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NUTRITION CAUSAL ANALYSIS



CAMBODIA

CHOAM KSANT DISTRICT, PRAEH VIHEAR PROVINCE

Publication: July 2016



FINAL
REPORT





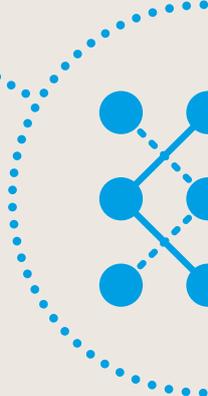
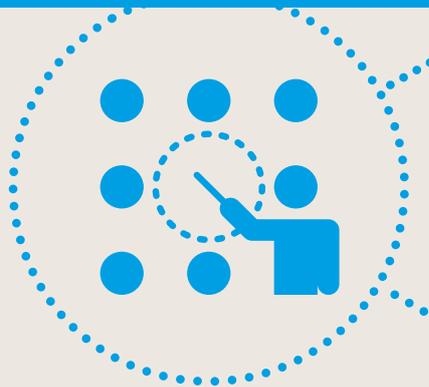
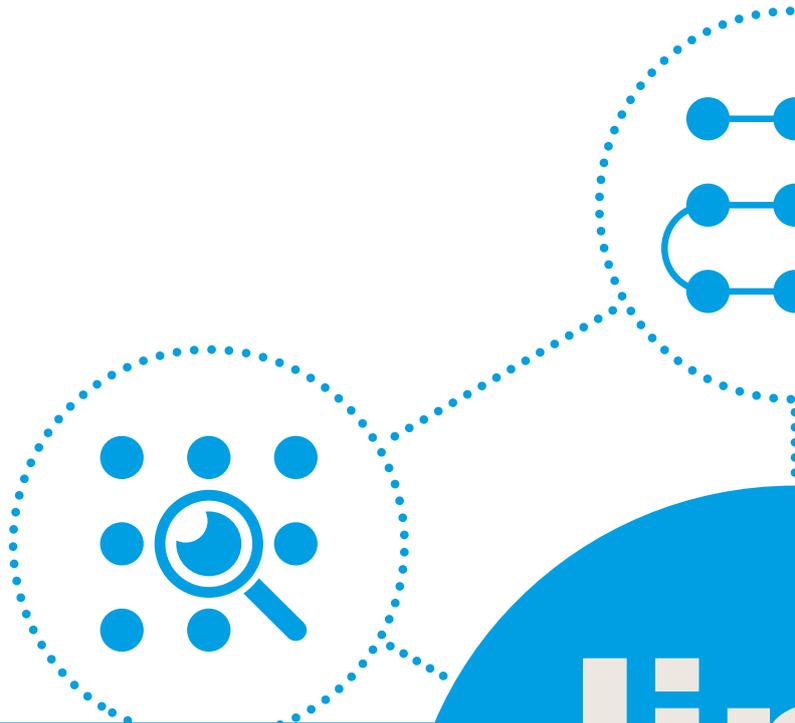
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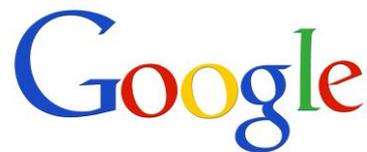
Link NCA Final Report



NUTRITION CAUSAL ANALYSIS

December 2015 - March 2016

Choam Ksant District, Preah Vihear Province, Cambodia



Alice Burrell, Link NCA Expert

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- Google for their funding of the Link NCA activities.

