 6 = 201, CFI 7 = 189, CFI 8 = 106, CFI 9 = 83, CFI 10 = 45.

* Covariates appearing in the model are evaluated at the following values: CFI, CFI-sq, age (days), household members aged 2 years, education respondent (years of schooling), household's wealth index, age of mother, height (cm) of mother, BMI of mother, sex of child;

** CFI score 1 represents one case only, thus the estimation might be biased.

The relationship between LAZ and CFI was influenced by the age of the child. Results from a moderator analysis showed significant interaction between CFI₅₋₁₀ and LAZ with age as a moderator (Table 9). The conditional effect of a CFI between 5-10 on LAZ at values of age as moderator shows that CFI₅₋₁₀ has a significant positive effect (effect= 0.09, $P = 0.02$) on LAZ under the condition that children's age is the mean of age -1 SD (1 SD= 157 days). At mean age and older (mean age + 1 SD), the effect becomes non-significant and even negative for the eldest age group (effect= -0.04).

Table 9: Linear model of predictors of LAZ disaggregated into CFI₁₋₄ and CFI₅₋₁₀

CFI		b	SE B	t	P
1 to 4 (N=67)	Constant	-4.64	3.98	-1.17	0.25
	age (in days)	-0.0001	0.0008	-0.16	0.87
	CFI	-0.45	0.18	-2.49	0.02
	age (in days) x CFI	0.0004	0.0013	0.33	0.75
5 to 10 (N=696)	Constant	-10.05	1.13	-8.89	0.000
	age (in days)	-0.002	0.0003	-6.52	0.000
	CFI	0.03	0.03	0.76	0.45
	age (in days) x CFI	-0.0004	0.0002	-1.99	0.05

Wealth had a small effect on HAZ through the CFI₁₋₄ as mediator ($b = -0.016$, $SE(b) = 0.013$, 95% CI (b) $[-0.052, 0.002]$, $\kappa^2 = 0.048$). The effect decreased for CFI₅₋₁₀: $b = 0.007$, $SE(b) = 0.0031$, 95% CI (b) $[0.002, 0.014]$, $\kappa^2 = 0.020$. [29]

Discussion

In this study, a combination of indicators for young child feeding reflected in the CFI as suggested by Ruel & Menon [8] was found significantly associated with LAZ. The more recommended criteria were met by the caregivers, the more likely the 6- to 23-months-olds achieved age-appropriate length. In contrast, the caregiver's practices assessed with the WHO IYCF indicators did not explain the observed decrease of LAZ by age. Other variables known to impact on LAZ such as household's socio-economic status, access to improved sanitation facilities, and maternal height were not associated with LAZ. [5, 30, 31]

However, if stratified by age group the association between CFI and LAZ was significant only for children younger than one year. The older the children, the less a CFI score above 5 had an impact on LAZ. This result supports findings from a prospective open-cohort study from Bork *et al.* who also described a decrease of LAZ with age. [11] Their sample from Senegal showed strong positive associations among children 6-12 months only ($P < 0.001$). Adjustments for wealth, maternal height, education, and occupation, did not change their results which conform partly to our findings where wealth, maternal education and occupation did also not significantly influence the relationship between CFI and LAZ. [11] Another study from Shanghai found a slightly different CFI also not being significantly associated with LAZ for 10-14 months old children. [23]

The association between LAZ and CFI had been investigated in several studies with different sample sizes and indicators used for CFI: whereas Ruel & Menon in Latin America (2002),

Sawadogo *et al.* in Burkina Faso (2006), and Ma *et al.* in Shanghai (2012) described strong correlations between LAZ and a CFI, Bork *et al.* in Senegal (2012) and the data of this study proved the association only in younger children. [8, 11, 23, 24]

The highest breastfeeding rates in this Cambodian study population were found among the 6- to 8-months-olds, a subgroup in which the use of bottles is highly prevalent, too. Those figures are concordant with the latest CDHS reporting 82% of the 6- to 8-months-olds still being breastfed and 27% of the same age group being bottle fed. [15] In this study, the 12-23 months old children had a lower CFI score than infants mainly due to low FFQ and low breastfeeding rates. This age group also showed the lowest mean LAZ score (-1.496). This contradicts Arimond's & Ruel's general conclusion of a strong positive association between LAZ levels and dietary diversity. [32] In this Cambodian sample LAZ scores were not influenced by dietary diversity over all age groups whereas LAZ scores increased with higher food frequency particularly in children aged 6-11 months.

In rural Cambodia, where knowledge of adequate complementary feeding practices is low, children do not receive an age-appropriate diet, aside from the practice of exclusive breastfeeding of children under six months of age. Main reasons of poor complementary feeding practices for children from 6 months of age onwards are poor quality of the meal, especially low energy and nutrient density as well as an inadequate feeding frequency.

Just as complementary feeding practices have a wide range of characteristics and measurement approaches, stunting, as a sign of chronic undernutrition, has various causes that cannot be addressed by the assessment of complementary feeding practices only. Stunting is found to be more prevalent among children under two years of age as a possible result of an interaction of intrauterine growth retardation, suboptimal breastfeeding practices, micronutrient deficiencies, reduced energy intake, infections, and – more general – poverty, food insecurity, insufficient health care, and access to sanitation facilities. [1]

However, in this study no significant association between LAZ and breastfeeding practices, poverty, or access to sanitation facilities could be shown. The relationship between household wealth and LAZ was less strong compared to the findings of Hong & Mishra who analysed CDHS data concluding that children in comparatively poorer households are at much greater risk of suffering from chronic undernutrition than children from wealthier

households. [18] For Cambodia, Ikeda *et al.* described a strong influence of increasing household wealth on stunting over the past 10 years. [16] Furthermore, improvements in sanitation facilities as well as paternal and maternal education, a lower number of household members, higher maternal BMI, and lower incidence of diarrhoea contributed to lowering the stunting prevalence among children less than five years of age. [16] Access to improved sanitation facilities - and probably subsequent lower diarrhoea incidence - impact on child's LAZ scores as a study in India has shown. [33] Hong & Mishra also found a lack of sanitation facilities to be associated with stunting in Cambodia, where stunting rates are higher in rural areas. [18] The effect of higher maternal education on a lower prevalence of stunting demonstrated by Marriott *et al.* could not be confirmed by our results which might be due to the homogeneity of our sample. [10]

Different causes for stunting than those reflected in the CFI must be considered. Especially, the negative correlation between CFI and LAZ among those children of any age between birth and 24 months achieving CFI scores below 4 suggests other not registered causes.

In Cambodia diversity of complementary foods for infants is usually low. The predominant porridge is made from rice and water and has a low nutritional value. Most of the children received fish and vegetables from 12 months of age onwards. [34] Jones *et al.* propose to include different indicators on quality of food, safety, and the feeding behaviour in the analysis of child feeding practices. [35] Another conclusion could be that changes in feeding practices only influence LAZ from above a certain minimum level as there was no difference in feeding less than three different food groups.

The history of breastfeeding and its impact on LAZ should also be taken into account. Results from a cross-sectional study from Malawi showed the significant positive impact of exclusive breastfeeding on growth. [36] In Cambodia with much higher exclusive breastfeeding rates, the initiation of breastfeeding as well as the place of delivery may be relevant for the subsequent child feeding pattern. The latter especially offers access to information on IYCF practices.

A different young child feeding index was used in a study from India. [37] Their index consisted of the age when solid, semi-solid, and soft foods were introduced, the minimum amount per meal, and active feeding practices as well as consistency and safety of food in

addition to breastfeeding, bottle feeding, meal and food frequency as well as dietary diversity. This resulted in a significantly higher score in well-nourished than in undernourished children aged 6-23 months as presented in this study for stunted vs. not stunted children.

Further research is needed to also investigate the seasonal differences of child feeding and its impact on the child's nutritional status. As the effect of breastfeeding on the development of a child, has been well demonstrated, the aspect whether the child was exclusively breastfed before starting complementary feeding at 6 months of age also needs to be reflected. Thus the general variable 'breastfeeding' should be differentiated by including the time when breastfeeding is initiated and the use of pre-lacteal/early supplementary feeds.

Conclusion

The objective of this study was to analyse the relationship between IYCF practices and LAZ scores in rural Cambodia. Findings demonstrated that the age of the child and maternal height were significantly associated with LAZ scores. The WHO IYCF indicators did neither show any strong nor significant association with LAZ. The composite CFI was weakly associated with LAZ scores of children aged 6-23 months. Statistical significance could be demonstrated among the younger children only. The correlation between CFI and LAZ, however, was unexpectedly negative from CFI 1-4 and became positive for CFI 5 and higher, suggesting a lack of relevance of differentiation of CFI below 5. Overall, the CFI was therefore considered to be more useful to explain the link between IYCF practices and growth retardation in this sample than the more simple WHO IYCF indicators.

However, although this study revealed associations between a composite CFI and LAZ in infants and young children more research is required for an assessment of IYCF practices with regard to nutrition education. Even where local resources allow for adequate infant and young child feeding, nutritional knowledge and abilities of mothers are crucial for improving the nutritional status of the children.

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Ethics approval The study was approved by the Institutional Review Board of Justus Liebig University and the National Ethics Committee for Health Research in Cambodia, and registered at the German Clinical Trials Register (no. DRKS00004379).

Contributors AR assessed, analysed and interpreted the data. She drafted the manuscript with the contribution of MK and I J who designed the overall study. JH proofed the data analysis and contributed to the manuscript. JK assisted during data collection and contributed to the manuscript. EM advised the research team on the study design and contributed to the development of the questionnaire as well as the manuscript. OK was the national principal investigator in Cambodia; MK was the principal investigator of the overall IMCF study.

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Conflicts of interest None.

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3 One-year nutrition education intervention improves dietary diversity but not stunting among children aged 6 to 23 months in rural Cambodia

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Submitted

Abstract

Poor infant and young child feeding (IYCF) practices are major determinants of chronic malnutrition. The main objective of this study was to assess the impact of a nutrition education (NE) program aimed at promoting improved IYCF behaviors in combination with an agriculture intervention on children's dietary diversity and nutritional status.

From 2012 to 2014, a cluster randomized trial was rolled out in 2 provinces in Cambodia in the context of an agriculture and nutrition project of the Food and Agriculture Organization (FAO) of the United Nations. The cross-sectional baseline was carried out in 16 pre-selected communes in 2012. Restricted randomization selected the communes into intervention (NE and agriculture intervention) and comparison (agriculture intervention only). The impact survey was conducted as census in all FAO project villages in 2014. Caregivers of children aged 0-23 months were interviewed using standardized questions on socio-economic status and dietary diversity (24-hr recall). Anthropometric measurements were taken. A difference-in-differences (DiD) model was applied.

Overall, 1,028 households were interviewed at baseline, 1,176 at impact. After one year of NE, 62% of the intervention households reported to have participated in the NE. Estimated mean child dietary diversity was significantly different at impact between comparison and intervention (3.6 and 3.9, respectively). In particular the consumption of beta-carotene rich foods and other fruits and vegetables increased. No treatment effects on HAZ could be shown.

NE led to improvements in children's diets. For effects on growth it is assumed that longer NE activities are required to achieve sustainable behavior change of age-appropriate infant feeding.

Introduction

Poor knowledge of infant and young child feeding (IYCF) practices in addition to household food insecurity is a major determinant of chronic malnutrition among children aged 6-23 months. In this age group, often referred to as the 'critical window', the timeliness of the introduction, quality, quantity, and appropriateness of complementary food are crucial to ensure adequate growth and motor, and mental development. [1, 2] However, to date, the prevalence of chronic malnutrition reflected in stunted growth globally remains high, with 162 million children under 5 years of age affected. [3] Predictors to be addressed vary by

country and context but have the improvement of complementary feeding practices in common. [1, 4] Community-based nutrition education interventions are potential solutions to improve caregiver's complementary feeding practices by increasing knowledge of age-appropriate diets as well as caring and feeding practices. Through raised awareness, changes in behavior can be expected and with improved quality of infant's diets, adequate growth could be achieved. [4, 5] Even in food secure populations, lack of knowledge of appropriate IYCF practices may lead to inadequate nutritional intakes and thus, negatively impact the infant's health and development. [5]

Food insecurity can be a major constraint for caregivers to make use of gained IYCF knowledge as the availability, affordability, and utilization of food in a household is directly linked to the diets of its members including young children. [6, 7] Combined nutrition education and agricultural interventions could address not only poor IYCF knowledge and practices, but also household food insecurity. In fact the number of such programs implemented globally increased in recent years and more efforts are drawn towards linking nutrition and agriculture.

Stunting prevalence among children aged 0-23 months in Cambodia was 22% in 2014 showing a slight decrease in comparison to 2010 where 26% of all children under 2 had a HAZ score of -2 SD. [8, 9] The demand for options for sustainably improving IYCF practices to further reduce stunting prevalence has been addressed by a number of programs in Cambodia, but evidence for the determination of best practices remains limited.

Hence, the main objective of this study was to assess the impact of a nutrition education program aimed at promoting improved IYCF practices by combining agricultural interventions with training interventions on child feeding. A unique aspect of this study was the separation of the implementation of nutrition education interventions under the responsibility of a project of the Food and Agriculture Organization of the United Nations (FAO) and the research performed by an independent research team from Justus Liebig University Giessen.

Study design and methods

From 2012 to 2014, a cluster randomized controlled trial was rolled out in Preah Vihear and Oddar Meanchey provinces in Northern Cambodia in the context of a food security and

nutrition project of the FAO. The FAO project “Improving market linkages for smallholder farmers (MALIS)” included a component of nutrition education on infant and young child feeding linked with components directed towards improved farming systems and building up market linkages. The overall aim of MALIS was to increase and diversify production and improve food security amongst smallholder farmers. Working closely with the respective provincial departments of the Ministries of Agriculture, Forestry, and Fisheries, Women’s Affairs, and Health, as well as with NGOs, the project selected a total of 16 communes in Preah Vihear and Oddar Meanchey. FAO conducted training of trainers in conjunction with government staff prior to any field activities. The agriculture component started in implementation in late 2012 and comprised farmer field schools (FFS), farmer business schools (FBS), and the provision of input credit, mainly through agricultural fairs. The nutrition education component started in August 2013 in intervention villages where FFS and FBS had already been rolled out. Caregivers with a child aged 5-18 months were recruited based on their interest in participating; priority was given to caregiver-child pairs from households already participating in a FFS or FBS.

Agricultural Interventions

FAO worked through existing farmer groups and recruited participants based on their interest in participating in either a FFS on rice, chicken, vegetables, or cash crop production. The topic varied by location following the farmers’ needs and interests. Households were eligible to participate if they had access to land. Each FFS curriculum included a field day and sessions on family nutrition. After one round of FFS was concluded, the group was given the opportunity to continue with one of the other four topics. FBS aimed to link farmers to each other and to local markets and were primarily offered to former FFS participants. In some villages, however, FBS were offered instead before or in addition to FFS when the group’s interest and capacity was considered appropriate. Agricultural fairs were conducted in May/June 2014 and farmers from FFS, FBS, and other farmer cooperatives from the 6 districts were invited. Each farmer was given a voucher to purchase items for their farm (fertilizer, seeds, tools, etc.) or kitchen equipment. The farmers were obliged to pay back 60% of the value of the voucher to the cooperative after receiving income from harvest.

Nutrition education

Trained community nutrition promoters (CNP) together with local NGOs conducted 7 nutrition education sessions of 2 to 4 hours weekly or biweekly depending on the availability of the participants.

A public announcement in each FFS/FBS village in the intervention group called for interested caregivers with children between 5-18 months of age. In each village a group of 15 caregiver-child pairs were selected for nutrition education sessions. National nutrition education materials were used developed by the National Nutrition Program and UNICEF in Cambodia in 2012 (Baby-Friendly Community Initiative (BFCl) flipchart). These are part of the nationwide behavior change communication strategies that have been implemented to promote appropriate complementary feeding practices. [10]

In addition, nutrition education posters were developed by the FAO-nutrition team in MALIS itself for use by the trainers and handed out to the mothers as a reference and to help with the dissemination of the information. The topics of the posters were recipes, age-appropriate feeding, sanitation and hygiene, food preparation, and a seasonal food availability calendar. Also, a facilitator's guide for CNPs was developed by the implementing project based on Trials of Improved Practices (TIPs) results which were conducted during the previous FAO project in the same region. The guide assisted CNPs to structure the specific content selected for the 7 sessions. The content of the sessions comprised 8 key messages: continued breastfeeding, introduction of complementary foods, consistency of complementary foods, dietary diversity, feeding a sick child, responsive feeding, family nutrition, and hygiene practices (table 10). Three TIPs based cooking demonstrations were conducted at sessions 3, 4, and 5. Materials such as educational posters, soap, and kitchen equipment were provided. In addition, two sharing meetings enhanced the exchange of experience, questions, barriers, motivational factors between participants and trainers. CNPs had additional sharing meetings with the other facilitators. The research team closely monitored the trainings, but at no point actively influenced the implementing MALIS project's design and process.

Table 10: Content of nutrition education sessions

N	Key messages	Content
1	Awareness of IYCF Food safety, hygiene practices	<ul style="list-style-type: none"> • Introduction • Before cooking : Wash your hands with clean water and soap ; wash foods with clean water ; wash knife and cutting surface • Cover food and store utensils in clean place • Before eating : Wash your hands and baby's hands with clean water and soap • Wash your hands with clean water and soap after using the toilet or cleaning the baby's bottom
2	Continued breastfeeding, dietary diversity, food for lactating mothers	<ul style="list-style-type: none"> • Breastfeed your child on demand in addition to giving complementary foods • Continue to breastfeed your child until he/she is 2 years of age or older • From the age of 6 months, feed your child enriched <i>borbor</i>² made with meat or fish or egg or beans and vegetables • Give your child fruit such as banana or mango or other soft fruits • A lactating mother should be eating 4 meals/day to be healthy and produce breast milk • A mother should regularly go to the health center for check-ups • In the health center, mothers will get vitamin A capsules, iron/folate tablets • If you live in a zone with malaria, make sure you and your baby sleep under insecticide-treated bed net to prevent malaria
3	Dietary diversity, consistency	<ul style="list-style-type: none"> • Feed your child animal source foods such as fish or meat or egg or bean every day • Feed your child vegetables every day • Feed your child with a separate bowl and spoon
Sharing meeting		
4	Dietary diversity, consistency, responsive feeding	<ul style="list-style-type: none"> • Peanuts provide energy and fat and are part of the body-building foods and will help children grow strong • Eggs are part of the body-building foods and can be used when preparing enriched <i>borbor</i>² for your child • Make mealtimes a relaxed and happy time for the child, i.e. clap your hands, make funny faces, demonstrate opening your own mouth very wide, say encouraging words • Feed slowly and patiently, encourage your child to eat but do not force them
5	Quantity (age-appropriate), dietary diversity	<ul style="list-style-type: none"> • Gradually increase the quantity and frequency of complementary foods as your child grows older • Feed your baby ripe fruits for snacks such as banana, papaya, and mango
Sharing meeting		
6	Having a separate bowl for the child, feeding a sick child	<ul style="list-style-type: none"> • If the baby has diarrhea or is vomiting, he/she should be taken to the health center or hospital immediately to get medication like oral rehydration solution • A sick child should be given more fluids and food: breastfeed more, give more frequently thick <i>borbor</i>², coconut water, and plain clean water • Because the child is not feeling well, it is important to feed the child with patience and encourage him/her to eat by talking to him and helping him/her to eat
7	Review of key messages, Graduation	

1 produced by the National Nutrition Program and UNICEF

2 *borbor* is the Khmer word for porridge which is traditionally made with rice

Baseline survey

A baseline survey was carried out in the MALIS project communes in 2012. All 16 communes from six districts were included. About 17,650 possible MALIS beneficiaries lived in the area. Only farm households with children aged 0–23 months were enrolled in the survey. Other inclusion criteria required being resident in the sampled area, being randomly selected, and willingness to participate. Informed consent was obtained from each caregiver prior to data collection.

The sample size at baseline was determined using Emergency Nutrition Assessment (ENA) for Smart sample-size calculator. [11] A population size of 15,000 children under 2 years of age was considered as living in the survey area, 50% of stunting (primary indicator), a desired precision of $\pm 5\%$ and a design effect of 3, the sample size calculated resulted in 1,124 children. The sampling was conducted using a two-stage probability sampling strategy. Initially, three villages per community were sampled proportional to population size. At the second sampling stage, 23 households with children aged 0–23 months were randomly selected in each village where more than 23 children in this age range lived in the selected village. If there were exactly 23 children all caregiver–child pairs were asked to participate. If the village had fewer than 23 suitable children, eligible households were selected at random in the nearest adjacent village to complete the required sample size. A total of 1,032 households were interviewed. Out of 1,032 datasets one child was excluded due to different age and three children were excluded being twins with the child code 2. In total, 1,028 households with a child between 0 and 731 days from 49 villages were eligible for further data analysis.

Randomization of intervention and comparison clusters

Restricted randomization divided the communes (clusters) into 10 intervention and 5 comparison communes accounting for height-for-age Z-scores (HAZ), maternal education, household wealth, and child dietary diversity. Characteristics of the study groups were defined as follows:

- *Intervention:* Households in the intervention area that had access to FFS/FBS training and additional nutrition education by the MALIS project fulfilled eligibility criteria (e.g. having access to land or having a child aged 5-18 months) as described above. If possible, beneficiaries received both, FFS/FBS training and nutrition education.

- *Comparison:* Households in the comparison area had access to FFS/FBS training only. No MALIS nutrition education was offered. However, as this is applied research, the research team had no influence on whether nutrition education was carried out by other projects or within other programs in the project's comparison area. Thus, households may have had access to information on IYCF messages and cooking demonstrations carried out by health center staff and NGOs also using government materials. As far as possible, these activities were mapped and each household's participation was assessed. Contradictory messages could be excluded. None of the other observed projects used a participatory village group-teaching approach.

Impact survey

Two years after the baseline an impact survey was conducted in the format of a census in all MALIS project villages targeted since 2012. This resulted in a total of 46 villages (32 villages in the intervention and 14 in the comparison area). Information on children less than 2 years of age was obtained from each village in close collaboration with village chiefs and community health workers. An estimated number of 1,172 children under 2 years were eligible for the impact survey. Due to absence or different age of the child, 1,076 caregiver-child-pairs finally participated.

For the analyses in this study, only children in the complementary feeding age of 6-23 months were considered as the study focused on the impact of the nutrition education on dietary diversity. The final sample sizes comprised 743 caregiver-child-pairs at baseline and 921 at impact.

Data collection procedure in the field

Data collection at baseline and impact followed a similar procedure. In each village, the selected primary caregivers with their children were invited to a central meeting point for participating in the survey. The children's ages were verified at this point by cross-checking the birth dates indicated on village lists with the vaccination cards or birth certificates. If there was no information on the child's age, the age was estimated using a local events calendar and later dated to the 15th of the named month.

Semi-structured questionnaires, which included a household, child, and caregiver section, were administered in face-to-face interviews with the primary caregiver of the under 2-year-old child in the selected household. Data collected included socio-economic and

demographic information on the household, as well as household and child dietary diversity (HDDS, CDDS) based on 24-hour recall, and child's 7-day food frequency. Also, feeding and caring practices including hygiene were assessed. In addition, episodes of fever, diarrhea, and acute respiratory infections (ARI) as perceived by the caregiver were recorded for the two weeks preceding the interview. All data collection tools were pre-tested in the field. Quality control of the data collection was conducted regularly. At impact, enumerators were blind to group assignment.

Anthropometry

Anthropometric measurements were taken from the mother and child with standardized equipment from Seca (Seca GmbH & Co. KG, Hamburg, Germany): digital flat weighing scales with mother/child function (Seca 874, capacity 200 kg, SECA, Germany; kg to two decimal points), lengthboards (Seca 417, measurement range 10–100 cm, SECA, Germany), and stadiometers (Seca 213, measuring range 20–205 cm, SECA, Germany). Mothers' heights and weights were collected as well as the children's lengths and weights following a standardized protocol. Height/length and weight were assessed to the nearest 0.1 cm and 0.1 kg, respectively. [12] All measurements were taken twice. The maximum tolerated difference between the two measurements was 1.0 cm for height/length and 0.5 kg for weight at baseline; 0.7 cm for height/length and 0.15 kg at impact. [12, 13] The mean of both measurements was used for the final analysis. Height-for-age Z-scores (HAZ), weight-for-age Z-scores (WAZ), and weight-for-height Z-scores (WHZ) were created using SPSS Macro (adopted) from WHO. [14]

Wealth index

Socio-economic data was used to develop an adapted local wealth index based on the results of a principal component analysis. Variables included in the wealth index were: housing, people per sleeping room, floor composition, type of sanitation, and drinking water source; also ownership of land and certain assets (e.g. radio, television, mobile and non-mobile phone, wardrobe, sewing machine or loom, CD/DVD player, generator/battery/solar panel, watch, bicycle, motorcycle, motorcycle-cart, car/truck/van, boat, ox-/horse-cart and hand-tractor) were considered. [15, 16] For this analysis a wealth index, created together for baseline and impact, was used.

Indicators for infant and young child feeding

Feeding practices were assessed using the following WHO IYCF indicators for children aged 6–23 months: continued breastfeeding, introduction of solid, semi-solid, and soft foods, minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum acceptable diet (MAD). [17, 18] These indicators look at the percentage of children meeting the recommended criteria. Child dietary diversity (CDDS) was calculated using a 7-food-group score reflecting the consumption of seven different food groups in the past 24 hours: cereals, legumes, milk and milk products, meat and fish, eggs, beta-carotene rich foods (yellow and orange flesh roots and tubers, orange flesh fruits, and dark green leafy vegetables), and other fruits and vegetables. [18] This score only assesses whether or not the child had eaten food from a certain food group, not the quantity consumed. In addition, food consumption in the past seven days was determined by a food frequency questionnaire. A child feeding index was created assessing five different IYCF components compiled in one index adjusted for child's age: continued breastfeeding, no bottle feeding, dietary diversity, meal frequency, and food frequency. [19]

Statistical analysis

Double entry of all data was performed using EpiData (version 3.1). Analyses were done with SPSS (IBM, SPSS Statistics version 20.0.0.2). Before testing for associations between different indicators, data were tested for intra-class correlations. Potential village clustering was determined and proved not to be informative. Pearson's correlation and independent sample t-tests were used to determine differences between groups. To take differences at baseline into account, as well as the impact of other NE programs on both groups, difference-in-differences (DiD) models were applied using linear regression. [20] Dependent variables were either CDDS or single food groups or HAZ. Age of child, maternal education, and household wealth were included as covariates in all models, maternal height and sex of the child only in the analysis with HAZ. All covariates were grand mean centered beforehand. Associations between HAZ and CDDS were assessed using partial correlation with and without control variables. Linear probability models with robust standard errors [21] were calculated to determine differences of particular food groups. In SPSS the heteroscedasticity-consistent standard error estimators (HCSE) procedure by Hayes & Cai was used. [22]

Results

A total of 1,664 datasets were used for analysis consisting of 743 and 921 caregiver-child-pairs from baseline and impact survey, respectively. Children's age ranged from 6- 23 months with a mean (\pm SD) age of 13.5 (\pm 5.2) months at baseline and 14.2 (\pm 5.2) months at impact. Main household and child characteristics are presented in table 11.

Between baseline and impact, the ownership of homegardens and animals decreased in both groups. The majority of households had access to arable land with a mean size increasing towards impact, ranging from 1.7 to 2.3 hectares at baseline and 2.4 to 2.5 hectares at impact. The access to improved sanitation facilities was higher at impact compared to baseline in both groups. Average maternal education was higher and households had a more diverse diet at impact in both groups in comparison to baseline.

The number of children receiving a vitamin A-supplement and deworming tablets was lower at impact than at baseline. Prevalence of diarrhea decreased in both groups between baseline and impact.

Table 11a: Main household characteristics

Indicator	Baseline		Impact	
	Comparison (n=233)	Intervention (n=510)	Comparison (n=397)	Intervention (n=524)
Household (HH)				
% Access to arable land	89.7	93.5	91.7	94.5
Mean (\pm SD) size of arable land in hec	1.72 (1.33)	2.26 (2.03)	2.36 (5.21)	2.48 (2.81)
% Homegarden	76.0	67.5	56.4	58.8
% Access to fruits	86.7	81.4	87.9	88.9
% Ownership of animals	88.4	92.5	83.1	91.6
% Access to improved sanitation facilities	19.7	19.0	28.5	27.1
% Access to protected source of drinking water	85.8	87.6	88.4	86.3
Mean (\pm SD) years education				
Respondent	3.4 (3.1)	3.5 (3.1)	4.4 (3.5)	4.3 (3.5)
HH head (if not respondent)	4.0 (3.9)	4.3 (3.7)	5.3 (3.9)	4.5 (3.9)
Mean (\pm SD) HH dietary diversity score (min-max: 2-12)	7.0 (1.6)	6.8 (1.7)	7.6 (1.7)	7.8 (1.7)
Mean (\pm SD) Wealth Index score	-0.6 (2.8)	-0.6 (3.1)	0.5 (3.3)	0.5 (3.2)
Wealth Index Quintiles				
% Lowest	25.0	29.2	14.1	13.7
% Second	20.7	16.1	20.4	21.2
% Middle	22.0	20.8	20.4	19.3
% Fourth	19.4	19.2	21.7	19.8
% Highest	12.9	14.7	23.4	26.0

Table 11b: Main child characteristics

Indicator	Baseline		Impact	
	Comparison (n=233)	Intervention (n=510)	Comparison (n=397)	Intervention (n=524)
Child				
Mean (\pm SD) Age in months	13.8 (5.3)	13.5 (5.1)	14.4 (5.4)	14.1 (5.2)
% Sex (female)	48.5	43.1	46.9	49.0
% Delivery by professional health staff	82.0	76.7	94.4	91.0
% Vitamin A supplement (past 6 mo)	83.6	83.2	62.4	59.1
% Deworming tablet (past 6 mo)	47.4	40.4	34.0	30.9
Illness past 2 weeks (as perceived by respondent)				
% Fever	69.1	67.1	76.8	71.2
% Diarrhea	41.6	36.9	26.2	27.9
% ARI	22.0	17.3	27.2	22.3
WHO indicators (in % achieved)				
% Intro. of semi/semi-solid/soft foods (6-8 mo)	95.9 (n 49)	91.7 (n 96)	92.6 (n 68)	88.1 (n 84)
% Continued breastfeeding (12-15 mo)	92.2 (n 51)	92.6 (n 122)	85.5 (n 76)	89.1 (n 117)
% Continued breastfeeding (20-23 mo)	44.9 (n 49)	50.0 (n 96)	34.3 (n 99)	31.9 (n 116)
% Minimum Dietary Diversity (MDD) (6-23 mo)	50.2(n 233)	44.3 (n 508)	55.9(n 398)	64.9 (n 524)
% Minimum Meal Frequency (MMF) (6-23 mo)	69.0(n 232)	66.5 (n 508)	83.4(n 398)	86.4 (n 523)
% Minimum Acceptable Diet (MAD) (6-23 mo)	33.2(n 232)	27.2 (n 508)	36.2(n 398)	45.5 (n 523)
Mean (\pm SD) Child feeding index (min-max: 0-10)	6.8 (1.6)	6.7 (1.7)	7.2 (1.7)	7.3 (1.6)
Nutritional status				
Mean (\pm SD) height-for-age Z-scores	-1.24 (1.03)	-1.27 (1.17)	-1.27 (1.09)	-1.33 (1.09)
Mean (\pm SD) weight-for-height Z-scores	-0.75 (1.01)	-0.77 (1.04)	-0.63 (0.98)	-0.63 (0.99)
Mean (\pm SD) weight-for-age Z-scores	-1.19 (0.99)	-1.23 (1.08)	-1.13 (0.97)	-1.15 (0.99)

Coverage of FAO project

Overall, 79% of the intervention group and 25% of the comparison group stated that they had participated in any kind of nutrition education program offered in the project region. Participation in the FAO nutrition education was assessed by confirming the presence of FAO educational posters in the respondent's house, proving that 70% of the households in the intervention area had actually participated in the 12 months prior to the survey. Participation in a FFS or FBS was 36% in the intervention and 22% in the comparison group at the time of the survey. The overlap between FAO agriculture intervention and nutrition education was 30% in the intervention group.

Infant and young child feeding

Continued breastfeeding at 12-15 months and 20-23 months decreased in both groups (table 11b). In contrast, a higher number of children achieved MDD, MMF, and MAD in both

groups at impact. The consumption of all food groups increased in the intervention group, whereas the consumption of beta-carotene rich foods and ASF decreased in the comparison group (table 12).

Table 12: Descriptive characteristics of food consumption (24-hr recall)

Food group (% of children aged 6-23 mo consumed)	Baseline		Impact	
	Comparison (N=233)	Intervention (N=508)	Comparison (N=397)	Intervention (N=524)
cereals, grains, white tubers*	97.4	95.3	96.5	97.5
flesh and organ meat, fish*	79.4	73.9	76.3	77.7
other fruits & vegetables*	56.7	48.2	57.9	65.1
beta-carotene rich foods*	51.1	43.3	47.6	55.7
eggs*	29.6	32.7	36.0	46.0
legumes, nuts, seeds*	21.9	16.3	34.0	35.1
milk*	8.6	11.6	21.9	16.4
ASF	82.8	81.8	82.6	89.5
dark green leafy vegetables	41.2	29.4	37.5	46.2
beta-carotene rich roots and tubers	24.0	23.1	20.4	38.2
beta-carotene rich fruits	6.0	4.9	6.3	7.1
fat, oil	40.8	33.3	57.4	58.8
sugary foods and crisps	60.1	58.4	75.8	70.2
Mean (\pm SD) CDDS (0-7)	3.5 (1.6)	3.2 (1.5)	3.7 (1.5)	3.9 (1.5)

*one out of seven food groups the CDDS consists of.

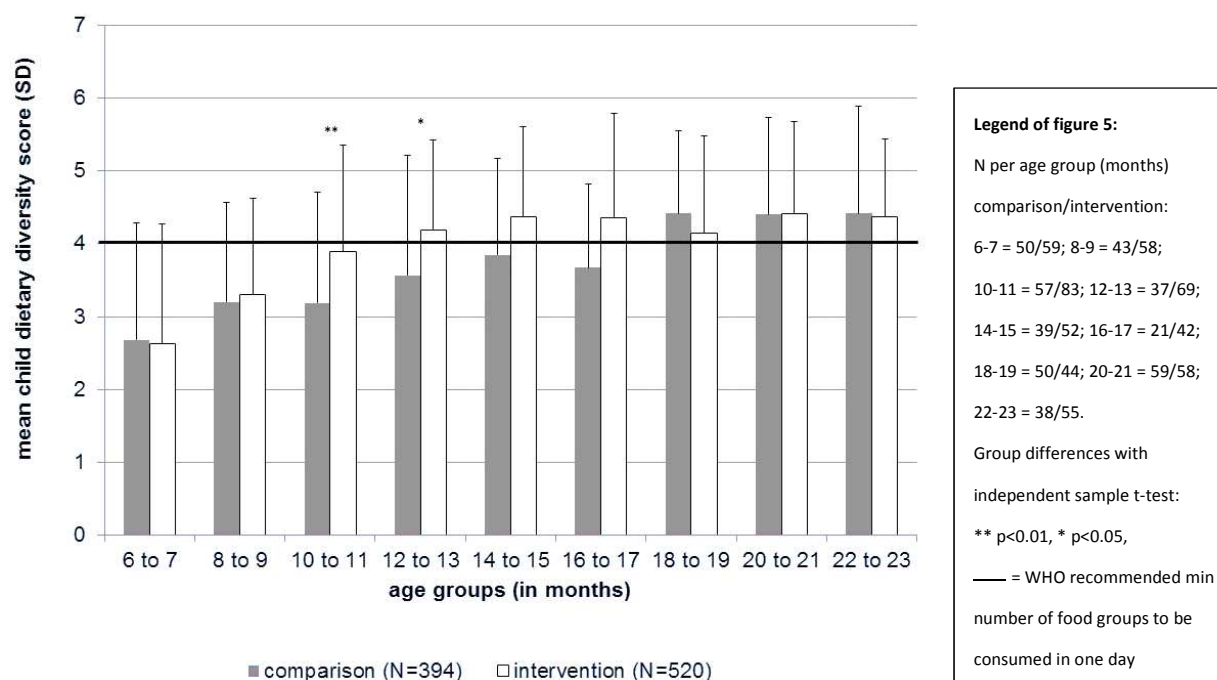


Figure 5: Mean child dietary diversity scores (+1 SD) of children in the intervention and comparison group by 2-months age groups

Overall consumption of ASF and sugary foods and snacks was high. CDDS increased by 0.2 score points in the comparison and 0.6 in the intervention group. Mean CDDS increased with age in both groups (figure 5). From 10 to 18 months of age children in the intervention group showed higher mean CDDS than children of the same age in the comparison group. However, this was only significant for 10- to 11-month-olds ($R = 0.23$, $p = 0.007$) and 12- to 13-month-olds ($R = 0.21$, $p = 0.03$). From 18 to 23 months of age children in both groups showed nearly similar mean CDDS or the comparison group showed higher scores (figure 5).

Nutritional status

Mean (SD) HAZ scores at baseline were at -1.24 (1.03) for the comparison and at -1.27 (1.17) for the intervention group. At impact, mean (SD) HAZ scores were -1.25 (1.12) and -1.32 (1.12) for comparison and intervention, respectively. Figure 6 shows that the vast majority of the infants and young children were growing well or in the lower normal range. The median HAZ did not vary much between intervention and comparison group. Average stunting prevalence at impact was 23.5% and 24.7% in the comparison and intervention group, respectively.

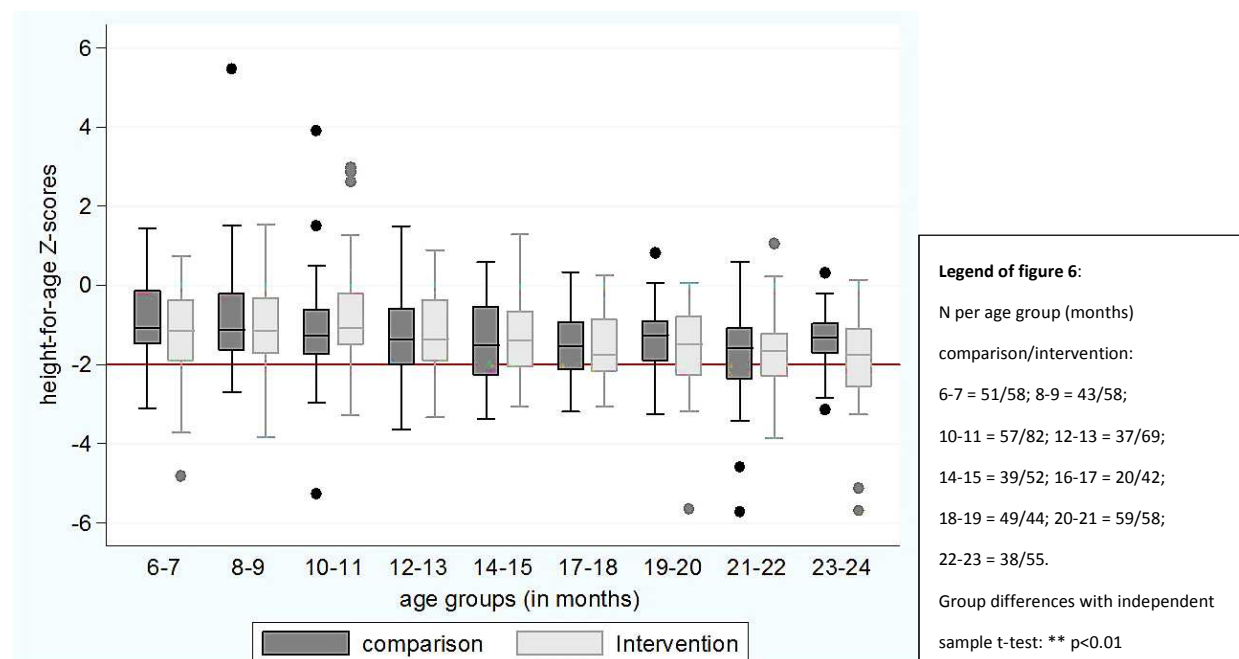


Figure 6: Mean height-for-age Z-scores (± 1 SD) of children in the intervention and comparison group by 2-month-age group at impact

Association between dietary diversity and nutritional status

In a partial correlation model, HAZ scores were weakly but not significantly correlated with CDDS when including covariates: $R = 0.05$, $p = 0.06$.

Effects of the intervention on children's diets and nutritional status

At impact, the estimated mean CDDS was 3.6 and 3.9 in the comparison and intervention group, respectively (figure 7). Improvements in CDDS were reflected in a significant positive treatment effect ($B = 0.49$, $SE(B) = 0.14$, 95% CI 0.21-0.77, $p = 0.001$) controlled for differences at baseline and between groups. Increased CDDS was mainly attributed to increased consumption of beta-carotene rich foods and other fruits and vegetables. The intervention showed a negative significant treatment effect on milk consumption. Treatment effects on the consumption of legumes, meat, and eggs were positive but not significant (table 13). If all ASF were combined into one food group, a DiD model including age of child, maternal education, and wealth, showed a positive treatment effect ($B = 0.08$, $SE(B) = 0.04$, 95% CI 0.004-0.16, $p = 0.025$). Age of child, wealth, and maternal education as covariates were significantly associated with the model.

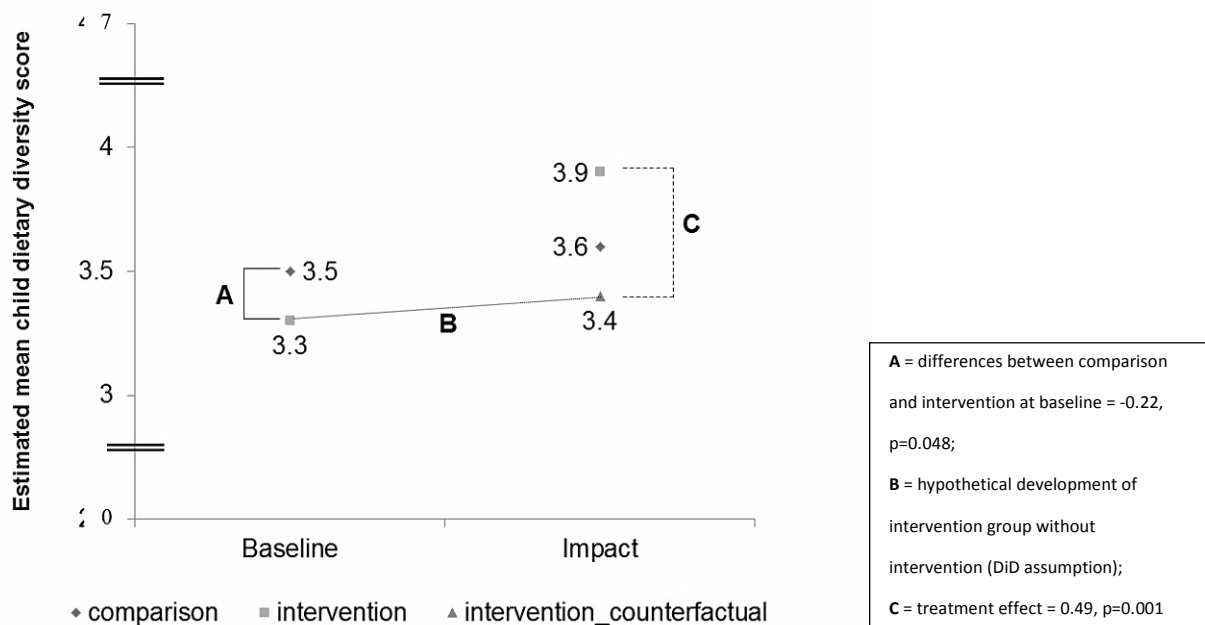


Figure 7: Differences in estimated mean child dietary diversity (DiD model)

Based on the 7-day food frequency significant treatment effects on the consumption of specific foods were determined by a DiD model including age of child, wealth, and maternal

education: beta-carotene rich fruits ($B= 0.21$, $SE(B)= 0.08$, 95% CI 0.05-0.36, $p= 0.01$), beta-carotene rich roots and tubers ($B= 1.06$, $SE(B)= 0.19$, 95% CI 0.69-1.43, $p< 0.001$), and dark green leafy vegetables ($B= 1.10$, $SE(B)= 0.22$, 95% CI 0.68-1.53, $p< 0.001$). Maternal education as covariate was significantly associated with the consumption of beta-carotene rich roots and tubers as well as dark green leafy vegetables whereas age was significantly associated with the consumption of beta-carotene rich fruits only. Wealth as covariate only reached significance in association with beta-carotene rich roots and tubers.

No significant treatment effects of the nutrition education intervention on HAZ, WAZ, and WHZ were observed.