Abbreviations and Acronyms

ACF	Action Contre la Faim
ANC	Ante-Natal Care
CLTS	Community-Led Total Sanitation
DHS	Demographic Health Survey
FGD	Focus Group Discussion
FSL	Food Security and Livelihoods
GAM	Global Acute Malnutrition
HAZ	Height-for-Age Z-score
HH	Household
IYCF	Infant and Young Child Feeding
KII	Key Informant Interview
IUGR	In Utero Growth Retardation
LBW	Low Birthweight
MAM	Moderate Acute Malnutrition
MDD	Minimum Dietary Diversity
MMF	Minimum Meal Frequency
MUAC	Mid-upper Arm Circumference
NCA	Nutrition Causal Analysis
NGO	Non-Government Organisation
PD	Positive Deviant
PVH	Preah Vihear Province
RFS	Risk Factor Survey
SAM	Severe Acute Malnutrition
SBCC	Social Behaviour Change and Communication
TBA	Traditional Birth Attendant
UNICEF	United Nation's Children's Fund
VHSG	Volunteer Health Support Group
VSLA	Village Savings and Loans Association
WASH	Water Access, Sanitation and Health
WAZ	Weight-for-Age Z-score
WCBA	Women of Child Bearing Age
WHO	World Health Organisation
WHZ	Weight-for-Height Z-score

Glossary

This glossary defines local terms which are used in the report.

<i>Ang pleung or roasting</i>	Lying on a bed with a fire underneath to warm the body, typically carried out for 3-days after child birth
<i>Borbor</i>	Rice porridge
<i>Bobor khap krop kroeung</i>	Enriched rice porridge
<i>Commune</i>	2 nd smallest administrative area, contains a number of villages
<i>District</i>	3 rd smallest administrative area, a district contains a number of communes
<i>Khan loung</i>	Yellow skin and hair
<i>Kres krun</i>	Small
<i>Prahok</i>	Fermented fish paste
<i>Province</i>	Largest administrative unit. A province contains a number of Districts
<i>Skom</i>	Thin
<i>Slek slun</i>	Pale/anaemic/weak

Executive Summary

Introduction

Choam Ksant district is situated in the North-East Province of Preah Vihear, which borders Thailand and Laos. There are 8 communes with 55 villages in total, and a population of around 60,000 persons. Choam Ksant District was selected for the Link NCA Study due to minimal NGO activity at the time of scoping missions, and poor nutritional indicators. Preah Vihear/Stung Treng Province was reported to have 47.1% in the lowest wealth quintile and 27.3% in the second wealth quintile in the most recent DHS (Demographic Health Survey). Prevalence of stunting was highest at 44.3% and Moderate Acute Malnutrition (MAM) was among the highest for all the provinces at 13.8%. It also showed the second highest infant mortality rate at 70 per 1,000 live births.

Objectives

The main objective of the Link NCA was to provide a greater level of understanding regarding the possible causes of child undernutrition, in particular wasting and stunting of children aged 0-59 months, in Choam Ksant District, Preah Vihear Province, Cambodia.

The objectives of the study were:

- To estimate the prevalence of known risk factors for under-nutrition among the population and key “nutrition vulnerable groups”;
- To identify main causes of wasting and stunting in order to inform the technical strategy and programs for the prevention of the same at local level;
- To determine which causal pathways of malnourishment are likely to explain most undernutrition cases in Choam Ksant district;
- To develop an “emic” definition and understanding of good nutrition, malnutrition and believed causes of under-nutrition within the target population;
- To understand the local seasonal and historical pathways to wasting and stunting;
- To support technical advocacy on causes of undernutrition so as to support technical strategy; and,
- To improve knowledge of the causes of undernutrition for provincial departments and NGOs working in the area to improve programme impact and coordination between active parties.

Methods

The Link NCA began in December 2015 with a review of current literature and secondary data to draft hypothesized causal risk factors for undernutrition in Choam Ksant District. An initial Stakeholder Technical Workshop with representatives from various sectors and organisations was held in January 2016 to validate the hypothesised causal risk factors for field testing. The data collection began in February and ran for 5 weeks in total. The Link NCA employs a mixed-methods approach, combining both qualitative and quantitative data collection. Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) were conducted in 4 communities, and a Risk Factor Survey was conducted in 30 clusters across 25 villages, with anthropometric measurements taken of children aged 6-59 months,

and females aged 15-49 years. Following data analysis, results were presented for each hypothesised causal risk factors at a final Stakeholder Technical Workshop in March. Through multi-sector working groups, results were validated and a final rating was assigned to each of the causal risk factors based on: secondary data, Risk Factor Survey data, the evidence base for the strength of association between the risk factor and undernutrition, seasonal patterns/historical trends, qualitative data, and risk factor ranking by the communities (full explanation of Criteria can be found in the Report).