Table 13: Treatment effects on children's food consumption (linear probability models with robust standard errors)

food group (24-hour recall)	treat effect	SE (B)	p	95% CI	
legumes, nuts, seeds	0.07	0.04	0.113	-0.01	0.15
milk and milk products	-0.08	0.03	0.016	-0.14	-0.02
meat and fish	0.07	0.04	0.082	-0.01	0.15
eggs	0.07	0.05	0.141	-0.03	0.17
beta-carotene rich foods	0.16	0.05	0.002	0.06	0.26
other fruits and vegetables	0.16	0.05	0.033	0.06	0.26

Determinants of child dietary diversity

Wealth and age of the child were determinants of child dietary diversity at baseline (wealth: $B= 0.08$ $SE(B)= 0.02$, $Beta= 0.17$, $p<0.001$) and impact (wealth: $B= 0.09$, $SE(B)= 0.02$, $Beta= 0.19$, $p< 0.001$). The older the child and/or the wealthier the household, the more diverse the child's diet was. Maternal education was positively associated with child dietary diversity in the same model at impact only ($B= 0.06$, $SE(B)= 0.01$, $Beta= 0.15$, $p< 0.001$). Household's dietary diversity was significantly associated with child dietary diversity at impact ($B= 0.41$, $SE(B)= 0.02$, $Beta= 0.47$, $p=0.011$) in a model including group, age of child, maternal education, and wealth as confounders.

Discussion

In this study we could show that the nutrition education intervention embedded in an agriculture project led to significant improvements in the quality of children's diet. However, the diversity of children's diet still remained below the recommended number of food groups. [23] Other studies with similar nutrition education messages but different

approaches also reported improvements in dietary diversity. [24, 25] Nutrition education delivered through home-visit counseling improved dietary diversity in India and overall energy and nutrient intake in Malawi. [26-29] Nutrition education through intensive training to small groups resulted in a positive impact on caregiver's nutrition and health knowledge and practices in Indonesia. [30]

Best practices have been summarized in several reviews but the lack of scientific evidence on nutrition education projects in development cooperation and their impact on growth is limited. In contrast to other studies, proven changes in feeding practices of the respondents were not reflected in changes of HAZ scores in our study. In China, Z-scores of children whose caregivers participated in a nutrition education intervention started to increase after 10-11 months of education. [31] In Peru [32] improved IYCF practices following nutrition education impacted on child's growth after a period of 18 months of regular home visits and counseling by health sector staff. In this study the evaluated nutrition education was only carried out for 12 months and was, thus, probably too short to see an impact on HAZ. Another explanation might be the limited exposure of behavior change communication messages (6 sessions).

A study from Pakistan showed that an education program on complementary feeding had a direct positive impact on linear growth of infants. [33] An analysis of the CDHS 2005 data by Darapheak and colleagues suggested a positive impact of ASF consumption on the reduction of stunting. [34] In this study meat consumption was common but mainly attributed to high fish consumption. Fish is part of the daily Cambodian diet and commonly available and affordable in rural areas, especially in the rainy season. Best sources of iron, however, are flesh meats, which are more expensive and less consumed by poorer, rural households.

Other studies which reported a positive impact on HAZ scores were characterized by their impact on increased intake of protein rich foods, like eggs, legumes, nuts, and seeds. [31, 32, 34] The lacking impact on HAZ scores in this study might also be attributed to the amount consumed by a child during a meal which could be limited by the high prevalence of the consumption processed snacks. Where consumption of snacks is high and caregiver's knowledge on responsive feeding behaviors poor, meal patterns are less structured and children lack hunger. [35, 36]

As known from previous research, a set of good IYCF practices is associated with the nutritional status of the children. [19, 37] Although food-based approaches are often questioned their applicability remains obvious, especially in remote and poverty affected areas [38, 39]. Nutrition education alone is able to improve caregiver's awareness of the importance of complementary foods impacting on IYCF practices and subsequently enhancing the quality of children's diets.

The nutrition education carried out by the FAO project and local partners increased the intake of micronutrients and bioactive plant components in particular through increased consumption of fruits and vegetables. In general, respondents of the intervention group had increased access to fruits which could be due to raised awareness of the availability of these foods and thus the utilization for young children increased. In general, CDDS was strongly correlated with maternal education and age of the child. The latter was also found to be a determinant of CDDS in Tanzania. [40]

In the present study, mean CDDS of the 6-to-11-month-olds was below the WHO recommendation which leads to the recommendation to address lactating mothers with nutrition education programs. Children from birth up to 18 months in Peru [32] and 12 months of age in India [27] were followed with home-visit nutrition education resulting in improved growth. An enrollment of mothers when children are still below 6 months of age could strengthen IYCF practices, also with respect to breastfeeding. Despite the fact that the continuation of breastfeeding was part of the FAO's nutrition education curriculum, its messages did not seem to impact on caregiver's behavior.

Strengths and limitations of the study

There are a number of aspects reducing the expected effect of the nutrition education on HAZ in the setting of this study: first, the majority of children studied were not stunted but growing in the lower normal range; second, there was low overlap between food security and nutrition education intervention; third, the presence of nutrition education activities in the project's comparison area; and fourth, the nutrition education was performed for a short period only.

The overlap between the agriculture intervention and nutrition education in the intervention area was low. Different selection criteria for both interventions led to a low

number of households with children aged 5-18 months selected for the agriculture intervention. Although ownership of animals, size of land, and household dietary diversity increased, this study could not demonstrate a clear, evidence-based linkage that the project's agricultural activities contributed to these results. For future programs it is recommended to target the same households with both interventions at the same time to reduce food insecurity while enhancing improved IYCF knowledge and practices. However, an earlier start of the agricultural intervention to improve households' food security status first, could also be a solution and create a basis for utilization of improved knowledge. To sustainably impact on an improved nutritional status of children, the collaboration between the agriculture and health sector needs to be strengthened through joint efforts and programs. Qualitative data from this research, not shown here, indicate that through inclusion of nutrition education in agriculture program and involvement of husbands and grandparents, overall sustainable improvements could be achieved by improved nutrition knowledge as well as access, availability, and utilization of nutritious, diverse foods.

To the knowledge of the authors, only a few applied nutrition research studies, where the researchers have not designed the intervention, have shown community effects of a project to date. The necessity and benefit of such studies to scientifically evaluate such natural situations and to help in improving future programs - ideally carried out by the government - is obvious. [26] As this research was attached to a development project implemented by FAO, the researchers had no influence on NGO activities in the project region. Also, the activities of the government's Baby-Friendly Community Initiative (BFCI) rolled out through health centers in the project region were beyond the researchers' control.

Conclusion

Though the study is limited due to the named reasons, it shows the need for assessing the implementation of nutrition education to better understand the natural situations and improve coordination and overall design of such projects and programs.

A 2-3 months nutrition education program carried out through government and community health volunteers as well as local NGOs addressing caregivers with a child between 5-18 months of age improved practices on diversification of children's diet. As no impact on average HAZ scores could be demonstrated we suggest putting more emphasis on ASF and

other protein sources in the nutrition education. In addition, nutrition education in the community through trained government and community members including peers as trainers should be targeted. It is recommended to include sessions on family nutrition into the curriculum and emphasize on the continuation of breastfeeding.

For successfully combining agriculture interventions and nutrition education the overlap between the interventions must be considered. Addressing food security and IYCF practices at the same time raises awareness and creates effective linkages between food production and nutrition

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Ethical Considerations The study was approved by the Institutional Review Board of Justus Liebig University and the National Ethics Committee for Health Research in Cambodia, and registered at the German Clinical Trials Register (no. DRKS00004379).

Contributors AR collected, assessed, analysed, and interpreted the data. She drafted the manuscript with contributions from MK and IJ who designed the overall study. AS and JK assisted during data collection and also contributed to the manuscript. JH proofed the data analysis and contributed to the manuscript. TJ mainly contributed to the design of the intervention. IR as FAO MALIS project manager rolled out the intervention and gave technical support throughout the study. OK was the national principal investigator in Cambodia, while MK was the principal investigator of the overall IMCF study.

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4 Density and diversity of nutrition interventions in Preah Vihear and Oddar Meanchey provinces in Cambodia

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Background

The number of local and international, public and private, governmental and non-governmental organizations (NGOs) in developing countries often leads to the assumption and expectation that causes of poverty, malnutrition, and food insecurity among others will be alleviated soon. The IMCF research project linked to a nutrition education project implemented by FAO itself came across a high prevalence of nutrition programs in the project's region. The linked project was implemented by the Food and Agriculture Organization (FAO) of the United Nations in Preah Vihear and Oddar Meanchey Provinces and has been described in Chapter 3. In April 2013, the Cambodian government together with the United Nations Children's Fund (UNICEF) and other stakeholders launched a communication campaign to promote improved complementary feeding in Cambodia. [1] The campaign includes the distribution of micronutrient powders for home fortification of foods. Each sachet contains 15 different micronutrients to be sprinkled over the complementary meal for children aged 6-23 months. [2] In this context, the number of nutrition-specific activities to improve young children's diets has increased. For the present research project, nutrition activities in the research area were mapped geographically and thematically with the objective to assess the potential impact on nutritional status of children aged 6 to 23 months through participation in other - non-FAO - projects. Especially with regard to the comparison group of the IMCF project this information was beneficial for understanding changes in behaviour and nutritional status of children if taken into account.

Methods

Data on nutrition activities in the research project's districts in the two provinces, Preah Vihear and Oddar Meanchey, was collected between April and June 2014. As primary information source, the Provincial Health Departments were interviewed and information on active NGOs and current health center activities was obtained. In a second step, each health center per commune in the project area was listed, visited, and interviewed. NGOs which were registered at the Provincial Health Departments as currently implementing

activities were interviewed as well. The interviews followed a semi-structured interview-guideline obtaining information on current general activities and nutrition specific activities including nutrition education, supplementation, distribution of micronutrient powders (sprinkles), and cooking demonstrations. In addition, detailed information on villages in the health center's catchment area and its cooperation with NGOs was collected. Graphic illustrations (photos or displays) of materials used by health workers were taken and observation of the presence of posters and other education materials were recorded.

Finally, Global Positioning System (GPS) points using a GPS device (Garmin GPSmap 60CS) were obtained to record the location of each health center and project village. Two geographical information system (GIS) specialists converted the collected data into a map using ArcGIS (version 10.2) [3]. Additional information was received from OpenStreetMaps® [4] and Diva GIS [5]. The distances between health center and villages were calculated using ArcGIS.

Data from the cross-sectional impact survey as well as the longitudinal study component was used to support the collected information.

Results

The project villages fell under the catchment areas of a total of 13 health centers, 2 in Preah Vihear and 11 in Oddar Meanchey. The number of villages a health center was responsible for ranged from 8 to 29 with an average of 16 villages. Distance of villages to the respective health centers ranged from 0 km to 45 km. The majority of project villages were located within a distance of less than one hour for one way to their health center. Health center staff mainly consisted of nurses and midwives. Number of staff ranged from 4 to 19 with a mean of 8.1 (N=13). Only two health centers were headed by a medical doctor.

Table 14 briefly summarizes public health fields which are addressed by health center activities. Basic health services are provided by every health center and include immunization, vitamin A supplementation and deworming tablet provision, and antenatal care. Each health center offered general information and service on nutrition for children and pregnant or lactating women.

Table 14: Basic and optional health services offered by health centers in Preah Vihear and Oddar Meanchey provinces

	Services	Activities
Basic health services	Immunization	<ul style="list-style-type: none"> - 8 kinds of different vaccinations including BCG, HB0, DTP, Polio and Measles for the children under 9 months of age - Tetanus for women 15 to 44 years of age
	Deworming	<ul style="list-style-type: none"> - 1 Mebendazol tablet for children aged 6 months to 5 years; also provided to adults
	Vitamin A	<ul style="list-style-type: none"> - Provided to children aged 6 months to 5 years every 6 months
	Antenatal care (ANC)	<ul style="list-style-type: none"> - Scheduled for 5 times during a pregnancy - Provision of 60 iron tablets, blood check-up, HIV check-up including husband, weight monitoring, baby's heart rate monitoring
	Outreach activities	<ul style="list-style-type: none"> - Bi-monthly 2 nurses visit each village under the catchment area - Activities include birth control, ANC, vaccination, general hygiene awareness raising
Optional activities depending on financial and technical support of NGO and time capacity of staff	Growth promotion	<ul style="list-style-type: none"> - For children under 5 years of age
	Nutrition counselling	<ul style="list-style-type: none"> - For every child under 5 years of age, especially to caregivers of underweight or anemic children - Cooking demonstrations are conducted for caregivers with a child under 2 years of age irregularly
	Provision of multiple micronutrient powders	<ul style="list-style-type: none"> - For every child aged 6 months to 2 years sachets of a powder containing 15 micro-nutrients is provided to be added to enriched porridges 3 to 5 times/week

Nutrition activities in the respective health centers were mainly dependent on support of NGOs in terms of training, provision of materials, and coordination. The following map indicates the density of activities in the project region (Figure 8) highlighting the name of the respective NGO. Each health center in the region received support from a NGO. In total, 4 different NGOs rolled out nutrition education. The red boxes in figure 9 show the availability and distribution of micronutrient powders by health center.

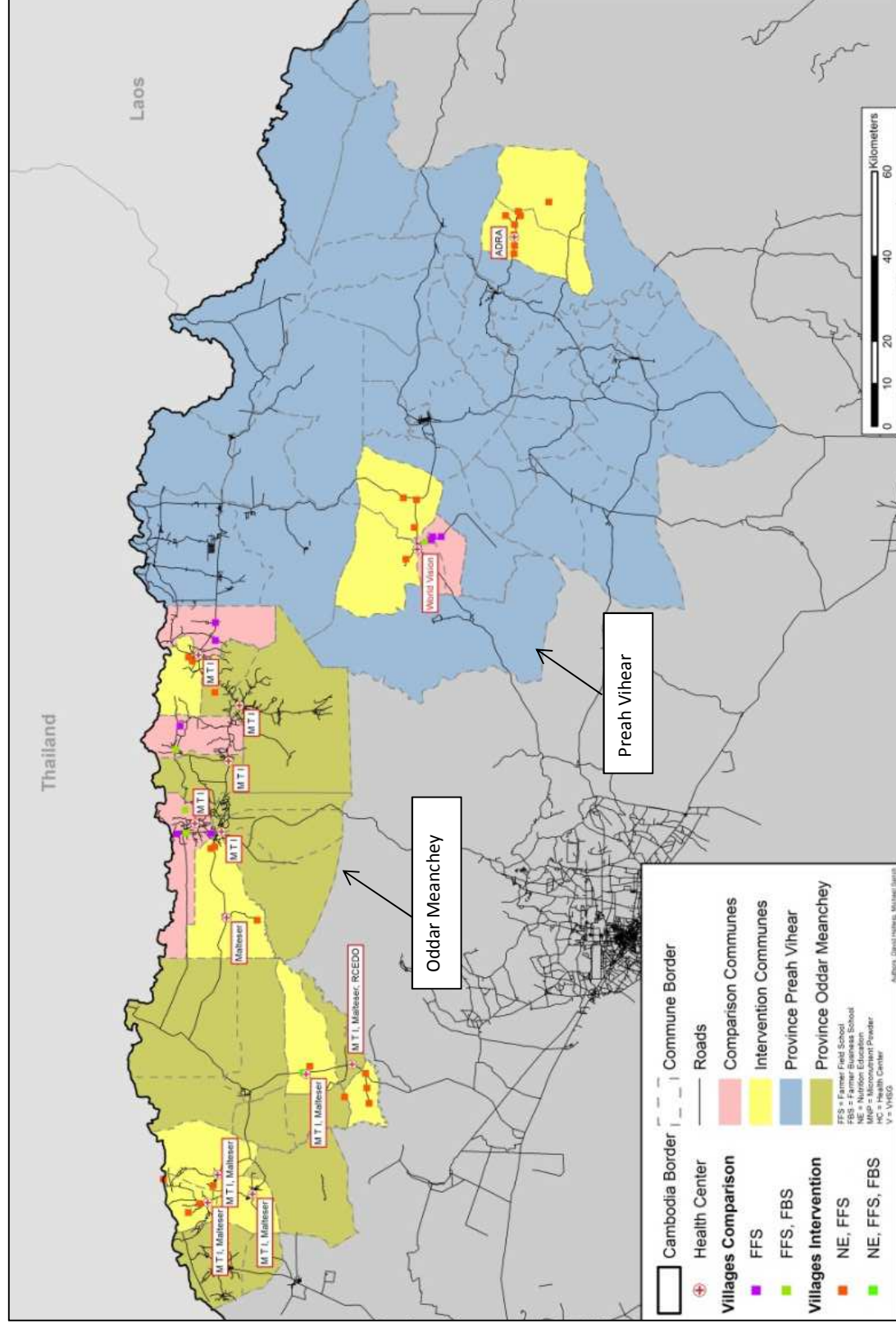


Figure 8: Health centers and respective active NGOs in the project region

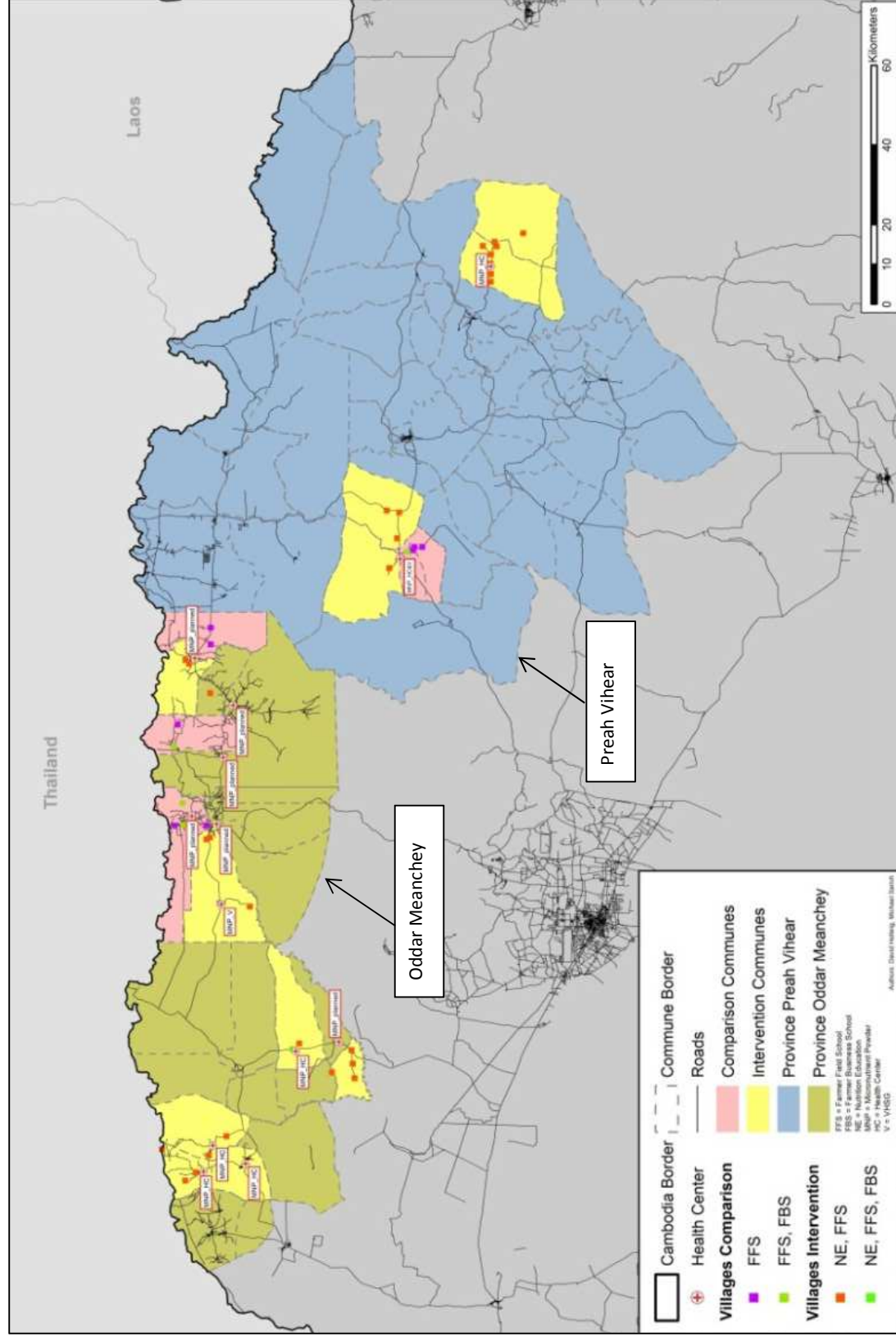


Figure 9: Availability of micro-nutrient powders in the research area

As part of the government behaviour change campaign [1], multiple micronutrient powders (MNP) were provided to caregivers of children aged 6-23 months. Financial and technical support was given by NGOs. Distribution strategies differed between health centers. In some areas the village health support group was responsible for the provision of MNPs in their respective village. In other areas MNPs were provided to caregivers at the health center and given to either only malnourished children (children with weight-for-age Z-scores or mid-upper-arm circumference below the cut-off [6]) or to all children. Overall, data collected revealed that the use and provision of MNPs was inconsistent between health centers and thus, did not seem to have reached its full potential. This was reflected in data from the cross-sectional impact survey: in Preah Vihear (N=431) and in Oddar Meanchey (N=491) only 7% of children aged 6-23 months received MNPs in the 24 hours prior to the survey.

NGOs were mainly responsible for capacity building of health workers at health centers and volunteers in the villages. They primarily used existing government materials [1] and developed additional materials in some regions. Messages given were consistent and only differed in the intensity of given doses. Cooking demonstrations, for example, were conducted every month in one area but without a regular schedule in another area.

Discussion

The results of the mapping exercise provide detailed information on different nutrition activities in the research area as well as geographical distance of households to health facility. This information was crucial for the IMCF project's results and their interpretation as those mapped activities were also accessible for our study population. The information obtained showed that both, intervention and comparison group, were affected in the same manner. Density of interventions correlated with the number of health centers and was higher in Oddar Meanchey than in Preah Vihear. The materials used by the different actors were similar which leads to the conclusion that no conflicting messages were distributed. The coverage of MNPs was smaller than expected which was reflected in the low number of children who consumed MNPs in intervention and comparison group.

On the one hand, the majority of programs and locally dense actions could have led to an information overload of the population rather than positively adding to each other and

strengthening the importance of nutrition in a more coordinated way. On the other hand, as all projects worked through the same channels – health centers and village health volunteers – access to nutrition information has improved for the community. The density of programs in Oddar Meanchey in addition to the low distance between villages and health centers could be important in reducing child mortality as shown in a study from Burkina Faso. [7]

As all NGOs worked through the same channels, namely health center staff and village health volunteers, both might have been overwhelmed. Health centers are generally understaffed and it is challenging for them to integrate additional activities into their daily schedule and even more into their outreach activities. Village health volunteers usually conduct this type of work in addition to their income generating activities as they do not receive any regular payment by the government or NGOs.

Conclusion

The results represent a common situation in developing countries nowadays. The importance for NGOs to function as a facilitator rather than taking over a key role should be stressed. Development projects are usually limited with regard to time and budget as well as human resources. An often occurring challenge is related to the fact that after projects are concluded, government resources and capacities are too weak to take over and continue implementation. With regard to nutrition education the current attention and international support should be used as an opportunity to facilitate the inclusion of nutrition counselling as a basic health service independent of financial resources. This, however, involves stronger capacity at health center and government level. Thus, the integration of nutrition in the curriculum of nursing schools is recommended.

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5 Discussion

This chapter summarizes the main findings, reviews those findings in the scope of other studies' results and the wider IMCF research results, and discusses strengths and limitations. Finally, a general conclusion proposes ideas for future programming and research in the wider context of public health and community-based nutrition programs.

Summary of main results

A sum of infant and young child feeding (IYCF) indicators is associated with height-for-age Z-scores (HAZ) of children aged 6-23 months rather than one single indicator. The WHO IYCF indicators showed no strong or significant association with HAZ scores. The more recommended IYCF criteria were met by caregivers, the more likely it was that the 6- to 23-month-olds achieved age-appropriate length. Findings demonstrate that the age of the child and maternal height were significantly associated with HAZ.

The FAO project's nutrition education addressed different aspects of IYCF. Improvement of children's dietary diversity after one year of nutrition education was shown. There was no impact on HAZ and changes in child dietary diversity score showed to not be linked to HAZ either. Other indicators such as meal frequency and continued breastfeeding did not show significant changes. Considering findings from chapter 2 where only a set of indicators was associated with HAZ the results are not surprising. A positive change in only one child feeding indicator does not necessarily lead to improvements in growth. More importantly, it needs to be considered that, though positive effects were determined, mean dietary diversity of the sample remained below the recommended 4 food groups at the time of the impact survey.

Research outcomes in a wider frame

This study highlights the need to consider more than one indicator when determining associations between children's diets, caregiver's feeding behavior, and growth. Causes of growth failure as a result of chronic malnutrition are multifaceted as presented in the introduction. Thus, nutrition education interventions aiming at improving child feeding and nutritional status benefit from including different key messages in the curriculum.

By using the dietary diversity score as the impact measure of a nutrition education program, this study reflects on specific changes in children's diets. It is discussed whether dietary diversity is a useful measure for nutrition adequacy of diets or food security in general. [1, 2] Results from chapter 3 showed that the intervention lead to changes in vegetable and fruit consumption, specifically of those being rich in beta-carotene. The results match the content of the nutrition education curriculum (Table 10) and the availability and accessibility of those foods in the research area. The consumption of foods rich in protein including flesh meats did not change significantly though it was taught. Underlying reasons could be either insufficient accessibility or cultural norms and beliefs with regard to the acceptability of feeding such foods to young children. [3] However, nutrients from animal source foods (ASF) are crucial to the young child's diet and known to be associated with growth and improved micronutrient status. [4, 5] The lack of inclusion of region specific Trials of Improved Practices (TIPs) derived messages in the intervention might have led to wrong expectations of changes in diets. [6] Studies showed that formative research effectively shaped intervention strategies and helped to identify cultural barriers and enablers to optimal feeding practices. [7] Consumption of flesh meat in the study region is rather low in comparison to fish consumption. Affordability of flesh meat is low and livestock owned by households is rather kept for sale than for own consumption. [8] Caregivers who participated in focus group discussions within the IMCF project stated to not be able to afford buying flesh meat for their children. [9] Other misbeliefs have also been released by caregivers stating that young children cannot digest meat. This leads back to underlying and basic causes of malnutrition. Low education levels can hinder adoption of messages. Prevalence of food insecurity plays a central role when looking at changes in child feeding behavior as well. [10, 11]

Contrary to this study, several studies showed associations between nutrition education intervention outcomes and growth. [12-14] In general it should be understood that dietary diversity will increase the chance of achieving recommended intake of macro- and especially micronutrients. However, dietary diversity does not necessarily ensure dietary quality. Behavior change is intended through nutrition education projects to cause long-term changes in children's diets. While dietary diversity remains an important aspect, it is but one component of the overall dietary quality. It is essential to put more emphasis on other

components as well to ensure achievement of all dietary goals. As presented in the introduction (Table 1), besides dietary diversity, the frequency of foods fed as well as meal frequency, and the amount of food fed are important indicators to be taken into account when measuring outcomes of nutrition education programs and better the understanding of associations between overall diet and growth (chapter 2). Additional analysis of IMCF data, not published yet, confirms the lack of a significant treatment of the nutrition education intervention on HAZ: changes in a child feeding index estimated by a difference-in-differences model including age of child, maternal education, and wealth as covariates lack significance as well. However, the child feeding index shows an improvement from baseline to impact survey mainly due to increased dietary diversity.

To what extent changes in IYCF practices can be expected depends on the intensity of the intervention. Characteristics to be considered are dose-response related and include duration of interventions, materials and micronutrient supplements used, and the nature of the delivery of messages. [15] Short-term interventions such as the FAO MALIS project deliver messages to a selected group in 7 sessions over a period of 3 months. Increased intensity through, e.g. home-visit nutrition counselling as implemented in a study from India where monthly nutrition counselling was given to caregivers with children from birth to 18 months of age, leads to increased responses. The study from India compared routine visits to monthly home-visit counselling and found higher dietary diversity and length in children of the intervention group. [16] To measure impact of short-term nutrition education interventions on HAZ where prevalence of stunting was not high was not realistic, especially in interventions where neither food supplements were given, nor home-visits increased the strength of close supervision on household level. Studies have shown, the closer the caregiver's were supervised, counselled, or observed, the longer the time of participation, and the more specific the messages, the better the outcomes were. In addition, the more active and participatory nutrition education sessions were carried out, the higher the motivation was and the better the understanding and thus outcomes were. [16-19]

In our study, analyses of biomarkers of iron and vitamin A status did not show any effects of the intervention despite improved dietary diversity. [20] This result provides evidence for the lack of impact of changes in dietary diversity on changes in micronutrient status and thus, the lack of impact on HAZ. Though consumption of beta-carotene rich fruits and

vegetables as well as consumption of oil and fat has increased, levels of retinol binding protein (biomarker for vitamin A status) did not show any positive changes. Other studies either delivered messages on the consumption of specific food groups [13] or promoted fortified foods [21, 22], or distributed supplements such as micronutrient powders [23]. Analyses of blood data goes beyond the scope of this thesis and will be discussed elsewhere. It should be stated, however, that data on micronutrient status of children can help to understand linkages between food consumption and changed dietary patterns.

The examined nutrition education intervention was nutrition-specific and at the same time integrated in an agriculture program. The link between MALIS's agriculture intervention and its nutrition education was weak due to the reasons named in chapter 3. Hence, the anticipated benefit from participating in both the agriculture program and nutrition training were not detected. The initial intervention design aimed at achieving food security among participating households before nutrition education sessions commenced. However, the achievement of food security could not be proved with our data. Results showed that participants of the nutrition education did not necessarily receive agriculture training prior to the nutrition sessions. Participants of the agriculture intervention, however, might not have been interested in the nutrition education offered or the density of other nutrition education programs could have led to a decreased interest in MALIS's nutrition education intervention. Previous studies have shown effects of nutrition education only in food secure populations. [24-26] This, however, could not be confirmed by the results from the IMCF longitudinal study which showed improvements in dietary diversity under remaining prevalence of food insecurity. [data not published yet] Findings from IMCF's qualitative and quantitative additional data recommend paying more attention to the linkage between nutrition and agriculture and the need to carry out both interventions with the same target group.

The challenge to provide evidence of the impact of a one-year nutrition education project on child's nutritional status as well as caregiver's behaviour change is obvious. Most research studies developed the intervention themselves and used a longitudinal study design or fortified food products or micronutrient supplements. [17, 22, 23, 27] Additional challenges of IMCF were the presence of other similar nutrition projects in the defined research area. (chapter 4) Being a community-based intervention and applied nutrition

research project carried out in a natural, closest-to-reality setting, these facts were beyond the control of the researchers and need to be taken into account while interpreting the results. Other project's activities were mapped and respondent's participation in other programs was determined. The overall measured impact is weak in comparison to other projects but when estimating long term effects the potential of such nutrition-specific and nutrition-sensitive interventions is evident. [28, 29]

Validity of the study

This cross-sectional randomized controlled study was robust due to several criteria, including sample size calculation, selection of participants, and data collection tools to ensure external and internal validity. [30] The IMCF research was linked to the FAO project and intended to assess the impact of the intervention of the FAO project. Thus, pre-selected communes and villages as well as pre-defined household characteristics needed to be met. External validity in terms of extrapolating results from our sample to the broader population was met by regarding this sample as representative for rural smallholder farming households in Northwest Cambodia. It should be understood that our sample does not represent the poorest households of the region. Internal validity was met by applying the following research tools: informed consent was read to every participant prior to the data collection; semi-structured pre-tested questionnaires were used in a standardized way; enumerators were intensively trained prior to data collection and received regular refresher trainings; regular quality control assessments were conducted; each data collection day followed the same procedure in each village. This study shows a strong internal logic and allows the reader to draw conclusions with a high degree of certainty, however, given the design of the research project several limitations and strengths need to be highlighted and different biases need to be elaborated. Table 15 gives a brief overview of the strengths, limitations, and bias of this study's research.

The uniqueness of this study and the wider IMCF project was that it facilitated an independent look at a situation which reflects reality. It could be criticized that independency was limited by financial dependency as well as location of intervention and research project in the same office. However, financial dependency did not play a role throughout data collection and was settled and agreed upon before any activities

commenced. During no point of the study did the research team and the intervention influence each other. By being located close to each other it was possible to closely monitor the MALIS project leading to essential background information for the overall research project. A timely conclusion of research activities enabled the comparison group to also receive nutrition education training by the FAO project. This ethical consideration is unusual for most research projects.

Table 15: Strengths, limitations, and bias of study design

Category	Characteristics	Details
Strengths	Design	<ul style="list-style-type: none"> - Cross-sectional - Census - Central meeting point
	Sample Size	<ul style="list-style-type: none"> - Representative
	Independency	<ul style="list-style-type: none"> - Researcher have not been part of the intervention's design and implementation and vice versa
	Ethical considerations	<ul style="list-style-type: none"> - Timely conclusion of activities to enable comparison group to receive nutrition education
Limitations	Design	<ul style="list-style-type: none"> - Cross-sectional - Central meeting point
	Lack of data	<ul style="list-style-type: none"> - Amounts consumed - Micronutrient content - Different season
	Intervention	<ul style="list-style-type: none"> - Delays caused a shorter time of NE as planned
Bias	Selection	<ul style="list-style-type: none"> - Preparation of lists of children under 2 years of age by the village chief, village health volunteer
	Confounding	<ul style="list-style-type: none"> - Age - Wealth - Presence of other nutrition programs in research area - Presence of researchers in the field
	Information	<ul style="list-style-type: none"> - Enumerators - Seasonality - 24-hour recall
	Response	<ul style="list-style-type: none"> - Interview situation - Social desirability

Limitations due to the cross-sectional nature of the study are given but in the context of the overall study objectives the collected data provides important information on community effects of the intervention. The fact that caregivers were invited to a central meeting point contains advantages as well as disadvantages. On the one hand, the presence of other caregivers being in the same situation might have encouraged caregivers to take part in the study and enhanced curiosity. On the other hand, there was no chance to prove certain data

by cross-checking with the caregiver's private environment. Specifically hygienic environment or wealth index variables could have been proved by means of household interviews. For this analysis, however, it was not of disadvantage.

Data on amounts consumed by children in addition to dietary diversity would have been advantageous. Such data could have helped to better understand intakes of micronutrients through changed dietary patterns but also would have validated the dietary diversity score in a way that single food groups could have been weighed according to the amount consumed. The use of minimum amounts as cut-offs when assessing dietary diversity could be another possibility to further validate this tool and possible linkages to growth. However, these questions go beyond the scope of this thesis.

Selection bias can occur due to the absence of random selection of participants, or due to pre-defined research areas. It often stems from an absence of comparability between groups that are studied. [31, 32] At baseline, villages in pre-selected communes were randomly selected following the proportional to population-size method. Participants then were randomly selected from a list of children under 2 years of prepared by the village chief or village health volunteer of the respective village. It is difficult to obtain in rural Cambodia where information on birth dates, names, and locations of people's houses is often incomplete at all administrative levels. At impact, a census was conducted, relying on updated population lists. Close cooperation of FAO and IMCF with the local community and the applied selection methods kept the selection bias to a minimum.

Confounding bias is most relevant with regard to interpretation of results in a way that confounding factors can blur effects. [31, 32] The most important confounding factors have been taken into account in our statistical analysis. Age of the child is certainly influencing dietary diversity and other feeding practices and has been included as covariate in the analyses. Wealth of a household, also known to be closely linked to household dietary diversity and thus food availability on household level, has also been included into models. Child's sex often known to be a confounder did not confirm to be so in this Cambodian sample. The presence of researchers can positively impact results and bias the real picture by subconsciously influencing the respondent's answers. The initially planned comparison of intervention and non-intervention group was limited due to the number of different

nutrition education interventions in the comparison area. These programs were carefully mapped and data on participation was assessed. (Chapter 4) With regard to results of the second publication, it is important to point out that this also might have led to a lower intervention effect on dietary diversity than expected.

Bias can occur as a result of differently gathered information. [31, 32] The team of enumerators comprised 12 interviewers, 2 anthropometric measurers, and 2 blood collection teams. During data collection it was ensured that enumerators were blind to group assignment and the same questionnaires were completed in a standardized way for both groups. It is suggested to keep the number as limited as possible to reduce inter-enumerator data collection bias. For the analyses we tested those effects and were able to exclude them prior to further analysis. Due to the nature of the assessment of dietary diversity through the 24-hour recall method, recall bias might occur. However, interviewers were specifically trained to reduce this bias.

Conclusions

This thesis shows that it is important to take a set of IYCF indicators into account when a) designing nutrition education programs to improve IYCF practices and children's nutritional status; and b) analysing data regarding child feeding and its impact on nutritional status. Community-based participatory nutrition education can lead to improvements in children's dietary diversity. However, these changes do not necessarily lead to improvements in growth. Even where local resources allow for adequate infant and young child feeding, nutritional knowledge and awareness, and factors such as the mother's available time are crucial to improving the nutritional status of the children.

The study shows the potential of nutrition education to improve children's diets and overall IYCF indicators. Additionally, the need for assessing implemented nutrition education interventions to better understand local situations, improve coordination and overall design of such projects and programs, and disseminate best practices has been highlighted. However, there is more need for independent applied nutrition research to add evidence to applicable solutions to combat malnutrition among children under 2 years of age.

Recommendations for future nutrition education projects

It is recommended to invest in formative research prior to any intervention and use the results for capacity building of local staff and the design of the intervention according to local needs in the first step. With regard to nutrition education it is suggested to integrate nutrition education into agricultural interventions to enable participants through enhanced food security to apply their achieved knowledge on nutrition. Nutrition education programs specifically designed to improve IYCF practices should consider enrolling caregivers at an earlier stage to increase the dose-response effect and ensure a timely introduction of adequate nutritious complementary foods. Involving peers in nutrition education programs can help other participants to change their behaviour. A participatory training approach for trainers and regular refresher trainings are strongly recommended with regard to successful implementation and further positive impact and sustainability. As no impact on average HAZ scores could be demonstrated, it is suggested to put more emphasis on consumption of ASF and other protein sources in nutrition education. Additionally, a component on growth monitoring should be included in nutrition education to raise awareness on the relationship between food intake and growth.

Best practices are characterized by the level of feasibility, acceptance by the local community and practitioners, and the potential for scaling-up. Feasible programs are designed sensitive to local needs and take local capacity, resources, and culture into account to contribute to sustainable development. Enhancing local nutrition capacity and raising awareness of the importance of early life nutrition, creates the potential for scaling-up nutrition education programs. Overall, the primary goal of development projects should be to enhance local capacity and enable local systems to take over interventions as integrated programs.

Recommendations for future research

Future research should focus on the assessment of existing nutrition-sensitive and -specific programs to determine available best practices. The lesser a research project is involved in designing and carrying out its own intervention but instead looks at an intervention independently, the better its results reflect realistic best practices. The ability to make assumptions on feasibility and impact increases with applied independent nutrition research. Thus, the potential to contribute to current efforts by bringing together best

practices for scaling-up nutrition programs in developing countries is given rather than if new interventions were designed. Often pure research interventions are far away from practicability, e.g. home-visit counselling programs in communities where local resources are scarce and financial support by the government cannot be expected, or distribution of supplements which are produced outside the country for home-fortification.

Given the design of the project and the objectives of the research, different research designs can be applied. A combination of qualitative and quantitative data collection tools has proved to benefit the interpretation of results. Qualitative data on child feeding remains rare and, thus, it is recommended to collect qualitative data on responsive feeding behaviour which can help to better understand quantitative IYCF data. The use of a CFI is supported when program managers or researchers want a broader picture of caregiver's IYCF behaviour.

With regard to child feeding it is suggested to collect data on the amount fed from a smaller sample and match with reported 24-hour recall. In addition, several 24-hour recalls over a period of 3-4 weeks conducted at random points of time could help to better understand dietary patterns. This method is regarded superior to 7-day food frequency which often is biased by recall. Assessing blood parameters is useful and it is recommended to take inherited hemoglobinopathies and parasitic infections into account. The latter two are highly prevalent in Southeast Asia and will be helpful when analysing other biomarkers of nutritional status.

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6 Summary

Main causes for child undernutrition are a diet poor in quality and quantity, feeding practices, and hygiene. In particular during the first two years of life, the so called ‘window of opportunity’, the timeliness of the introduction, quality, quantity, and appropriateness of complementary food are crucial to ensure adequate growth and motor, and mental development. Chronic malnutrition leads to stunted growth and increases child morbidity and mortality. Young child feeding practices are influenced by a multitude of factors such as maternal health and education, household wealth and food security status. Often a lack of knowledge on age-appropriate infant and young child feeding practices among caregivers is one of the main contributors. Community-based nutrition education interventions are potential solutions to improve caregiver’s complementary feeding practices by increasing knowledge of age-appropriate diets as well as caring and feeding practices. Evidence on best feasible practices to date remains rare. As causes are multifaceted nutrition-sensitive interventions and programs have shown enormous potential to enhance the scale and effectiveness of nutrition-specific interventions.

From 2012 to 2014, a cluster randomized trial was rolled out in 2 provinces in Cambodia in the context of an agriculture and nutrition project of the Food and Agriculture Organization (FAO) of the United Nations. The cross-sectional baseline was carried out in 16 pre-selected communes in 2012. Restricted randomization selected the communes into intervention (nutrition education and agriculture intervention) and comparison (agriculture intervention only). The impact survey was conducted as census in all FAO project villages in 2014. Caregivers of children aged 0-23 months were interviewed using standardized questions on socio-economic status and dietary diversity (24-hr recall). Anthropometric measurements were taken. Minimum dietary diversity (MDD), minimum meal frequency (MMF), minimum acceptable diet (MAD), and child dietary diversity was calculated as food group score (min-max: 0-7) for children aged 6-23 months following WHO guideline. A child feeding index (CFI; 0-10) was created for children aged 6-23 months consisting of five components: breastfeeding, use of bottle, dietary diversity, food frequency and meal frequency which were adjusted for three age groups: 6–8, 9–11 and 12–23 months. In a first step associations between height-for-age Z-scores (HAZ) and WHO indicators (MDD, MMF, MAD) or CFI were

explored with baseline data. In a second step a difference-in-differences (DiD) model was applied testing community effects of the intervention.

At baseline, 803 children aged 6-23 months were included in the analysis. None of the WHO IYCF indicators was associated with HAZ, whereas CFI showed significant association with HAZ ($P < 0.01$). The association between higher CFI scores and HAZ became weaker as age increased.

Two years after the baseline survey, after one year of nutrition education, 62% of the intervention households ($N = 524$) reported to have participated in the nutrition education. A total of 1,664 datasets were used for analysis consisting of 743 and 921 caregiver-child-pairs from baseline and impact survey, respectively. Children's age ranged from 6- 23 months with a mean (\pm SD) age of 13.5 (\pm 5.2) months at baseline and 14.2 (\pm 5.2) months at impact. Overall, children's diets improved. Estimated mean child dietary diversity was significantly different at impact between comparison and intervention (3.6 and 3.9, respectively). In particular the consumption of beta-carotene rich foods and other fruits and vegetables increased. No treatment effects on HAZ could be shown.

This thesis shows that when linking infant and young child feeding practices to child growth, it is necessary to include more than one indicator into the analysis. Furthermore, it could be shown that participation in a nutrition education program led to increased child dietary diversity whereas participation in an agriculture intervention only did not show any improvements. The results highlight the potential of nutrition-sensitive agriculture interventions including nutrition-specific actions to address causes of child malnutrition in developing countries. For future research it is recommended to focus on the assessment of existing programs and available best practices. Efforts need to be directed towards a better understanding of the local context and needs to contribute to alleviation of malnutrition in a sustainable way.

7 Zusammenfassung

Hauptursachen für Unterernährung bei Kindern sind genauso vielfältig wie die Faktoren, die den Ernährungsstatus und -praktiken beeinflussen. Insbesondere während der ersten zwei Lebensjahre sind die zeitgerechte Einführung, Qualität, Quantität und die Angemessenheit von Beikost entscheidend um adäquates Wachstum sowie motorische und mentale Entwicklung zu sichern. Chronische Mangelernährung verursacht vermindertes Wachstum und erhöht das Erkrankungs- und Sterblichkeitsrisiko. Oft ist fehlendes Wissen der Mütter über altersgerechte Ernährungspraktiken für Kleinkinder einer der Hauptgründe. Gemeindebasierte Ernährungsbildungsinterventionen sind potenzielle Lösungen um Beikosternährungspraktiken der Mütter zu verbessern. Dies geschieht durch gestärktes Wissen bezüglich altersgerechter Kost sowie Pflege- und Fütterungspraktiken. Bislang mangelt es an Nachweisen für realistisch umsetzbare Maßnahmen. Ernährungssensitive Interventionen und Programme haben erhebliches Potential den Umfang und die Effektivität von ernährungsspezifischen Interventionen zu erhöhen.