Findings

Major risk factors identified were open defecation and unhygienic environments, and high prevalence of illness in children under 5-years. There were high rates of open defecation (83.0%) and unsafe disposal of child faeces (49.6%). Additionally, animal faeces in the household and community waste were adding to unhygienic environments. There is a strong association with these behaviours and child illness such as diarrhoea (34.1%), environmental enteropathy, and parasitic worms (57.7% of children under 5-years had not received deworming medication in the last 12-months), all shown to be associated with child undernutrition. Additionally, there was reported high prevalence of fever (53.3%) and ARI (68.3%). Important contributing risk factors to high disease prevalence were poor hygiene practices, drinking of untreated water, and poor exposure to health advice in many communities. This included barriers to healthcare and limited community health activities, meaning illness was prolonged and preventive behaviours were low.

Poor care practices was identified as an important contributing risk factor, with impact on: poor hygiene practices, poor drinking water treatment, feeding practices, and prevention and treatment of illness. Poor care practices were perceived by communities to be mainly due to time constraints with high maternal workload, other contributors identified were poor maternal wellness and gender issues, with risk of maternal depression very high at 55.3%, poor resources in the field, use of secondary carers with less ability for proper care practices, and poor knowledge attainment. Maternal occupation was often seasonal from June to March, with many of these practices showing seasonal trends too.

Low incomes and limited livelihoods were identified as an important contributing risk factor. Low incomes were perceived by communities to be the root cause of poor diets, poor growth, poor health, and time constraints among other things. Low incomes and limited livelihoods impacted on other important risk factors: agricultural dependence and poor crop diversity, poor resilience, household food insecurity, maternal employment and migration, and maternal wellness. There is the perception that incomes are decreasing due to extreme weather events, lack of diversity of agricultural products and deforestation. With reducing incomes, the practice of taking loans is rapidly increasing. These were being repaid with income generated from sale of agricultural crops, which were becoming unreliable, causing a deteriorating cycle of coping strategies. Household food security was an important risk factor affected by poor resilience, low incomes and limited livelihoods, poor market access and poor infrastructure, and agricultural dependence for incomes and rice stocks. Household food security indicators showed an adequate situation at the time of the study, however the Link NCA was not conducted at the peak of the lean season. Rice shortages occurred pre-harvest in August to October, whereas wild food and fish shortages were in the dry season from November-April.

Children's diets lacked in diversity, animal source foods, and frequency with minimum diet diversity reached in 44.5% of children under 2-years, and minimum meal frequency in 45.1%. Practice of giving packaged snack foods was alarmingly high with most mothers giving these daily, a new practice that had increased over the last few years despite mothers knowing that these foods are not good for their children. Household food security, low incomes, poor exposure to health advice, and poor care

practices impacted on the quality of children's diets, another important contributor to child undernutrition.

Risk factors identified as Minor contributors to undernutrition were mosquito-borne disease, delivery without skilled professional, early child bearing, inadequate breastfeeding practices, poor nutritional status of WCBA (Women of Child Bearing Age), and poor knowledge attainment. Poor awareness of malnutrition was classified as untested due to the complicated nature of indicators for this risk factor. It is recommended that a specific study is conducted to focus on this factor.

Conclusions

A complex situation exists, with minimal resources to enable behaviour change despite good knowledge in some communities. With minimal commune funding and scattered coverage of local NGOs, there is a need for collaboration and coordination of activities for maximum coverage and impact.