Zwischen 2012 und 2014 wurde eine Cluster randomisierte Studie in zwei Provinzen in Kambodscha im Kontext eines Agrar- und Ernährungs- Projektes der Ernährungs- und Landwirtschaftsorganisation (FAO) der Vereinten Nationen durchgeführt. Die Baseline Querschnittsdatenerhebung wurde in 16 im Vorfeld selektierten Kommunen im September 2012 durchgeführt. Darauf folgte eine eingeschränkte Randomisierung zur Einteilung der Kommunen in Intervention- und Vergleichsgruppe. Die Interventionsgruppe hatte Zugang zu einer Agrar- und Ernährungsbildungs-Maßnahme wohingegen die Vergleichsgruppe nur an der Agrar-Maßnahme teilnahm. Die Abschlusserhebung wurde im September 2014 als Zensus mit allen Müttern mit Kindern im Alter unter zwei Jahren in allen FAO Projektdörfern durchgeführt. Daten wurden mittels standardisierter Fragen zu sozio-ökonomischem Status und Nahrungsmittel-Diversität (24-Stunden Protokoll) erhoben. Zusätzlich wurden anthropometrische Messungen von Mutter und Kind durchgeführt. Standardindikatoren der Weltgesundheitsorganisation (WHO) zu Ernährungspraktiken von Kindern im Beikostalter (Minimum Dietary Diversity, Minimum Meal Frequency, Minimum Acceptable Diet) sowie eine Punktzahl für Kinder-Nahrungs-Diversität (min: 0, max: 7) für Kinder zwischen sechs und 23 Monaten wurden berechnet. Ein ‚child feeding index‘ (CFI) bestehend aus 5 Komponenten (Stillen, Flaschen-Fütterung, Nahrungsdiversität, Häufigkeit des Verzehr von

bestimmten Lebensmitteln und Anzahl der Mahlzeiten) wurde unter Berücksichtigung der aktuellen Altersempfehlungen gebildet. Zunächst wurden in der statistischen Analyse Assoziationen zwischen altersabhängiger Größe (height-for-age Z-scores (HAZ)) und WHO Indikatoren oder CFI mit dem Baseline Datensatz erforscht. Im zweiten Schritt wurde ein Difference-in-Differences (DiD) Modell angewandt, um die Wirkung der Intervention auf die Gemeinde zu testen.

Zu Baseline wurden 803 Kinder im Alter zwischen sechs und 23 Monaten analysiert. Keiner der WHO Indikatoren war mit HAZ assoziiert wohingegen der CFI signifikant Assoziation mit HAZ zeigte ($p < 0.01$). Je älter die Kinder allerdings wurden, desto schwächer wurde der Zusammenhang zwischen höheren CFI Punkten und HAZ. Zwei Jahre nach dem Baseline und nach einem Jahr Laufzeit der Ernährungsbildungsmaßnahme der FAO, hatten 62% der Haushalte in der Interventionsgruppe an der Ernährungsbildung teilgenommen (N= 524). Für die nachfolgende Analyse wurden 1664 Datensätze analysiert bestehend aus 743 und 921 Mutter-Kind-Paaren vom Baseline und der Abschlusserhebung. Kinder zu Baseline waren im Durchschnitt 13.5 (± 5.2) Monate alt und 14.2 (± 5.2) zur Abschlusserhebung. Im Gesamten betrachtet verbesserte sich die Kost der Kinder. Geschätzte durchschnittliche Nahrungsdiversität war signifikant unterschiedlich zwischen Interventions- und Vergleichsgruppe zum Zeitpunkt der Abschlusserhebung (3.6 und 3.9). Insbesondere nahm der Verzehr von beta-carotene-reichen Nahrungsmitteln sowie anderen Früchten und Gemüse zu. Es wurden keine Interventionseffekte auf HAZ nachgewiesen.

Diese Thesis zeigt die Wichtigkeit bei der Analyse von Daten in Bezug auf Kinderernährung und dessen Zusammenhang mit Ernährungsstatus ein Set an Indikatoren zu berücksichtigen. Darüber hinaus konnte gezeigt werden, dass gemeindebasierte partizipatorische Ernährungsbildung zu Verbesserungen der Nahrungsdiversität führte wohingegen die Teilnahme an nur der Agrarintervention diese Auswirkungen nicht zeigte. Diese Ergebnisse unterstreichen das Potenzial von ernährungssensitiven Agrarinterventionen in Entwicklungsländern, die ernährungsspezifische Komponenten, die Ursachen der Kindermangelernährung adressieren, beinhalten. Zukünftige Forschung sollte die Bewertung von bestehenden Programmen und verfügbaren realistischen Ansätzen in den Mittelpunkt rücken. Bemühungen sollten in Richtung eines besseren Verständnisses des lokalen Kontexts und Bedarf geleitet werden um nachhaltig Mangelernährung zu bekämpfen.

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Appendix

Questionnaire Baseline Survey

Questionnaire Impact Survey

Anthropometric Measurements

Baseline Survey

Part I: Household Questionnaire

Date: _____

Name of Mother/ Caretaker: _____

Name of Child: _____

ID Number Interviewer 1: Time interview start: :

ID Number Interviewer 2:

Identity Number of the household	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	Province	District Commune	Village	Household	Child















1	Do you have a written record of your child's date of birth (such as health card, birth certificate)? <i>Please ask other household members to confirm the date!</i>	<i>If yes, please record: day, month, year → Q 2</i> <i>If not, please proceed → Q 1a</i>	BIRTHDAT	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Day Month Year
1a	<i>Use the local calendar and ask: Do you remember a local event (or the season) when your child was born? Use this as the starting point to begin to narrow down the month and year of birth of the child by asking further questions</i>	<i>Use the local calendar of events to estimate the month and year of birth! In case of 1 month: please proceed → Q 2</i> <i>In case of 2 months: please thank the mother/caretaker for her time and close the interview!</i>	BIRTHCAL	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Month Year

Please note: If the child's age is equal or over 24 months, thank the mother for her time and end interview.















2	Does your child have a birth certificate?	0= no → Q 3 1= yes, available → Q 2a 2= yes, but not available → Q 3	BIRTHCRT	<input type="text"/>
2a	Copy the birth weight of the child (in kg)	_____ kg	BIRTHWEI	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> kg

Demographic Data

3	What is your relationship to your child?	1= Mother 2= Caretaker 3= Father	RELTOCH	<input type="text"/>
4	What is your current marital status?	1= married 2= widowed 3= divorced 4= single 99= other (specify):	HEADMAR	<input type="text"/>
5	Who is the household head?	1= respondent 2= spouse of respondent 3= female elderly 4= male elderly	HEADHH	<input type="text"/>
6	What is the religion of this household?	1= Buddhist 2= Muslim 3= Christian	RELHHH	<input type="text"/>

		99= other (specify):		
7	How many people live permanently in your household?	0-2 years	HHMEM2	    
		>2-5 years	HHMEM5	
		>5-15 years	HHMEM15	
		>15-49 years	HHMEM49	
		>49 years	HHMEM50	
8	Have you ever attended school?	0= no → Q 10 1= yes	EDUCMO	
9	What is the highest level of school you completed: primary, secondary, or higher?	1= informal education 2= some primary 3= completed primary (Grade 6) 4= some secondary 5= completed secondary (Grade 12) 6= more than secondary	EDUCLEV	
10	What is the highest level of school the head of the household attended: primary, secondary, or higher?	0= no school 1= informal education 2= some primary 3= completed primary (Grade 6) 4= some secondary 5= completed secondary (Grade 12) 6= more than secondary 88= don't know	EDUCHH	
11	<p><i>Ask respondent if he/she can read!</i> <i>If yes, ask further: Now I would like you to read this sentence to me</i></p> <p><i>Show card to the respondent, if the respondent cannot read easily ask "can you read any part of the sentence to me?"</i></p>	1= cannot read at all 2= able to read part of the sentence 3= able to read the entire sentence 4= no card with required language 5= blind or visually impaired	READRES	
12	What is the main occupation of the household head (mention one or two with priority)?	1= farming (focus crops) 2= farming (focus livestock) 3= business 4= petty trader/vocational skills 5= casual labour 6= wage employment 7= none 99= other (specify):	MAINOCC1	
			MAINOCC2	
13	What is your main occupation besides housework?	1= support spouse 2= own business 3= nurse 4= traditional birth attendant 5= none 99= other (specify):	WOMOCC	
14	What is the main source of income of your household throughout the year?	1= sale of agricultural products (crops/livestock) 2= sale of homemade crafts 3= sale of firewood/charcoal 4= casual labour 5= petty trade small business 6= employment/salary 7= loan 8= cash remittance 9= safety net labour 10= none 99= other (specify)	INCYEAR1	
			INCYEAR2	

Living conditions

15	How many rooms in your house are used for sleeping?	Number of rooms	NOROOM	
16	<i>Probe: What kind of house do you live in?</i> What is the main material of the floor?	1= Natural floor: earth/sand/clay, dung 2= Rudimentary floor: wood planks, palm/bamboo 3= Finished floor: ceramic tiles, cement tiles, cement 99= other (specify):	MATFLO	
17	Does your household have electricity?	0= no 1= yes	HHELECT	
18	Is the cooking usually done in the house, in a separate building, or outdoors?	1= in the house 2= in a separate building 3= outdoors	HHCOOK	
19	What type of fuel does your household mainly use for cooking?	1= wood collected 2= wood bought 3= charcoal 4= liquid petroleum gas 5= biogas 6= animal dung 99= other (specify):	COOKEN	
20	What is the main source of drinking water during the wet season for members of your household?	1= piped water into dwelling, yard or plot, public tap/standpipe, tubewell / borehole, protected dug well, protected spring, rainwater collection 2= unprotected well, unprotected spring, tanker-truck, cart with small tank/drum, surface water (river, stream, dam, lake, pond, canal, irrigation channel), bottled water 99 = other (specify):	DRINKWA	
21	Do you treat your water in any way to make it safer to drink?	0= no → Q 23 1= yes 88= don't know → Q 23	WATSAFE	
22	Do you usually treat your water before you drink it? <i>Record all items mentioned with priority</i>	1= boil 2= add bleach/chlorine 3= strain it through a cloth 4= use a ceramic filter 5= let it stand and settle 88= don't know 99= other (specify):	WTREAT1 WTREAT2	 
23	How do you store the drinking water?	1= with lid/covered 2= without lid/uncovered 99= other (specify):	WSTORE	
24	Who usually goes to fetch the water for your household?	1= respondent 2= family member → Q 26 3= water source on premise → Q 26 4= buying water from cart → Q 26	WFETCH	
25	How long does it take to collect water and come back?	_____ Number Unit (e.g. minutes, hours) 88= don't know	WTIME	
26	What kind of toilet facility do members of your household usually use?	1= Flush / pour flush to: piped sewer system, septic tank, pit (latrine), unknown place/ not known where, Ventilated Improved Pit latrine (VIP), pit latrine with slab, composting toilet 2= Flush/ pour flush to elsewhere, pit latrine without slab/open pit, bucket, hanging toilet/hanging latrine, no facilities or bush or field 99= other (specify):	LATRINE	
27	How long does it take to reach to the nearest health facility for treatment?	1= less than 1 hour 2= more than 1 hour and less than 3 hours	TIMEHEAL	

	(one way)	3= between 3 hours and half a day 4= more than half a day 88= don't know		
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Household Dietary Diversity

28	Please describe the foods (meals and snacks) that you or any member of your household ate or drank yesterday during the day and night. Include only foods consumed at home, not those purchased and consumed outside of the home. Start with the first food eaten in the morning.				
Write down in the space below all foods and drinks mentioned. When composite dishes are mentioned ask for the list of ingredients. Probe for any meals/snacks not mentioned. When the recall is complete, fill in the food groups based on the foods mentioned during the recall. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.					
breakfast	snack	lunch	snack	dinner	snack
Food group	Examples				0= no 1= yes
Cereals	any food such as rice, porridge, bread, instant noodle, Khmer rice noodles or boiled whole maize grain				HHDD1 <input type="checkbox"/>
Vitamin A rich vegetables and tubers	pumpkin, carrots, or sweet potatoes that are orange inside + <i>other locally available vitamin-A rich vegetables (e.g. sweet pepper)</i>				HHDD2 <input type="checkbox"/>
White tubers and roots	irish potatoes, white sweet potatoes, white yams, coco yams, cassava, or any white roots and tubers or foods made from these				HHDD3 <input type="checkbox"/>
Dark green leafy vegetables	relish of dark green leafy vegetables as well as the indigenous vegetables including amaranthus, cassava leaves, sweet potato leaves, mustard, rape, pumpkin leaves, ivy gourd, moringa, star gooseberry, morning glory				HHDD4 <input type="checkbox"/>
Other vegetables	other vegetables (e.g. tomato, onion, eggplant, any kind of relish from leafy vegetables e.g. Chinese cabbage, cabbage, green pepper and green beans) including wild vegetables				HHDD5 <input type="checkbox"/>
Vitamin A rich fruits	papaya (fresh or dried), ripe mangoes (fresh or dried), musk melon or <i>other locally available vitamin A-rich fruits</i>				HHDD6 <input type="checkbox"/>
Other fruits	other fruits, including wild fruits, e.g. oranges, lemons, tamarind, sapodilla, bananas, water melon, jackfruit, mangosteen, rambutan, lychee, custard apple, dragonfruit, star fruit, star apple, pineapple				HHDD7 <input type="checkbox"/>
Organ meat (iron rich)	liver, kidney, heart or other organ meats or blood- based foods				HHDD8 <input type="checkbox"/>
Flesh meats	beef, pork, goat, chicken, duck, other birds, or any wild animal like deer, rabbit, pig, birds, or snail, snake, frog				HHDD9 <input type="checkbox"/>
Eggs	eggs from chicken, ducks, goose or any other eggs				HHDD10 <input type="checkbox"/>
Fish	fresh or dried fish or shellfish, fermented fish				HHDD11 <input type="checkbox"/>
Legumes, nuts and seeds	beans, lentils, cow peas, pigeon peas, ground beans, soya beans, ground nuts, cashews, green gram, chick peas nuts, lotus seeds				HHDD12 <input type="checkbox"/>
Insects	insect larvae, red ants, grasshopper, crickets				HHDD13 <input type="checkbox"/>
Milk and milk products	milk, yogurt drink or other milk products				HHDD14 <input type="checkbox"/>
Oils and fats	oil or fats added to food or used for cooking				HHDD15 <input type="checkbox"/>
Sweets	condensed milk, sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies, sugar can, sugar palm, bubble tea,				HHDD16 <input type="checkbox"/>

Spices, condiments, beverages	spices (black pepper, salt, chili), condiments (soy sauce, fish sauce, hot sauce), prahok, coffee, tea, tender coconut water, alcoholic beverages as such as: canned beer, rice wine, fermented palm juice	HHDD17	
28a	Did you or anyone in your household eat anything (meal or snack) OUTSIDE the home yesterday?	0= no 1= yes 88= don't know	HHOUT

Household Hunger Scale

29	READ TO RESPONDENT: "For each of the following questions, consider whether this has happened in the past 4 weeks. If the answer is yes to a question, please indicate how often this happened."		
a	In the past [4 weeks/30days] was there ever no food to eat of any kind in your house because of lack of resources to get food?	0= no → Q c 1= yes	HHSA
b	How often did this happen in the past [4 weeks/30 days]?	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HHSB
c	In the past [4 weeks/30 days] did you or any household member got to sleep at night hungry because there was not enough food?	0= no → Q e 1= yes	HHSC
d	How often did this happen in the past [4 weeks/30days]?	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HHSD
e	In the past [4 weeks/30 days] did you or any household member go a whole day and night without eating anything at all because there was not enough food?	0= no → Q 30 1= yes	HHSE
f	How often did this happen in the past [4 weeks/30 days]	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HHSF
30	In the past 12 months did your household experience a hungry season? <i>The hungry season means the number of months a household does not have enough food because their own food stores are depleted and they do not have enough money to buy food.</i>	0= no → Q 32 1= yes 88= don't know	HUNSEAS
31	During what month did the hungry season begin, when did it end? Probe: Early, mid or end of month?	Month begun: _____ Month ended: _____	HBEGUN HENDED

Possessions and income

32	Does any member of this household own any land that can be used for agriculture?	0= no → Q 34 1= yes	HHLAND	
33	How many hectares of agricultural land do members of this household own? <i>If more than 97, record '97'. If unknown, record '00'.</i>	square meters: ray A kong hectares:	LANDSQM LANDRAI LANDAR LANDKONG LANDHEC	
34	Do you sometimes hire labour for household or agriculture activities?	0= no 1= yes	HIRELAB	
35	Do you have a home garden?	0= no → Q 38 1= yes	HOMEGAR	
36	Do you grow vegetables?	0= no → Q 38 1= yes	GARVEG	
37	Main use of vegetable products	1= mainly own consumption 2= mainly for sale	USEVEG	

		3= both (in approx. equal amounts) 99= other (specify):		
38	Do you grow fruits?	0= no → Q 40 1= yes	GARFRUIT	<input type="checkbox"/>
39	Main use of fruits	1= mainly own consumption 2= mainly for sale 3= both (in approx. equal amounts) 99= other (specify):	USEFRU	<input type="checkbox"/>
40	Does this household own any livestock herds, or farm animals, or poultry?	0= no → Q 43 1= yes	ANIMALS	<input type="checkbox"/>
41	How many of the following livestock does your household own?			Number
	water buffalo		BUFFALO	<input type="checkbox"/>
	cows or bulls		CATTLE	<input type="checkbox"/>
	horses, donkeys, or mules		DONKEY	<input type="checkbox"/>
	goats/sheep		SHEEP	<input type="checkbox"/>
	pigs		PIG	<input type="checkbox"/>
	chickens or ducks		CHICKEN	<input type="checkbox"/>
	other (specify) :		OANIM	<input type="checkbox"/>
42	For what reason do you keep animals?	1= mainly own consumption 2= mainly for sale 3= both (in approx. equal amounts) 99= other (specify):	REAANIM	<input type="checkbox"/>
43	Does your household have any of the following functioning items:		0= no 1= yes	
	radio?		POSRAD	<input type="checkbox"/>
	television?		POSTEL	<input type="checkbox"/>
	mobile telephone?		POSMOB	<input type="checkbox"/>
	non-mobile telephone?		POSNMO	<input type="checkbox"/>
	wardrobe?		POSWAR	<input type="checkbox"/>
	sewing machine or a loom?		POSSEW	<input type="checkbox"/>
	CD/DVD player?		POSDVD	<input type="checkbox"/>
	generator/battery/solar-panel?		POSGEN	<input type="checkbox"/>
	watch?		POSWAT	<input type="checkbox"/>
44	Do you or anyone in your household own any of the following functioning items:			
	bicycle/cyclo?		POSBICY	<input type="checkbox"/>
	motorcycle/scooter?		POSMOT	<input type="checkbox"/>
	motorcycle-cart?		POSMCA	<input type="checkbox"/>
	car/truck/van?		POSCAR	<input type="checkbox"/>
	boat?		POSBO	<input type="checkbox"/>
	Ox/horse-cart		POSOXC	<input type="checkbox"/>
	hand-tractor		POSHT	<input type="checkbox"/>















Participation in CBO-Activities












45	Are you or is anyone in your household an active member in a CBO?	0= no → part II 1 = yes	MEMCBO	<input type="checkbox"/>
46	What kind of program did you participate in? <i>More than one answer possible</i>	0= no 1 = yes		
	Hand-tractor Group	CBO1	<input type="checkbox"/>	<input type="checkbox"/>
	Saving Group	CBO2	<input type="checkbox"/>	<input type="checkbox"/>
	Disaster and Risk Management Group	CBO3	<input type="checkbox"/>	<input type="checkbox"/>
	Water and Irrigation Group	CBO4	<input type="checkbox"/>	<input type="checkbox"/>
	Rice Bank Group	CBO5	<input type="checkbox"/>	<input type="checkbox"/>
	Others (please specify):	CBO6	<input type="checkbox"/>	<input type="checkbox"/>

Part II: Questionnaire for Children under 2 years

Child Health

1	Is your child a boy or a girl?	1= male 2= female	CHSEX	<input type="checkbox"/>
2	Where was your baby delivered?	1= provincial hospital 2= referral hospital 3= health center 4= at home 99= other (specify):	CHDELIV	<input type="checkbox"/>
3	Is there a yellow card of the child available? <i>If card available please record information on vaccination directly from card.</i>	0= no → Q 4 1= yes, seen 2= yes, not seen → Q 4	VACCARD	<input type="checkbox"/>
3a	Copy vaccinations from the card.			no = 0 yes = 1
	BCG	BCGVC	<input type="checkbox"/>	<input type="checkbox"/>
	HB 0 (given at birth)	HB0VC	<input type="checkbox"/>	<input type="checkbox"/>
	Polio 0 (Polio given at birth)	POL0VC	<input type="checkbox"/>	<input type="checkbox"/>
	Polio 1	POL1VC	<input type="checkbox"/>	<input type="checkbox"/>
	Polio 2	POL2VC	<input type="checkbox"/>	<input type="checkbox"/>
	Polio 3	POL3VC	<input type="checkbox"/>	<input type="checkbox"/>
	DTC 1	DTC1VC	<input type="checkbox"/>	<input type="checkbox"/>
	DTC 2	DTC2VC	<input type="checkbox"/>	<input type="checkbox"/>
	DTC 3	DTC3VC	<input type="checkbox"/>	<input type="checkbox"/>
	Measles	MEASVC	<input type="checkbox"/>	<input type="checkbox"/>
	If card is complete → Q 9			
4	Has (name of child) ever been given a BCG vaccination against tuberculosis – that is, an injection in the arm or shoulder that caused a scar?	0= no 1= yes 88= don't know	BCG	<input type="checkbox"/>

5	Has (name of child) ever been given “DTC 1-3” – that is, an injection in the thigh or buttocks?	0= never 1= once 2= twice 3= three times or more 88= don't know	DPT	
6	Has (name of child) ever been given any polio vaccination drops in the mouth?	0= never 1= once 2= twice 3= more than twice 88= don't know	OPV	
7	Has (name of child) ever been given “Measles vaccination injections” or MMR – that is, a shot in the arm at the age of 9 months or older?	0= no 1= yes 88= don't know	MEASLES	
8	A hepatitis B vaccination against hepatitis, that is, an injection given in the right thigh in the first weeks after birth?	0= no 1= yes 88= don't know	HB0	
9	Within the last six months was (name of child) given a vitamin A dose like any of these? <i>Ask mother if she has a written report when (name of the child) has received the last vitamin A supplement!</i> <i>Show common types of vitamin A ampules/ capsules</i>	0= no 1= yes 88= don't know	VITA	
10	Has (name of child) taken any drug for intestinal worms in the last 6 months? <i>Show common package of tablets</i>	0= no 1= yes 88= don't know	DEWORM	
11	Does (name of child) sleep under an insecticide treated net (ITN) or mosquito net?	0= no 1= ITN 2= mosquito net 88= don't know	CHITN	
12	Has (name of child) had fever in the past two weeks that is, since (day of the week) of the week before last?	0= no → Q 16 1= yes 88= don't know	CHFEV	
13	Has (name of child) had fever with chills (Malaria) in the past two weeks that is, since (day of the week) of the week before last?	0= no 1= yes 88= don't know	CHMAL	
14	Now I would like to know how much (name of child) was given to drink (including breast milk) during illness with fever. Was he/she given less than usual to drink, about the same amount, or more than usual to drink? <i>If less, PROBE: Was he/she given much less than usual to drink or somewhat less?</i>	1= much less 2= somewhat less 3= about the same 4= more 5= nothing 88= don't know	FEVDRINK	
15	When (name of child) had a fever was he/she given less than usual to eat, about the same amount, more than usual or nothing to eat? <i>If less, PROBE: Was he/she given much less than usual to eat or somewhat less?</i>	1= much less 2= somewhat less 3= about the same 4= more 5= stopped food 6= does not yet take food 88= don't know	FEVEAT	
16	In the event of fever, did you seek advice for treatment from any source?	0= no → Q 18 1= yes 2= never had fever → Q 18 88= don't know	FEVADV	
17	Where did you seek advice for treatment?	1= provincial hospital 2= referral hospital 3= health center 4= pharmacy 5= traditional practitioner 6= private clinic 7= Market 99= Other (specify)	FEVTREAT	
18	Has (name of child) had diarrhea in the past two weeks, that is, since (day of the week) of the week before last? <i>Diarrhea is determined as perceived by mother or caretaker, or as three or more loose or watery stools per day, or blood in stool.</i>	0= no → Q 21 1= yes 88= don't know	CHDIAR	

19	<p>Now I would like to know how much (name of child) was given to drink (including breast milk) during illness with diarrhea. Was he/she given less than usual to drink, about the same amount or more than usual to drink?</p> <p><i>If less, PROBE:</i> Was he/she given much less than usual to drink or somewhat less?</p>	<p>1= much less 2= somewhat less 3= about the same 4= more 5= nothing 88= don't know</p>	DIADRINK	
20	<p>When (name of child) had a diarrhea was he/she given less than usual to eat, about the same amount, more than usual or nothing to eat?</p> <p><i>If less, PROBE:</i> Was he/she given much less than usual to eat or somewhat less?</p>	<p>1= much less 2= somewhat less 3= about the same 4= more 5= stopped food 6= does not yet take food 88= don't know</p>	DIAEAT	
21	In the event of diarrhea, did you seek advice for treatment from any source?	<p>0= no → Q 23 1= yes 2= never had diarrhea → Q 23 88= don't know</p>	DIAADV	
22	Where did you seek advice for treatment?	<p>1= provincial hospital 2= referral hospital 3= health center 4= pharmacy 5= traditional practitioner 6= private clinic 7= market 99= other (specify)</p>	DIATREAT	
23	Has (name of child) had an illness with a cough at any time in the past two weeks, that is, since (day of the week) of the week before last?	<p>0= no → Q 28 1= yes 88= don't know</p>	CHARI	
24	When (name of child) had an illness with a cough, did he/she breathe faster than usual with short, quick breaths or have difficulty breathing?	<p>0= no 1= yes 88= don't know</p>	CHARIBR	
25	Were the symptoms due to a problem in the chest or a blocked nose?	<p>1= problem in chest 2= blocked nose 3= both 99= other (specify) 88= don't know</p>	CHARISYM	
26	<p>Now I would like to know how much (name of child) was given to drink (including breast milk) during illness with cough. Was he/she given less than usual to drink, about the same amount or more than usual to drink?</p> <p><i>If less, PROBE:</i> Was he/she given much less than usual to drink or somewhat less?</p>	<p>1= much less 2= somewhat less 3= about the same 4= more 5= nothing 88= don't know</p>	ARIDRINK	
27	<p>When (name of child) had a cough was he/she given less than usual to eat, about the same amount, more than usual or nothing to eat?</p> <p><i>If less, PROBE:</i> Was he/she given much less than usual to eat or somewhat less?</p>	<p>1= much less 2= somewhat less 3= about the same 4= more 5= stopped food 6= does not yet take food 88= don't know</p>	ARIEAT	
28	In the event of a cough, did you seek advice for treatment from any source?	<p>0= no → Q 30 1= yes 2= never had ARI → Q 30 88= don't know</p>	ARIADV	
29	Where did you seek advice for treatment?	<p>1= provincial hospital 2= referral hospital 3= health center 4= pharmacy 5= traditional practitioner 6= private clinic 7= Market 99= Other (specify)</p>	ARITREAT	

Breast feeding and complementary feeding practices

30	Has (name of child) ever been breastfed?	0= no 1= yes 88= don't know	IBFQ10	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
31	How long after birth did (name of child) had skin-to-skin contact with the mother?	Within one hour= 00 Hours (01-24 hours after birth) Days (record number of days) 88= don't know	SKINCON	<div style="display: flex; flex-direction: column; align-items: flex-end;"> <div><1 hour <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> <div>Hours <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> <div>Days <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> <div>don't know <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> </div>
31a	How long after birth was (name of child) first put to the breast?	Within one hour= 00 Hours (01-24 hours after birth) Days (record number of days) 88= don't know	IBFQ11	<div style="display: flex; flex-direction: column; align-items: flex-end;"> <div><1 hour <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> <div>Hours <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> <div>Days <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> <div>don't know <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div></div> </div>
32	a) Was (name of child) given anything to drink before the first breastfeeding? (= pre-lacteal food) b) Was (name of child) given anything apart from breast milk within the first 3 days? (= early supplementary feeding) <i>Read each item aloud and record response before proceeding to the next item.</i> RECORD: 0= no, 1= yes, 88= don't know		PLF	<div style="text-align: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <div>0= → b) 88= → b)</div> </div>
			ESPF	<div style="text-align: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <div>0= → 33 88= → 33</div> </div>
		pre-lacteal food	early supplementary feeding	
	Milk other than breast milk? (tinned, powdered or fresh animal milk)	PREMILK	REMILK	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Plain water?	PREWAT	RESWAT	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Sugar- or glucose-water?	PRESUGAR	RESUGAR	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Sugar-salt-water solution?	PRESUSAW	RESUSAW	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Fruit juice?	PREJUICE	REJUICE	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Infant formula	PREFORM	REFORM	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Tea/infusion like Thnam khmer?	PRETEA	RETEA	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Porridge?	PREPOR	REPOR	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Watery porridge?	PREWPOR	REWPOR	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Mashed food, including porridge?	PREFOOD	REFOOD	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
	Other foods/liquids (please specify)?	PRELIQU	RELIQU	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
33	Did you or another family member/caretaker ever give (name of the child) any drink like Thnam Khmer or other traditional medicine?	0= no → Q 34 1= yes 88= don't know → Q 34	RETRADM	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
33a	At what age did (name of child) first receive this food or drink?	Record age in months: 88= don't know	ADTHNAK	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>

34	Was (name of child) breastfed yesterday during day or at night?	0= no 1= yes → Q 38 88= don't know	IYCFQ7	<div><div></div><div></div><div></div></div>
35	Is (name of child) still being breastfed?	0= no 1= yes → Q 40 88= don't know	BFSTILL	<div><div></div><div></div><div></div></div>
36	If the child is not breastfed anymore, at what age (in month) was breastfeeding stopped? <i>(please verify by using the local calendar)</i>	Record age in months: 88= don't know	BREASTOP	<div><div></div><div></div><div></div></div>
37	Why was breastfeeding stopped?	1= not enough milk 2= feel too weak 3= wanted to stop (child old enough) 4= no time to breastfeed 5= pregnancy 6= breastfeeding younger child 7= baby wanted to stop 99= other (specify):	WHYSTOP	<div><div></div><div></div><div></div></div> → 41
38	How many times was (name of child) breastfed yesterday during day and night?	Number of times during the day: ____	BFFREQD	Day <div><div></div><div></div><div></div></div>
		Number of times during the night: ____ 88= don't know	BFFREQN	Night <div><div></div><div></div><div></div></div>
39	Was (name of child)'s breastfeed yesterday more or less than usual?	1= more than usual 2= less than usual 3= same as usual 88= don't know	BFUSUAL	<div><div></div><div></div><div></div></div>
40	How often do you offer the breast when (name of child) is ill?	1= more than usual 2= less than usual 3= same as usual 88= don't know	ILLBREAST	<div><div></div><div></div><div></div></div>
41	Did (name of child) consume breast milk in any other way yesterday during the day or at night? e.g. by spoon, cup or bottle; by his/her mother or another woman	0= no 1= yes 88= don't know	IYCFQ7A	<div><div></div><div></div><div></div></div>
42	Do you feed your baby any type of liquids with a bottle?	0= no → Q 44 1= yes 88= don't know	IYCFQ15	<div><div></div><div></div><div></div></div>
43	Which liquids do you feed your baby in a bottle?	1= water 2= infant formula 3= juice 4= tea 5= watery porridge 99= other (specify):	FOOBOT	<div><div></div><div></div><div></div></div>
44	Now I would like to ask you about some liquids that (name of child) may have had yesterday during the day or night. Did (name of child) have any <i>Read each item aloud and record response before proceeding to the next item.</i> RECORD: 0= no, 1= yes, 88= don't know			
	Plain water?		IYCFQ10A	<div><div></div><div></div><div></div></div>
	Vitamin, mineral supplements or medicine?		IYCFQ8	<div><div></div><div></div><div></div></div>
	Oral rehydration solution (ORS)? <i>Show ORS displays Care Plus, Electral from WHO, Oralite (by HC)</i>		IYCFQ9	<div><div></div><div></div><div></div></div>
	Juice or juice drinks?		IYCFQ10D	<div><div></div><div></div><div></div></div>
	Watery porridge?		IYCFQ10G	<div><div></div><div></div><div></div></div>
	Clear broth like soup?		IYCFQ10E	<div><div></div><div></div><div></div></div>

Infant formula?	IYCFQ10B	<input type="checkbox"/>	
Tinned, powdered or tetrapack milk?	IYCFQ10C	<input type="checkbox"/>	
Sour milk?	IYCFQ10F	<input type="checkbox"/>	
<p>If child consumed infant formula, tinned, powdered or pasteurized milk (tin/can or package) or sour milk :</p> <p>How many times yesterday infant formula, tinned, powdered or pasteurized milk (tin/can or package) or yoghurt drink: during the day or night did (name of child)?</p> <p>Record number of times</p> <p>88= don't know</p>	infant formula	IYCFQ11B	<input type="checkbox"/>
	tinned, powdered or pasteurized milk (tin/can or package)	IYCFQ11C	<input type="checkbox"/>
	Sour milk	IYCFQ11F	<input type="checkbox"/>
Any other liquids such as sweetened, flavored water or tea or infusion like Thnam khmer?	IYCFQ10H	<input type="checkbox"/>	
Any other liquids?	IYCFQ10I	<input type="checkbox"/>	

45	<p>Please describe everything that (name of child) ate yesterday during the day or night, whether at home or outside the home.</p> <p>a) Think about when (name of child) first woke up yesterday. Did (name of child) eat anything at that time? If Yes, please tell me everything (name of child) ate at that time. <i>Probe: Anything else? Then continue to question b)</i></p> <p>b) What did (name of child) do after that? Did (name of child) eat anything at that time? If yes, please tell me everything that (name of child) ate at that time. <i>Probe: Anything else? Probe for any meals/snacks not mentioned</i></p> <p><i>Continue through the day, repeating question b until respondent indicates child went to sleep until the next day. If respondent mentions a mixed dish like a porridge, relish or stew, ask about all ingredients that went into the dish, including added oil, sugar or condiments. When the recall is complete, fill in the food groups based on the foods mentioned during the recall. For any food groups not mentioned, ask: "Yesterday during the day or night, did (name of child) eat any foods such as (read examples of food group items)"</i></p> <p>RECORD: 0= no, 1= yes, 88= don't know</p>						
Breakfast	Snack	Lunch	Snack	Dinner	Snack	Night	
<p>After completing the past 24h, ask the mother:</p> <p>How often during the past 7 days did (name of child) eat these foods?</p> <p>Record the number of days in the column on the far right</p>				<p>Past 24h</p> <p>0= no</p> <p>1= yes</p> <p>88= don't know</p>		<p>Number of days</p>	
Porridge, bread, rice, noodles, corn, or other foods made from grains/cereals				IYCFQ12A	<input type="checkbox"/>	FQ1	<input type="checkbox"/>
Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside				IYCFQ12B	<input type="checkbox"/>	FQ2	<input type="checkbox"/>
White potatoes, white yams, manioc, cassava, taro, or any other foods made from roots				IYCFQ12C	<input type="checkbox"/>	FQ3	<input type="checkbox"/>
Any dark green leafy vegetables				IYCFQ12D	<input type="checkbox"/>	FQ4	<input type="checkbox"/>

Ripe mangoes, ripe papayas, or musk melon (Vitamin A rich foods)		IYCFQ12E	<input type="checkbox"/>	FQ5	<input type="checkbox"/>
Any other fruits or vegetables		IYCFQ12F	<input type="checkbox"/>	FQ6	<input type="checkbox"/>
Liver, kidney, heart, or other organ meats or blood products		IYCFQ12G	<input type="checkbox"/>	FQ7	<input type="checkbox"/>
Any meat, such as beef, pork, lamb, goat, chicken, mice, rabbit or...		IYCFQ12H	<input type="checkbox"/>	FQ8	<input type="checkbox"/>
Eggs		IYCFQ12I	<input type="checkbox"/>	FQ9	<input type="checkbox"/>
Fresh or dried fish, shellfish, or seafood		IYCFQ12J	<input type="checkbox"/>	FQ10	<input type="checkbox"/>
Any foods made from beans, peas, lentils, soya, nuts, or seeds		IYCFQ12K	<input type="checkbox"/>	FQ11	<input type="checkbox"/>
Yogurt or other milk products		IYCFQ12L	<input type="checkbox"/>	FQ12	<input type="checkbox"/>
Any fat, oil or lard or foods made with any of these		IYCFQ12M	<input type="checkbox"/>	FQ13	<input type="checkbox"/>
Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits, soda, bubble tea, condensed milk, sugar cane, palm sugar		IYCFQ12N	<input type="checkbox"/>	FQ14	<input type="checkbox"/>
Condiments for flavor, such as chilies, spices, herbs, or fish powder, fish sauce		IYCFQ12O	<input type="checkbox"/>	FQ15	<input type="checkbox"/>
Insects (red ants, grasshoppers, crickets), grubs		IYCFQ12P	<input type="checkbox"/>	FQ16	<input type="checkbox"/>
Other foods?					
46	Did (name of child) receive solid, semi-solid or soft food yesterday?	0= no → Q 53 1= yes 88= don't know → Q 53	IYCFQ13		<input type="checkbox"/>
47	How many times did (name of child) receive solid, semi-solid or soft food yesterday?	Record number of times 88= don't know	IYCFQ14		<input type="checkbox"/>
48	Yesterday, during the day or night, did (name of child) consume any food to which you added: <i>Read each item aloud and record response before proceeding to the next item.</i> RECORD: 0= no, 1= yes, 88= don't know				
	Iron fortified solid, semi-solid or soft foods or biscuits (specifically designed for children)?		IFFQ1		<input type="checkbox"/>
	Powder or sprinkles?		IFFQ2		<input type="checkbox"/>
	Fat based nutrient supplement?		IFFQ3		<input type="checkbox"/>
	Iron fortified infant/toddler formula?		IFFQ4		<input type="checkbox"/>
49	Did you prepare special meals for (name of child) yesterday?	0= no 1= yes → Q51	SPMEAL		<input type="checkbox"/>
50	What prevented you to prepare special meals for (name of child) yesterday?	1= don't know how to do 2= lack of time 3= no food available 99= other (specify)	SPMPREV		<input type="checkbox"/>
51	At what age did you start giving (name of child) other liquids or food apart from breast milk? <i>(Please verify by asking other household members and by using the local calendar)</i>	Record age in months 88= don't know 00= does not yet take food	CFAGE		<input type="checkbox"/>
52	Was (name of child)'s intake of solid, semi-solid or soft food yesterday different from usual?	0= no 1= yes 88= don't know	CFUSUAL		<input type="checkbox"/>

Food Selection

53	Are there any foods that you should not feed your child?	0= no → part III 1= yes 88 = don't know → part III	FOOTAB	<input type="checkbox"/>
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53 a	Which foods?	0= no 1= yes		
	meat and meat products		FOOTAB1	<input type="checkbox"/>
	milk and milk products		FOOTAB2	<input type="checkbox"/>
	raw vegetables		FOOTAB3	<input type="checkbox"/>
	spices		FOOTAB4	<input type="checkbox"/>
	other (specify):		FOOTAB5	<input type="checkbox"/>

Part III: Questionnaire for Mother/Caretaker

1	Ask only if respondent is mother of child! During your <u>last</u> pregnancy and/or lactating period did you receive any iron tablets?	0= no 1= yes 88= don't know	SUPPLEM	<input type="checkbox"/>
2	Do you use iodized salt for cooking?	0= no 1= yes 88= don't know	IODSALT	<input type="checkbox"/>
3	Do you know what causes anemia? <i>If yes, probe for explanation of anemia.</i>	0= no 1= yes (Iron deficiency)	DEFIRON	<input type="checkbox"/>
3a	Please name 3 foods that are rich in iron <i>Record foods:</i>		FOODIRON	
4	Do you know what causes night blindness? <i>If yes, probe for explanation of Vitamin A deficiency</i>	0= no 1= yes (Vitamin A deficiency)	DEFVITA	<input type="checkbox"/>
4a	Please name 3 foods that are rich in vitamin A. <i>Record foods:</i>		FOODVITA	
5	Who do you ask for advice when you have a question about feeding your child? <i>Do not read aloud the list, probe for further responses. More than one answer possible.</i> RECORD: 0= no, 1= yes			
	Respondent is not asking advice from anybody		IFSUPP	if 1= yes → Q6 <input type="checkbox"/>
	Health professional (health worker, nurse, hospital)		IFSUPP1	<input type="checkbox"/>
	Mother		IFSUPP2	<input type="checkbox"/>
	Mother in law		IFSUPP3	<input type="checkbox"/>
	Grandmother		IFSUPP4	<input type="checkbox"/>
	Village Chief		IFSUPP5	<input type="checkbox"/>

	Friend/neighbor	IFSUPP6	<input type="checkbox"/>
	Other (specify)	IFSUPP7	<input type="checkbox"/>
6	Who decides how you feed your baby? <i>Do not read aloud the list, probe for further responses. More than one answer possible.</i> RECORD: 0= no, 1= yes		
	Myself	IFDEC1	<input type="checkbox"/>
	Husband/partner	IFDEC2	<input type="checkbox"/>
	Grandmother of respondent	IFDEC3	<input type="checkbox"/>
	Mother of respondent	IFDEC4	<input type="checkbox"/>
	Mother in law	IFDEC5	<input type="checkbox"/>
	Other (specify)	IFDEC6	<input type="checkbox"/>
7	Can you tell me what causes diarrhea? <i>Do not read aloud the list, probe for further responses. More than one answer possible.</i> RECORD: 0= no, 1= yes		
	Respondent cannot tell what causes diarrhea	CAUSDIA	if 1= yes → Q8 <input type="checkbox"/>
	Contaminated food	CAUSDIA1	<input type="checkbox"/>
	Contaminated water	CAUSDIA2	<input type="checkbox"/>
	Contaminated hands	CAUSDIA3	<input type="checkbox"/>
	Flies	CAUSDIA4	<input type="checkbox"/>
	Eating greens	CAUSDIA5	<input type="checkbox"/>
	Other (specify)	CAUSDIA6	<input type="checkbox"/>
8	Can you name any ways to help to prevent from getting diarrhea? <i>Do not read aloud the list, probe for further responses. More than one answer possible.</i> RECORD: 0= no, 1= yes		
	Respondent does not know any way to prevent diarrhea	PREVDIA	if 1= yes → Q9 <input type="checkbox"/>
	Washing hands	PREVDIA1	<input type="checkbox"/>
	Use latrine or bury feces	PREVDIA2	<input type="checkbox"/>
	Boil or filter drinking water	PREVDIA3	<input type="checkbox"/>
	Exclusive breast feeding	PREVDIA4	<input type="checkbox"/>
	Protect food and water supplies with cover	PREVDIA5	<input type="checkbox"/>
	Other (specify)	PREVDIA6	<input type="checkbox"/>

9	Does your HH have soap (or washing powder/ liquid) at present?	0= no → Q 12 1= yes 88= don't know → Q 12	HHSOAP	<input type="checkbox"/>
10	Did you ever use soap yesterday or today?	0= no → Q 12 1= yes	SOAPYEST	<input type="checkbox"/>
11	<p>When you used soap today or yesterday, what did you use it for?</p> <p>If "for washing my hands" is mentioned, probe what was the occasion, but do not read the answers!</p> <p><i>(Do not read the answers, ask to be specific, encourage "what else" until nothing further is mentioned and check all that applies)</i></p> <p>RECORD: 0= no, 1= yes</p>			
	Washing clothes		WCHLOTH	<input type="checkbox"/>
	Washing my body		WBODY	<input type="checkbox"/>
	Washing my children		WCHILD	<input type="checkbox"/>
	Washing children's bottoms		WCHILDB	<input type="checkbox"/>
	Washing my children's hands		WCHILDH	<input type="checkbox"/>
	Washing hands after defecating		WCHILDD	<input type="checkbox"/>
	Washing hands after cleaning child		WAFTERC	<input type="checkbox"/>
	Washing hands before feeding child		WBEFFED	<input type="checkbox"/>
	Washing hands before preparing food		WBEFFOOD	<input type="checkbox"/>
	Washing hands before eating		WBEFEAT	<input type="checkbox"/>
	Other (Specify)		WOTHER	<input type="checkbox"/>
12	On average how much time do you spend for household chores and working in the garden or field per day?	Time in hours:	TIMEHHC	<input type="checkbox"/>
13	Who is taking care of your child/children when you have to go out?	1= respondent 2= spouse of respondent 3= elder children 4= grandparent of child 99= other (specify)	CARECH1	<input type="checkbox"/>
14	Who is taking care of your children when you are sick?	1= respondent 2= spouse of respondent 3= elder children 4= grandparent of child 5= friends/neighbors 99= other (specify)	CARECH2	<input type="checkbox"/>
15	In the past month did you see or hear any messages about child feeding?	0= no → Q 16 1= yes 88= don't know → Q 16	MESSCHF	<input type="checkbox"/>
15a	If yes: Where did you see or hear it?	1= Health Centre, Hospital 2= CBO 3= NGO 99= other (specify)	MESSLOC	<input type="checkbox"/>
16	In the past 3 months did you attend a cooking demonstration on how to feed a child under 2 years of age?	0= no 1= yes 88= don't know	COOKDEM	<input type="checkbox"/>

Thank the mother for her time and cooperation. Tick the respective boxes in her participant card. Hand over the filled out questionnaire, consent form and participant card and send the mother with her child to the anthropometric measurement station.