Two risk factors were highlighted as 'Major': open defecation and unhygienic environments, and the closely related child illnesses (diarrhoea, environmental enteropathy and worms, as well as fever and ARI). Given these results, the recommendation is a Nutrition programme with a strong WASH-component or collaboration with a WASH partner. The Nutrition component should focus on IYCF and maternal diets, with promotion of age-appropriate feeding for children, including the amount of food given, and increased food intake during pregnancy. The WASH component should focus on reducing open defecation, safe disposal of faeces, cleaning up environments, and improved handwashing practices at critical times. Recently a Nutrition-WASH sub-working Group has been established at National level with key actors in both sectors. This shows there is already National momentum for the integration of Nutrition and WASH programming.

As a number of risk factors were identified as 'Important' under food security and livelihoods (FSL), it is also recommended that the programme contain a FSL component to improve the capacity and ability of households to generate sustainable and reliable incomes to improve household wealth, which impacts on most of these risk factors with income the main barrier to providing good diets to children. This will also hopefully reduce the large number of households regularly taking loans or selling assets making them financially vulnerable.

Recommendations

Prior to implementation of the programme, it is recommended to spend time to ensure community buy-in. Additionally, an overarching recommendation is the consideration of all caregivers (mothers, fathers, grandmothers, possibly adolescent siblings) for activities to ensure secondary caregivers are improving practices and fathers are support wives in good practices. In some communities, knowledge is not the issue but there are barriers to behaviour change, therefore SBCC (Social Behaviour Change and Communication) approaches should be carefully designed to provide optimal behaviour change, and progress of positive behaviours should be monitored with strategies adapted and improved with operational learning and observations. Additionally, education levels are poor in many households and as such interactive and demonstrative SBCC tools should be used to deliver educational messages.

Many risk factors showed seasonality – with worse practices during the farming season when adults tended to be away from the household. Many behaviours that are often promoted such as hand washing with soap, treatment of water, using latrines are not possible in the field or forest setting. This should be considered, with possible solutions for how to enable these practices at all times of the

year. On this note, timing and location of activities should be carefully thought about to ensure activities have maximum participation. It is likely that in the farming season, the best location for any group meetings or educational sessions would be in the fields. Migration season should also be factored in to timings.

Specific recommendations for activities are detailed in the main report.

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1. Introduction

1.1. Action Against Hunger Cambodia

Action Against Hunger International (ACF) was previously active in Cambodia from 1988 to 2007, leaving as the situation had improved with Global Acute Malnutrition (GAM) rates at 8.5% according to the Cambodian DHS in 2005. However, by 2010 the situation had begun to deteriorate with GAM at 11.0%. For Preah Vihear Province, where ACF previously had their programmes, stunting was at 56% in 2010. Given this situation Action Against Hunger have decided to return to Cambodia to implement a nutrition-resilience multi-sectorial programme, working closely with provincial departments and local NGOs.

1.2. Choam Ksant District, Cambodia

Choam Ksant district is situated in the North-East Province of Preah Vihear (PVH), which borders Thailand and Laos. There are 8 communes with 55 villages in total, and a population of around 60,000 persons. Choam Ksant District has a history of conflict due to its location on the border of Thailand. Most recently there was a conflict between Cambodia and Thailand over the ownership of the Preah Vihear Temple. Given this, there is a history of migration and relocation in these areas. Recently the government has encouraged people and companies to settle in this district to try to repopulate the area. Among the 55 villages are: long-term villages founded prior to the Khmer Rouge and following the Khmer Rouge, military settlements, and new villages of military families, resettled households and migrants from other Provinces, and new villages are appearing frequently. Choam Ksant District was selected for the Link NCA Study due to minimal NGO activity at the time of scoping missions and poor nutritional indicators.