Time interview ended: ☐☐: ☐☐

Impact Survey

Part I: Household Questionnaire

Date: _____

Name of Mother/ Caregiver: _____

Name of Child: _____

ID Interviewer:

Time interview started: :

Registration





Identity Number of the household		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
		Province	District	Commune	Village	Household	Child	
1	Do you have a written record of your child's date of birth (such as yellow card or birth certificate)? <i>Ask the mother to show you the written record and record the birthdate from it.</i>	BIRTHDAT			<input type="text"/> . <input type="text"/> . <input type="text"/>			
					Day Month Year			
1a	Use the local calendar and ask: Do you remember a local event (or the season) when your child was born? Use this as the starting point to begin to narrow down the month and year of birth of the child by asking further questions.	BIRTHCAL			<input type="text"/> . <input type="text"/>			
					Month Year			
2	Sex of the child	1=male 2=female	CHSEX					<input type="text"/>

If the child was born before 09/2012, thank the mother for her time and end interview.












Demographic Data

3	What is your relationship to your child? <i>Make sure respondent is the primary caregiver!</i>	1= Mother 2= Father 3= Grandmo {0, no}... ther 4= relative of mother or father 5= older sibling of the child 99= other(specify): _____	RELTOCH	<input type="text"/>
4	What is your current marital status?	1= married 2= widowed 3= divorced 4= single 99= other (specify): _____	HEADMAR	<input type="text"/>
5	Who is the household head?	1= respondent 2= spouse of respondent 3= female elderly 4= male elderly 99= other (specify): _____	HEADHH	<input type="text"/>
6	How many people live permanently in your household? <i>Ask for each age group separately!</i>	0-2 years	HHMEM2	<input type="text"/>
		3-5 years	HHMEM5	<input type="text"/>
		6-15 years	HHMEM15	<input type="text"/>
		16-49 years	HHMEM49	<input type="text"/>
		Older than 50 years	HHMEM50	<input type="text"/>
7	Have you ever attended school?	0= no → Q 9 1= yes	EDUCMO	<input type="text"/>
8	What is the highest level of school you completed: primary, secondary, or higher?	1= informal education 2= some primary 3= completed primary (Grade 6) 4= some secondary 5= completed secondary (Grade 12) 6= more than secondary	EDUCLEV	<input type="text"/>

9	<i>If the respondent is the household head, go to Q 10!</i> What is the highest level of school the head of the household attended: primary, secondary, or higher?		0= no school 1= informal education 2= some primary 3= completed primary (Grade 6) 4= some secondary 5= completed secondary (Grade 12) 6= more than secondary 88= don't know		EDUCHH	<input type="text"/>																			
10	<i>Ask respondent if he/she can read!</i> <i>If yes, ask further:</i> Now I would like you to read this sentence to me <i>Show card to the respondent, if the respondent cannot read easily ask "can you read any part of the sentence to me?"</i>		1= cannot read at all 2= able to read part of the sentence 3= able to read the entire sentence 4= no card with required language 5= blind or visually impaired		READRES	<input type="text"/>																			
11	What is the main source of income of your household throughout the year? <i>Multiple answers possible, record up to 3 with priority!</i>		1= sale of agricultural products (crops/ livestock) 2= sale of homemade crafts 3= sale of firewood/charcoal 4= casual labour 5= petty trade small business 6= employment/salary 7= loan 8= cash remittance 9= safety net labour 10= none 99= other (specify):_____		INCYEARA	<input type="text"/>																			
					INCYEARB	<input type="text"/>																			
					INCYEARC	<input type="text"/>																			
12	In the past year have you worked outside the country (e.g. migration to Thailand) for a certain period of the year?		0= no → Q 13 1= yes		MIGRMO	<input type="text"/>																			
12a	Please indicate months when you have been working outside the country?																								
Sept 2013		October 2013		November 2013		December 2013		January 2014		February 2014		March 2014		April 2014		May 2014		June 2014		July 2014		August 2014		Sept 2014	
<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>	
12b	Did you take (name of the child) with you?					0= no 1= yes					MIGRCH		<input type="text"/>												
Living Conditions																									
13	<i>Probe: What kind of house do you live in?</i> How many rooms in your house are used for sleeping?					Number of rooms					NOROOM		<input type="text"/>												
14	What is the main material of the floor?					1= Natural floor: earth/sand/clay, dung 2= Rudimentary floor: wood planks, palm/ bamboo 3= Finished floor: ceramic tiles, cement tiles, cement 99= other (specify):_____					MATFLO		<input type="text"/>												
15	Is the cooking usually done in the house, in a separate building, or outdoors?					1= in the house 2= in a separate building 3= outdoors					HHCOOK		<input type="text"/>												
16	What type of cooking stove household mainly use for cooking?					1= lao stove 2= other fuel efficient stove 3= open fire/ fire place outside 99= other (specify):_____					COOKEN		<input type="text"/>												
17	What is the main source of drinking water during the wet season for members of your household?					1= piped water into dwelling, yard or plot, public tap/standpipe, tubewell/ borehole, protected dug well, protected spring, rainwater collection 2= unprotected well, unprotected spring, tanker-truck, cart with small tank/drum, surface water (river, stream, dam, lake, pond, canal, irrigation channel), bottled water 99 = other (specify):_____					DRINKWA		<input type="text"/>												
18	Do you treat your water in any way to make it safer to drink?					0= no → Q 20 1= yes 88= don't know → Q 20					WATSAFE		<input type="text"/>												

19	How do you usually treat your water before you drink it? <i>2 answers possible, record with priority!</i>	1= boil 2= add bleach/chlorine 3= strain it through a cloth 4= use a ceramic filter 5= let it stand and settle 88= don't know 99= other (specify): _____	WTREAT1 WTREAT2	 
20	What kind of toilet facility do members of your household usually use?	1= Flush / pour flush to: piped sewer system, septic tank, pit (latrine), unknown place/ not known where, Ventilated Improved Pit latrine (VIP), pit latrine with slab, composting toilet 2= Flush/ pour flush to elsewhere, pit latrine without slab/open pit, bucket, hanging toilet/hanging latrine, no facilities or bush or field 99= other (specify): _____	LATRINE	
21	How long does it take to reach to the nearest health facility for treatment? (one way)	1= less than 1 hour 2= more than 1 hour and less than 3 hours 3= between 3 hours and half a day 4= more than half a day 88= don't know	TIMEHEAL	

Household Food Insecurity Access Scale

22	READ TO RESPONDENT: "For each of the following questions, consider whether this has happened in the past 4 weeks. If the answer is yes to a question, please indicate how often this happened."			
a	In the past [4 weeks/30days] did you worry that your household would not have enough food?	0= no → Q c 1= yes	HFIASA	
b	How often did this happen in the past [4 weeks/30 days]?	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HFIASB	
c	In the past [4 weeks/30days], were you or any household member not able to eat the kinds of food you prefer because of a lack of resources?	0= no → Q e 1= yes	HFIASC	
d	How often did this happen in the past [4 weeks/30 days]?	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HFIASD	
e	In the past [4 weeks/30days], did you or any household member have to eat a limited variety of foods due to a lack	0= no → Q g 1= yes	HFIASE	
f	How often did this happen in the past [4 weeks/30 days]?	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HFIASF	
g	In the past [4 weeks/30days] did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other	0= no → Q i 1= yes	HFIASG	
h	How often did this happen in the past [4 weeks/30 days]?	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HFIASH	
i	In the past [4 weeks/30days] did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0= no → Q k 1= yes	HFIASI	
j	How often did this happen in the past [4 weeks/30 days]?	1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)	HFIASJ	
k	In the past [4 weeks/30days], did you or any other household member have to eat fewer meals in a day because there was not enough food?	0= no → Q m 1= yes	HFIASK	

i	How often did this happen in the past [4 weeks/30 days]?		1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)		HFIASL	<input type="text"/>							
m	In the past [4 weeks/30days] was there ever no food to eat of any kind in your house because of lack of resources to get food?		0= no → Q o 1= yes		HFIASM	<input type="text"/>							
n	How often did this happen in the past [4 weeks/30 days]?		1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)		HFIASN	<input type="text"/>							
o	In the past [4 weeks/30 days] did you or any household member got to sleep at night hungry because there was not enough food?		0= no → Q q 1= yes		HFIASO	<input type="text"/>							
p	How often did this happen in the past [4 weeks/30days]?		1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)		HFIASP	<input type="text"/>							
q	In the past [4 weeks/30 days] did you or any household member go a whole day and night without eating anything at all because there was not enough food?		0= no → Q 23 1= yes		HFIASQ	<input type="text"/>							
r	How often did this happen in the past [4 weeks/30 days]		1= rarely (1-2 times) 2= sometimes (3-10 times) 3= often (more than 10 times)		HFIASR	<input type="text"/>							
23	In the past 12 months did your household experience a hungry season? The hungry season means the number of months a household does not have enough food because their own food stores are depleted and they do not have enough money to buy that food.		0= no → Q 24 1= yes 88= don't know → Q 24		HUNSEAS	<input type="text"/>							
23a	When did you experience the hungry seasons? <i>Please indicate months when hungry season was experienced</i>												
	Sept 2013	October 2013	November 2013	December 2013	January 2014	February 2014	March 2014	April 2014	May 2014	June 2014	July 2014	August 2014	Sept 2014
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Household access to land and agriculture													
24	Does any member of this household has access to any land that can be used for agriculture?		0= no → Q 27 1= yes		HHLAND	<input type="text"/>							
25	How many hectares of agricultural land do members of this household have access to? <i>If unknown, record '00'.</i>		square meters:	LANDSQM	<input type="text"/>								
			ray	LANDRAI	<input type="text"/>								
			hectares:	LANDHEC	<input type="text"/>								
26	How many different crops do you grow on your land? <i>Write down all crops and record total number!</i>		Record number		CROPDIV	<input type="text"/>							
27	Do you have a homegarden?		0= no → Q 30 1= yes		HOMEGAR	<input type="text"/>							
28	Do you grow any vegetables?		0= no → Q 30 1= yes		GARVEG	<input type="text"/>							
29	What kind of vegetables do you grow in your homegarden since of this season? <i>Record 3 with priority and ask for the main use!</i>												
	1)	HG1	Main use of vegetable?	1= mainly own consumption 2= mainly for sale 3= both (in equal amounts) 99= other (specify):_____		USEVEG1	<input type="text"/>						
	2)	HG2	Main use of vegetable?	1= mainly own consumption 2= mainly for sale 3= both (in equal amounts) 99= other (specify):_____		USEVEG2	<input type="text"/>						

	3)	HG3	Main use of vegetable?	1= mainly own consumption 2= mainly for sale 3= both (in equal amounts) 99= other (specify): _____	USEVEG3	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
30	Do you have any fruit trees at your homestead or accessible to you and your family? e.g banana, mango, papaya etc., not palm sugar tree, not palm tree			0= no → Q 32 1= yes	GARFRU	<input type="checkbox"/>
31	What kind of fruits do you grow/have access to? <i>Record 3 with priority and ask for the main use!</i>					
	1)	FRU1	Main use of fruits	1= mainly own consumption 2= mainly for sale 3= both (in equal amounts) 99= other (specify): _____	USEFRU1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	2)	FRU2	Main use of fruits	1= mainly own consumption 2= mainly for sale 3= both (in equal amounts) 99= other (specify): _____	USEFRU2	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	3)	FRU3	Main use of fruits	1= mainly own consumption 2= mainly for sale 3= both (in equal amounts) 99= other (specify): _____	USEFRU3	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
32	Does your household own any livestock herds, or farm animals, or poultry?			0= no → Q 35 1= yes	ANIMALS	<input type="checkbox"/>
33	How many of the following livestock does your household own?				Record number	
	water buffalo				BUFFALO	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	cows or bulls				CATTLE	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	pigs				PIG	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	chicken				CHICKEN	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	ducks				DUCK	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	other (specify) : _____				OANIM	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
34	For what reason do you keep animals?			1= mainly own consumption 2= mainly for sale 3= both (in approx. equal amounts) 4= for agricultural purpose 5= eat, sale and agriculture 99= other (specify): _____	REAANIM	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
35	Does your household have any of the following functioning items:				0= no 1= yes	
	radio?				POSRAD	<input type="checkbox"/> <input type="checkbox"/>
	television?				POSTEL	<input type="checkbox"/> <input type="checkbox"/>
	mobile telephone?				POSMOB	<input type="checkbox"/> <input type="checkbox"/>
	non-mobile telephone?				POSNMO	<input type="checkbox"/> <input type="checkbox"/>
	wardrobe?				POSWAR	<input type="checkbox"/> <input type="checkbox"/>
	sewing machine or a loom?				POSSEW	<input type="checkbox"/> <input type="checkbox"/>
	CD/DVD player?				POSDVD	<input type="checkbox"/> <input type="checkbox"/>
	generator/battery/solar-panel?				POSGEN	<input type="checkbox"/> <input type="checkbox"/>
	watch?				POSWAT	<input type="checkbox"/> <input type="checkbox"/>
	bicycle/cyclo?				POSBICY	<input type="checkbox"/> <input type="checkbox"/>
	motorcycle/scooter?				POSMOT	<input type="checkbox"/> <input type="checkbox"/>
	motorcycle-cart?				POSMCA	<input type="checkbox"/> <input type="checkbox"/>
	car/truck/van?				POSCAR	<input type="checkbox"/> <input type="checkbox"/>
	boat?				POSBO	<input type="checkbox"/> <input type="checkbox"/>

	Ox/horse-cart	POSOXC	<input type="checkbox"/>
	hand-tractor	POSHT	<input type="checkbox"/>

Household Dietary Diversity					
36	Please describe the foods (meals and snacks) that you or any member of your household ate or drank yesterday during the day and night. Include only foods consumed at home, not those purchased and consumed outside of the home. Start with the first food eaten in the morning.				
<p><i>Write down in the space below all foods and drinks mentioned. When composite dishes are mentioned ask for the list of ingredients. Probe for any meals/snacks not mentioned. When the recall is complete, fill in the food groups based on the foods mentioned during the recall. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.</i></p>					
breakfast	snack	lunch	Snack	dinner	snack

Food group	Examples	0= no, 1= yes	
Cereals	any food such as rice, porridge, bread, instant noodle, Khmer rice noodles	HHDD1	<input type="checkbox"/>
Vitamin A rich vegetables and tubers	pumpkin, carrots, or sweet potatoes that are orange inside + <i>other locally available vitamin-A rich vegetables (e.g. sweet pepper)</i>	HHDD2	<input type="checkbox"/>
White tubers and roots	Purple sweet potatoes, white sweet potatoes, irish potatoes, white yams, cassava, taro, or any white roots and tubers or foods made from these	HHDD3	<input type="checkbox"/>
Dark green leafy vegetables	Including wild, indigenous leafy vegetables: amaranthus, cassava leaves, sweet potato leaves, mustard leaves, pumpkin leaves, ivy gourd leaves, moringa leaves, star gooseberry leaves, morning glory, pak choy	HHDD4	<input type="checkbox"/>
Other vegetables	other vegetables (e.g. tomato, onion, eggplant, chinese cabbage, green pepper, green beans, boiled whole corn, bottle gourd, bitter gourd, sponge gourd, water lily, lettuce)	HHDD5	<input type="checkbox"/>
Vitamin A rich fruits	Ripe papaya (fresh or dried), ripe mangoes (fresh or dried), musk melon	HHDD6	<input type="checkbox"/>
Other fruits	other fruits, including wild fruits, e.g. oranges, lemons, tamarind, sapodilla, banana, water melon, jackfruit, mangosteen, rambutan, lychee, custard apple, dragonfruit, star fruit, star apple, pineapple, longan, longkong, guava, green mango, green papaya, coconut meat	HHDD7	<input type="checkbox"/>
Organ meat (iron rich)	liver, kidney, heart or other organ meats or blood- based foods like blood pudding	HHDD8	<input type="checkbox"/>
Flesh meats	beef, pork, goat, or any wild animal like deer, rabbit, pig, birds, or snail, snake, frog	HHDD9	<input type="checkbox"/>
Poultry	chicken, duck, other birds	HHDD91	<input type="checkbox"/>
Eggs	eggs from chicken, ducks, goose or any other eggs	HHDD10	<input type="checkbox"/>
Fish	fresh or dried fish or shellfish, fermented fish, snails	HHDD11	<input type="checkbox"/>
Legumes, nuts and seeds	beans, lentils, cow peas, pigeon peas, soy beans, mung beans, ground beans, ground nuts, cashews, green gram, chick peas nuts, seeds like lotus seeds, bean sprouts, Lactasoy	HHDD12	<input type="checkbox"/>
Insects	insect larvae, red ants, grasshopper, crickets	HHDD13	<input type="checkbox"/>
Milk and milk products	milk, yogurt drink or other milk products (like powdered milk, AD milk, Red cow milk)	HHDD14	<input type="checkbox"/>
Oils and fats	oil or fats added to food or used for cooking	HHDD15	<input type="checkbox"/>
Sweets	condensed sweet milk, sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies, sugar cane, sugar palm, bubble tea, sweet dessert, sweet milk (Red Cow Milk, Lactasoy)	HHDD16	<input type="checkbox"/>

Spices, condiments, beverages		spices (black pepper, salt, chili, ginger), herbs (lemongrass, lime leaf, krasong, lime, tamarind leaves), condiments (soy sauce, fish sauce, hot sauce), prahok, coffee, tea, tender coconut water, alcoholic beverages as such as: canned beer, rice wine, palm wine	HHDD17	<input type="checkbox"/>
37	Did you or anyone in your household eat anything (meal or snack) OUTSIDE the home yesterday?	0= no 1= yes 88= don't know	HHOUT	<input type="checkbox"/>
38	Was yesterday an unusual day for eating? That is a holiday or festival with special foods or a larger quantity of foods available?	0= no 1= yes	HHNORM	<input type="checkbox"/>
39	Do you use iodized salt for cooking? <i>Show pictures of displays!</i>	0= no 1= yes 88= don't know	IODSALT	<input type="checkbox"/>
40	Do you use fortified fish sauce or soy sauce for cooking? <i>Show pictures of displays!</i>	0= no 1= yes 88= don't know	FORTCO	<input type="checkbox"/>
Participation in FAO/MALIS activities				
41	Are you or is anyone in your household an active member in a Farmer field School (FFS) or Farmer Business School (FBS) of the MALIS project? <i>Show picture of a FFS sessions!</i>	0= no → Q 44 1= yes, respondent 2= yes, other household member 3= both (respondent and household member) 88= don't know → Q 44	MEMFFS	<input type="checkbox"/>
42	If yes, what kind of current/most recent training do you or your family member receive? <i>Read the option aloud and show pictures for each topic!</i>	1= rice 2= chicken 3= cash crops 4= vegetable 5= Farmer Business School 88= don't know 99= other (specify):_____	FFSTOP FFSTOPO	<input type="checkbox"/> <input type="checkbox"/>
43	Have you received any benefit from the MALIS project? <i>Multiple answers possible, record up to 3 with priority!</i>	1= input credit 2= any other input distribution (like seeds, fertilizer, chicken) 3= cooking equipment 4= participation in fairs 88= don't know 99= other(specify):_____	MAINPUT1 MAINPUT2 MAINPUT3	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
44	Do you or anyone in your household currently participate in another agriculture program (like an AC or CBO for the PDA or another NGO)? <i>If yes, ask for the</i> NAME OF PROGRAM:_____ NAME OF ORGANIZATION:_____	0= no 1= yes 88= don't know	FSOTH	<input type="checkbox"/>

Part II: Questionnaire for Children under 2 years

Child Health				
45	Where was your baby delivered?	1= health facility 2= at home, attended by health professional 3= at home, attended by traditional healer 4= unattended 88= don't know	DELIVERY	<input type="checkbox"/>
46	<i>Copy vaccinations from the card, if no card available → Q 47</i>			no = 0 yes = 1
	BCG		BCGVC	<input type="checkbox"/>
	Hepatitis B		HB0VC	<input type="checkbox"/>
	OPV1		POL1VC	<input type="checkbox"/>