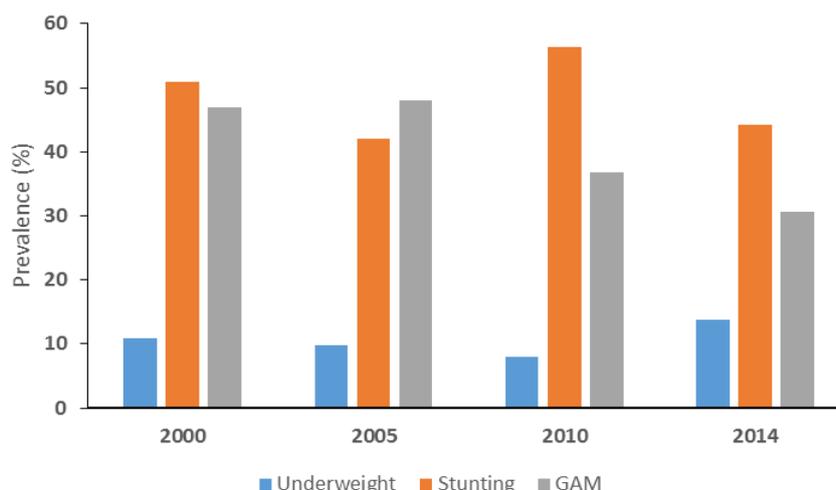
Section I: Methodological considerations

1. Why conduct a Link NCA?

1.1. Context information

There is little to no data available at district level, however Preah Vihear/Stung Treng Province was reported to have 47.1% in the lowest wealth quintile, and 27.3% in the second wealth quintile in the most recent DHS. There were the lowest numbers for having some secondary education for both males and females, at 16.0% and 15.4% respectively. There was the highest prevalence of stunting at 44.3%, Moderate Acute Malnutrition (MAM) was also in the highest for all the provinces at 13.8%. Figure 1 shows the trends over the last 15 years for nutritional status of the population. It can be seen that there has been progress in reducing Global Acute Malnutrition (GAM), but that stunting has increased between 2005 and 2010, and underweight has increased since 2010. For women 15-49 years, Preah Vihear/Stung Treng was among the highest for short stature at 8.0% and moderately to severely thin at 5.2%.¹

Figure 1 Trends in nutritional status 2000 – 2015 for Preah Vihear/Stung Treng from the Cambodian DHS



In Cambodia, rural areas show worse indicators for sanitation and water with 60.1% having access to improved drinking water, and 39.7% having improved sanitation which is not shared. There is widespread open defecation. Preah Vihear/Stung Treng showed one of the highest practices of unsafe disposal of child's faeces at 50.0%. Incidence of diarrhoea in children under 5-years was the 2nd highest at 19.3%. Despite high numbers of women attending ANC, for pregnancies in the last 5 years in Preah Vihear/Stung Treng there were some of the lowest numbers for women taking intestinal parasite drugs at 59.6%, receiving tetanus vaccination at 45.1%, and one of the highest numbers for home births at 48.8%. The suggestion here is that there may be issues with Health Centre services or resources in the province. There was also one of the lowest for children 12-23 months having had all basic vaccinations at 55.6%, and the second highest infant mortality rate at 70 per 1,000 live births.

¹ National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

Progress has been made in many areas, however with its remote location and basic infrastructure Choam Ksant has a number of worrying indicators across all sectors. This Link NCA aims to identify the main risk factors for undernutrition in the District.

1.2. Main study objective

The main objective was to identify the most important causes of child undernutrition, in particular wasting and stunting of children aged 0-59 months, in Choam Ksant District, Preah Vihear Province, Cambodia.

1.3. Specific study objectives

The objectives of the study were:

- To estimate the prevalence of known risk factors for under-nutrition among the population and key “nutrition vulnerable groups”;
- To identify main causes of wasting and stunting in order to inform the technical strategy and programs for the prevention of the same at local level;
- To determine which causal pathways of malnourishment are likely to explain most undernutrition cases in Choam Ksant district;
- To develop an “emic” definition and understanding of good nutrition, malnutrition and believed causes of under-nutrition within the target population;
- To understand the local seasonal and historical pathways to wasting and stunting;
- To support technical advocacy on causes of undernutrition so as to support technical strategy; and,
- To improve knowledge of the causes of undernutrition for provincial departments and NGOs working in the area to improve programme impact and coordination between active parties.