	OPV2		POL2VC	<input type="checkbox"/>
	OPV3		POL3VC	<input type="checkbox"/>
	DPT-HepB-Hib 1		DPT1VC	<input type="checkbox"/>
	DPT-HepB-Hib 2		DPT2VC	<input type="checkbox"/>
	DPT-HepB-Hib 3		DPT3VC	<input type="checkbox"/>
	Measles		MEASVC	<input type="checkbox"/>
47	Has (name of child) taken any drug for intestinal worms in the last 6 months? <i>Show common package of tablets</i> <i>Check with yellow card record!</i>	0= no 1= yes 88= don't know	DEWORM	<input type="checkbox"/>
48	Within the last six months was (name of child) given a vitamin A dose like any of these? <i>Show common types of vitamin A ampules/ capsules</i> <i>Check with yellow card record!</i>	0= no 1= yes 88= don't know	VITA	<input type="checkbox"/>
49	Has (name of child) had fever in the past two weeks that is, since (day of the week) of the week before last?	0= no → Q 51 1= yes 88= don't know	CHFEV	<input type="checkbox"/>
50	Has (name of child) had fever with chills (Malaria) in the past two weeks that is, since (day of the week) of the week before last?	0= no 1= yes 88 = don't know	CHMAL	<input type="checkbox"/>
51	Has (name of child) had diarrhea in the past two weeks, that is, since (day of the week) of the week before last? <i>Diarrhea is determined as perceived by mother or caregiver, or as three or more loose or watery stools per day, or blood in stool.</i>	0= no → Q 53 1= yes 88= don't know → Q 53	CHDIAR	<input type="checkbox"/>
52	How was the diarrhea characterized?	1= loose stools (≥ 3 times/day) 2= watery stools (≥ 3 times/day) 3= loose and watery stools (≥ 3 times/day) 4= blood in stool 88= don't know 99= other(specify): _____	DIARDEF	<input type="checkbox"/>
53	Has (name of child) had an illness with a cough at any time in the past two weeks, that is, since (day of the week) of the week before last?	0= no → Q 56 1= yes 88= don't know → Q 56	CHARI	<input type="checkbox"/>
54	When (name of child) had an illness with a cough, did he/ she breathe faster than usual with short, quick breaths or have difficulty breathing?	0= no → Q 56 1= yes 88= don't know → Q 56	CHARIBR	<input type="checkbox"/>
55	Were the symptoms due to a problem in the chest or a blocked nose?	1= problem in chest 2= blocked nose 3= both 88= don't know 99= other (specify): _____	CHARISYM	<input type="checkbox"/>
56	Now I would like to know how much (name of child) was given to drink (including breast milk) during the last episode of illness like diarrhea, cough or fever. Was he/she given less than usual to drink, about the same amount of more than usual to drink? <i>If less, PROBE: Was he/she given much less than usual to drink or somewhat less?</i>	1= much less 2= somewhat less 3= about the same 4= more 5= nothing 88= don't know	ILLDRINK	<input type="checkbox"/>
57	The last time when (name of child) had diarrhea, cough or fever was he/she given less than usual to eat, about the same amount, more than usual or nothing to eat? <i>If less, PROBE: Was he/she given much less</i>	1= much less 2= somewhat less 3= about the same 4= more 5= stopped food 6= does not yet take food	ILLEAT	<input type="checkbox"/>

	than usual to eat or somewhat less?	88 = don't know		
Breast feeding and complementary feeding practices				
58	Has (name of child) ever been breastfed?	0= no → Q 66 1= yes 88= don't know → Q 66	IBFQ10	<input type="text"/>
59	How long after birth was (name of child) first put to the breast?	<1 hour= 00	RECCOL1	<1 hour <input type="text"/>
		Hours (01-24 hours after birth)	RECCOL2	Hours <input type="text"/>
		Days (record number of days)	RECCOL3	Days <input type="text"/>
		88= don't know	RECCOLDK	Don't know <input type="text"/>
60	Is (name of child) still being breastfed?	0= no 1= yes → Q 62	BFSTILL	<input type="text"/>
61	If the child is not breastfed anymore, at what age (in month) was breastfeeding stopped? (please verify by using the local calendar)	Record age in months: 88= don't know → Q 65	AGEBFST	<input type="text"/>
62	Was (name of child) breastfed yesterday during day or at night?	0= no 1= yes → Q 64 88= don't know	IYCFQ7	<input type="text"/>
63	Did (name of child) consume breast milk in any other way yesterday during the day or at night? e.g. by spoon, cup or bottle; by his/her mother or another woman	0= no → Q 65 1= yes 88= don't know → Q 65	IYCFQ7A	<input type="text"/>
64	Was (name of child)'s breastfeed yesterday more or less than usual?	1= more than usual 2= less than usual 3= same as usual 88= don't know	BFUSUAL	<input type="text"/>
65	After your child was born and before you put the child to your breast the first time, was (the name of child) given anything to drink or eat?	0= no 1= yes 88= don't know	PLF	<input type="text"/>
65a	Was (name of child) given anything apart from breast milk within the first 3 days ?	0= no 1= yes 88= don't know	ESPF	<input type="text"/>
66	Do you feed your baby any type of liquids with a bottle?	0= no → Q 68 1= yes 88= don't know	IYCFQ15	<input type="text"/>
67	Which liquids do you usually feed your baby in a bottle?	1= water 2= infant formula 3= juice 4= tea 5= watery porridge 99= other (specify): _____	FOOBOT	<input type="text"/>
68	Now I would like to ask you about some liquids that (name of child) may have had yesterday during the day or night. Did (name of child) have any..... <i>Read each item aloud and record response before proceeding to the next item.</i> RECORD: 0= no, 1= yes, 88= don't know		If child consumed infant formula, tinned, powdered or pasteurized milk (tin/can or package) or sour milk : How many times yesterday during the day or night did (name of the child) receive infant formula, tinned, powdered or pasteurized milk (tin/can or package) or yoghurt drink? Record number of times or 88= don't know	
	Plain water?	IYCFQ10A	<input type="text"/>	
	Infant formula?	IYCFQ10B	<input type="text"/>	If yes, how many times IYCFQ11B <input type="text"/>
	Tinned, powdered or tetrapack milk?	IYCFQ10C	<input type="text"/>	If yes, how many times IYCFQ11C <input type="text"/>
	Juice or juice drinks?	IYCFQ10D	<input type="text"/>	

	Clear broth like soup?	IYCFQ10E	<input type="text"/>		
	Sour milk?	IYCFQ10F	<input type="text"/>	If yes, how many times	IYCFQ11F <input type="text"/>
	Watery porridge?	IYCFQ10G	<input type="text"/>		
	Any other liquids such as sweetened, flavored water or tea or infusion?	IYCFQ10H	<input type="text"/>		
	Any other liquids? Please specify:	IYCFQ10I	<input type="text"/>		

Child Dietary Diversity

- 69 Please describe everything that (*name of child*) ate yesterday during the day or night, whether at home or outside the home.
- a)** Think about when (*name of child*) first woke up yesterday. Did (*name of child*) eat anything at that time? *If yes, please tell me everything (*name of child*) ate at that time. Probe: Anything else? Then continue to question b)*
- b)** What did (*name of child*) do after that? Did (*name of child*) eat anything at that time? *If yes, please tell me everything that (*name of child*) ate at that time. Probe: Anything else? Probe for any meals/snacks not mentioned.*

*Continue through the day, **repeating question b until respondent indicates child went to sleep** until the next day. If respondent mentions a mixed dish like a porridge, relish or stew, ask about all ingredients that went into the dish, including added oil, sugar or condiments.*

RECORD: 0= no, 1= yes, 88= don't know

	Ingredients of the meal				
Breakfast					
Snack					
Lunch					
Snack					
Dinner					
Snack					
Night					
<i>When the recall is complete, fill in the food groups based on the foods mentioned during the recall.</i> <i>For any food groups not mentioned, ask: "Yesterday during the day or night, did (name of child) eat any foods such as (read examples of food group items)</i> <i>After completing the past 24h, ask the mother going through all food groups again.</i> How often during the past 7 days did (name of child) eat these foods? <i>Record the number of days in the column on the far right</i>			Past 24h 0= no 1= yes 88= don't know		Number of days
Rice, bread, noodles, corn flour, or other foods made from grains/cereals			IYCFQ12A	<input type="text"/>	FQ1 <input type="text"/>
Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside			IYCFQ12B	<input type="text"/>	FQ2 <input type="text"/>
White potatoes, white yams, elephant foot yam, cassava, taro, or any other foods made from roots			IYCFQ12C	<input type="text"/>	FQ3 <input type="text"/>
Any dark green leafy vegetables as well as indigenous vegetables including amaranthus, cassava leaves, sweet potato leaves, mustard, rape pumpkin leaves, ivy gourd, moringa leaves, star gooseberry leaves, morning glory, water mimosa, collard green, chinese green, kale			IYCFQ12D	<input type="text"/>	FQ4 <input type="text"/>
Ripe mangoes, Ripe Paw paws			IYCFQ12E	<input type="text"/>	FQ5 <input type="text"/>

Any other fruits or vegetables like Chinese cabbage, eggplants, tomatoes, cucumber, onions, green bellpepper, radish, wintermelon, sponge gourd, bottle gourd, bitter gourd, oranges, lemons, tangerines, bananas, tamarind, sapodilla, water melon, jackfruit, mangosteen, lychee, custard apple, dragonfruit, star fruit, star apple, pineapple, longan, apple, pear, green papaya, green mango, krasang, rambutan, durian, green beans, long beans, coconut meat, water lily, steamed corn			IYCFQ12F	<input type="checkbox"/>	FQ6	<input type="checkbox"/>
Liver, kidney, heart, or other organ meats			IYCFQ12G	<input type="checkbox"/>	FQ7	<input type="checkbox"/>
Any meat, such as beef, pork/wild pig, deer, chicken, mice, rats, rabbits, ducks, any kind of frog			IYCFQ12H	<input type="checkbox"/>	FQ8	<input type="checkbox"/>
Eggs from any kind of birds			IYCFQ12I	<input type="checkbox"/>	FQ9	<input type="checkbox"/>
Fresh or dried fish, shellfish, smoke fish, fermented fish, sour fermented fish, fish paste, seafood or crab, snails			IYCFQ12J	<input type="checkbox"/>	FQ10	<input type="checkbox"/>
Any foods made from beans, red beans, black beans, mungbean, bean sprouts, any kinds of peas, nuts, or seeds, like lotus seeds			IYCFQ12K	<input type="checkbox"/>	FQ11	<input type="checkbox"/>
Any kinds of foods made out of soy beans as soy milk and tofu, LACTASOY			IYCFQ12L	<input type="checkbox"/>	FQ12	<input type="checkbox"/>
Peanuts (boiled, steamed, stir-fried) or foods made from peanuts (paste)			IYCFQ12M	<input type="checkbox"/>	FQ13	<input type="checkbox"/>
Yogurt or other milk products, like RED COW milk or AD sour milk			IYCFQ12N	<input type="checkbox"/>	FQ14	<input type="checkbox"/>
Any fat, oil or lard or foods made with any of these			IYCFQ12O	<input type="checkbox"/>	FQ15	<input type="checkbox"/>
Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits, soda, bubble tea, condensed milk, sugar cane, sugar cane juice, palm sugar, any kinds of crisps and chips, sweet milk, sweet dessert like pumpkin cake...			IYCFQ12P	<input type="checkbox"/>	FQ16	<input type="checkbox"/>
Condiments for flavor, such as chilies, pepper, ginger, spices, herbs, or fish powder, fish sauce, soy sauce, sugar added in little amounts, salt, seasoning, lemongrass, tamarind leaves, kaffir lime leaves, krasang added only for sour taste			IYCFQ12Q	<input type="checkbox"/>	FQ17	<input type="checkbox"/>
Insects (flying termites, grasshoppers, crickets, fragrant water insects, black water insects, wood worn, mole cricket, tarantula)			IYCFQ12R	<input type="checkbox"/>	FQ18	<input type="checkbox"/>
70	Did (name of child) receive solid, semi-solid or soft food yesterday?	0= no → Q 74 1= yes 88= don't know → Q 74	IYCFQ13	<input type="checkbox"/>		
71	How many times did (name of child) receive solid, semi-solid or soft food yesterday? <i>Count the number of times obtained in the food record!</i>	Record number of times 88= don't know	IYCFQ14	<input type="checkbox"/>		
72	Was yesterday an unusual day for the diet of the child? Due to e.g. a wedding, stay in the rice field, funeral, any other ceremony, was the child sick or stayed with relatives etc.,	0= no 1= yes 88= don't know	CFUSUAL	<input type="checkbox"/>		
73	At what age did you start giving (name of child) other liquids or food apart from breast milk? <i>(Please verify by using the local calendar)</i>	Record age in months: ____ 88= don't know 77= does not yet take food	CFAGE	<input type="checkbox"/>		
Supplements and Preparation of complementary food						
74	Yesterday during the day or night, did (name of the child) receive any vitamin, mineral supplements or medicine in form of liquids? e.g. calcium, magnesium, vitamins.... <i>Display multivitamin tablets!</i>	0=no 1=yes 88= don't know	IYCFQ8	<input type="checkbox"/>		
75	Yesterday during the day or night, did (name of the child) receive any oral rehydration solution (ORS) Oralite? <i>Display ORS package!</i>	0=no 1=yes 88= don't know	IYCFQ9	<input type="checkbox"/>		
76	Yesterday, during the day or night, did (name of child) consume any food to which you added: <i>Read each item aloud and record response before proceeding to the next item.</i> RECORD: 0= no, 1= yes, 88= don't know					
	Iron fortified solid, semi-solid or soft foods or biscuits (specifically designed for children)? (Corn-Soy-Blend, Super Cereal)	IFFQ1	<input type="checkbox"/>			
	Infant/toddler formula?	IFFQ4	<input type="checkbox"/>			

	Fat based nutrient supplement? (BP 100, Plumpy nut, etc)	IFFQ3		
	Micronutrient Powder or sprinkles? <i>Display Sprinkles package!</i>	IFFQ2		How many days received in the past 7 days? IFFQ2FRE
77	Do you have Sprinkles stored in your household?	0= no 1= yes		SPRINWE
78	Did you prepare special meals like borbor khap khurb kroeurng for (name of child) yesterday? <i>For interviewer: special meal is a meal which was not consumed among other family members and was cooked to feed the child only.</i>	0= no 1= yes → Q 80		SPMEAL
79	What prevented you to prepare special meals for (name of child) yesterday?	1= don't know how to do → Q 80 2= lack of time → Q 80 3= no food available → Q 79a 4= child doesn't like to eat → Q 80 5= child doesn't take food yet → Q 83 99= other (specify): _____		SPMPREV
79a	If 3 = no food available What kind of food was not available? <i>Write down the named items!</i>			FOODAV
80	What is the most common snack you give to your child?	0= no snacks → Q 81 1= ripe fruits like banana, mango, papaya 2= raw fruits like mango → Q 81 3= boiled sweet potato/pumpkin → Q 81 4= candies, sweets, cakes, dessert → Q 81 5= potato chips, salty cake → Q 81 6= sweet milk (AD, red cow) 7= lactasoy 8= fried banana 99= other (specify): _____ → Q 81		SNACKS
80a	How did you offer the named fruit for your child? Did you prepare it in a special way?	1= mashed it 2= give mouth-sized pieces 3= peel it and gave it in one piece 4= do not prepare in a special way 99= other (specify): _____		SNAPRE
81	How much of this bowl do you usually offer your child per meal (during the last week)?	1= full bowl or more 2= more than half bowl 3= half bowl 4= less than half bowl 99= other (specify): _____		VOLUME
82	Yesterday, how much of the food offered did your child eat?	1= full bowl or more 2= more than half bowl 3= half bowl 4= less than half bowl 99= other (specify): _____		VOLUMEAT
83	Please look at these two pictures of porridges. Which one do you think should be given to a child 6-9 months of age? <i>(Show the images/pictures of thick and watery/thin porridges and tick one of the options here below depending on the respondent answer)</i>	1= thick porridge (Picture A) 2= watery porridge (Picture B) 88 = don't know		CONSISTP

Part III: Questionnaire for Mother/Caregiver

84	Ask only if respondent is biological mother of the child! How many children have you ever given birth to?	Record number of children	BIRTHORD	
85	How many times did you receive antenatal care during the pregnancy with (name of child)?	Record number of times 88= don't know	ANTECAR	
86	Ask only if respondent is mother of child! During your <u>last</u> pregnancy and/or lactating period did you receive any iron tablets?	0= no 1= yes 88= don't know	MOIRON	

87	Are you alone (exclusively) taking care of (name of child) or do you get support?	1= alone 2= supported (sometimes) 3= supported (often)	CARESUPP	<input type="text"/>
88	Who is mainly supporting you in taking care of (name of child)? <i>Probe: In case respondent is sick or busy, who takes care of the child?</i>	1= spouse of respondent 2= older children 3= grandparent of child 4= relatives 5= mother is alone 99= other (specify): _____	MLCARECH	<input type="text"/>
89	Who do you ask for advice when you have a question about child feeding? <i>Multiple answers possible, record up to 3 with priority!</i>	1= grandmother of the child 2= friends/neighbors 3= CNPs 4= VHSG 5= mother/father of the child 6= doctor 7= relatives 8= health center staff 9= no one 88= don't know 99= other (specify): _____	IFSUPP1 IFSUPP2 IFSUPP3	<input type="text"/> <input type="text"/> <input type="text"/>
Hygiene Practices				
90	Can you tell me what causes diarrhea? <i>Probe: In case your child has diarrhea, what might have been the cause?</i>	0= no → Q91 1= yes	CAUSDIA	<input type="text"/>
<i>Do not read aloud the list, probe for further responses. More than one answer possible.</i> RECORD: 0= no, 1= yes				
	Contaminated food		CAUSDIA1	<input type="text"/>
	Contaminated water		CAUSDIA2	<input type="text"/>
	Contaminated hands		CAUSDIA3	<input type="text"/>
	Flies		CAUSDIA4	<input type="text"/>
	Eating greens		CAUSDIA5	<input type="text"/>
	Other (specify)		CAUSDIA6	<input type="text"/>
91	Can you name any ways to help to prevent from getting diarrhea?	0= no → Q 92 1= yes	PREVDIA	<input type="text"/>
<i>Do not read aloud the list, probe for further responses. More than one answer possible.</i> RECORD: 0= no, 1= yes				
	Washing hands		PREVDIA1	<input type="text"/>
	Use latrine or bury feces		PREVDIA2	<input type="text"/>
	Boil or filter drinking water		PREVDIA3	<input type="text"/>
	Exclusive breast feeding		PREVDIA4	<input type="text"/>
	Protect food and water supplies with cover		PREVDIA5	<input type="text"/>
	Other (specify)		PREVDIA6	<input type="text"/>
92	Does your HH have soap (or washing powder/ liquid) at present?	0= no → Q 95 1= yes 88= don't know → Q 95	HHSOAP	<input type="text"/>
93	Did you ever use soap yesterday or today?	0= no → Q 95 1= yes	SOAPYEST	<input type="text"/>

94	When you used soap today or yesterday, what did you use it for? If "for washing my hands" is mentioned, probe what was the occasion, but do not read the answers! (Do not read the answers, ask to be specific, encourage "what else" until nothing further is mentioned and check all that applies) RECORD: 0= no, 1= yes		
	Washing my children's hands	WCHILDH	<input type="checkbox"/>
	Washing hands after defecating	WCHILDD	<input type="checkbox"/>
	Washing hands after cleaning child	WAFTERC	<input type="checkbox"/>
	Washing hands before feeding child	WBEFFED	<input type="checkbox"/>
	Washing hands before preparing food	WBEFFOOD	<input type="checkbox"/>
	Washing hands before eating	WBEFEAT	<input type="checkbox"/>
	Other like clothes, body, hair, wash cat, dog, cow,...	WOTHER	<input type="checkbox"/>

Participation in Nutrition Education

95	In the past 12 months, did you participate in any nutrition education program or cooking demonstration? <i>If yes:</i> NAME of PROGRAM: _____ NAME of ORGANIZATION: _____	0= no → Q 97 1= yes 88= don't know → Q 97	NEPART	<input type="checkbox"/>
96	<i>If yes, where did you learn it?</i>	1= NGO 2= mother/grandmother 3= other relative 4= Health Center 5= VHSG 6= CNP 7= community meeting hall 99= other (specify): _____	NELOC	<input type="checkbox"/>
97	Do you have this nutrition poster from the MALIS project at your house? <i>Display the poster!</i>	0= no 1= yes	NEPOST	<input type="checkbox"/>
98	Are you currently a member of a mother group in your village and learn about how to feed your child?	0= no 1= yes	NECURR	<input type="checkbox"/>
99	Have you heard or did anyone share knowledge about how to feed children under two?	0= no 1= yes	SPILLCF	<input type="checkbox"/>

Thank the mother for her time and cooperation. Tick the respective boxes in her participant card. Hand over the filled out questionnaire, consent form and participant card and send the mother with her child to the anthropometric measurement station.










Time interview ended: ☐☐☐ : ☐☐☐

Anthropometric Measurements

ID Measurer:

 ID Assistant 1:

Anthropometry of mother

Biological mother of child	0 = no → do not take measurements of the respondent 1 = yes	BIOMO	
Age of the mother	Record age in years	AGEMO	
Mother is pregnant	0 = no 1 = yes → do not take weight measurements!	PREGMO	
Height of the mother (in cm)	Measurement 1	HEIGHTMO1	 cm
	Measurement 2	HEIGHTMO2	 cm
Weight of the mother (in kg)	Measurement 1	WEIGHTMO1	 kg
	Measurement 2	WEIGHTMO2	 kg
MUAC of the mother (in cm) (if pregnant)	Measurement 1	MUACMO1	 cm
	Measurement 2	MUACMO2	 cm

Anthropometry of child

Sex of child?	1 = male 2 = female	SEXCHILD	<input type="text"/>
Weight of the child (in kg)	Measurement 1	WEIGHTCH1	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> kg
	Measurement 2	WEIGHTCH2	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> kg
Length of the child (in cm)	Measurement 1	LENGTHCH1	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> cm
	Measurement 2	LENGTHCH2	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> cm
Edema	1 = yes 0 = no	EDEMCH	<input type="text"/>

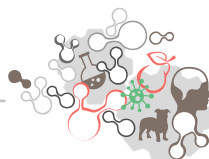
Haemoglobin of mother and child

Haemoglobin MOTHER (in g/dl)	HAEMMO	<div style="text-align: center;"> . g/dl</div>
Haemoglobin CHILD (in g/dl)	HAEMCH	<div style="text-align: center;"> . g/dl</div>

Blood sample ID:

Comments:

Motor milestones				
Sitting without support	Child's head is erect Child does not use arms or hands to balance Child sits up straight for at least 10 seconds	1= yes 2= no (inability) 3= no (refusal) 9= unable to test	MOTHSIT	<input type="text"/>
Hands-and-knees crawling	Alternating movement forward or backward on hands & knees Child's stomach does not touch the ground Continuous and consecutive movements, at least 3 in a row	1= yes 2= no (inability) 3= no (refusal) 9= unable to test	MOTOC	<input type="text"/>
Standing with assistance	Child is in an upright position on both feet Child holds onto a stable object with both hands without leaning on it Child's body does not touch the stable object Child stands with assistance for at least 10 seconds	1= yes 2= no (inability) 3= no (refusal) 9= unable to test	MOTOST	<input type="text"/>
Walking with assistance	Child is in an upright position with the back straight Child makes sideways or forward steps by holding onto a stable object One leg moves forward while the other supports part of the body weight Child takes at least 5 steps in this manner	1= yes 2= no (inability) 3= no (refusal) 9= unable to test	MOTOWA	<input type="text"/>
Standing alone	Child is in an upright position on both feet with the back straight Child stands alone for at least 10 seconds	1= yes 2= no (inability) 3= no (refusal) 9= unable to test	MOTOS	<input type="text"/>
Walking alone	Child is in an upright position with the back straight One leg moves forward while the other supports most of the body weight Child takes at least 5 steps independently	1= yes 2= no (inability) 3= no (refusal) 9= unable to test	MOTOW	<input type="text"/>



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