2. The Link NCA Methodology

2.1. Overview of the Link NCA Approach

The Link NCA was developed by ACF in order to strengthen the analytical foundation on which its programs are built. The Link NCA provides a structured and operationally feasible method for conducting a nutrition causal analysis in a specified local context.

All Link NCAs aim to answer the following **6 questions**:

- *What is the prevalence and severity of wasting and/or stunting in the study population?*
- *What is the prevalence of known risk factors for under-nutrition among the population and key “nutrition vulnerable groups”?*
- *What are the causal pathways of under-nutrition by which certain children in this population have become stunted and/or wasted?*

- *How have the stunting and/or wasting in this population and its causes changed a) over time due to historical trends, b) seasonally due to cyclical trends, c) due to recent shocks?*
- *Which causal pathways are likely to explain most cases of under-nutrition? Which sets of risk factors and pathways are likely to be the most modifiable by stakeholders within a given context and within a given period?*
- *Based on the causal analysis results, what recommendations can be made for improving nutrition security programming? How can the analysis be linked to a programmatic response?*

To answer the 6 questions, the Link NCA employs a **mixed-methods approach**, combining both **qualitative and quantitative** (from qualitative survey secondary data and/or from a SMART nutrition survey and Risk Factor Survey conducted during the Link NCA) research methods, and draws conclusions from a synthesis of results.

2.2. Study Design

A timeline of the Link NCA study can be found in Annex A.

2.2.1. Initial Stakeholder Technical Workshop

An Initial Stakeholder Technical Workshop was held on the 14th January 2015 to validate the proposed hypotheses for the causes of undernutrition to be field tested during the Link NCA. Stakeholders were invited from multiple sectors and multiple types of organisation and asked to work in mixed groups to facilitate multi-sectoral discussions and ideas.

2.2.2. Field data collection

The qualitative component was conducted in four villages in Choam Ksant with selected groups of each community. This qualitative enquiry ran from 25th February to 5th March 2016 and from the 14th – 25th March 2016, with 5 days spent in each village.

The Risk Factor and Nutritional Status Survey was conducted at households in 25 villages from the 15th February to the 4th March 2016.

2.2.3. Final Stakeholder Technical Workshop

Findings from the data collection were used for the Link NCA Analyst to objectively **rate** causal hypotheses using pre-set criteria. During the qualitative enquiries, on the last day in each village the communities were asked to give a rating to the relevant causal hypotheses for their village and an average was calculated for each hypotheses. Findings and the results of the Link NCA Analyst and Community **ratings** were presented to the Stakeholders on 29th March 2016 at a Final Workshop with the objective to reach a consensus on the most important risk factors for undernutrition in the Link NCA study area.

3. Sampling Procedures

3.1. Selected method and sample size calculations

3.1.1. Sampling methodology

The selected sampling method was random cluster sampling.

3.1.2. Indicators to be measured

In Table 1 are the core indicators for the Link NCA, these are highly recommended for most contexts. This list will be reviewed at the time of survey preparation: indicators not relevant to the context will be removed and optional indicators will be added. For the purpose of calculating the sample size, a selection of the core indicators is sufficient.

Table 1 List of Core indicators for measuring risk factors with their target population

Indicator	Targeted population
HDDS	Household
HFIAS	Household
MAHFP	Household
Early initiation of breastfeeding	0-24 months
Exclusive breastfeeding under 6 months	0-5 months
Continued breastfeeding at 1 year	12-15 months
Introduction of solid, semi-solid or soft foods	6-8 months
Minimum dietary diversity or IDDS	6-23 months
Meal frequency	6-23 months
Reported responsive feeding	6-59 months
Mother's food intake evolution during pregnancy and/or lactation	Mother
Caregiver's completed years of education	Caregiver
Perceived social capital	Mother
Caregiver's perceived workload	Caregiver
WHO5 and MDI if WHO5 \leq 13	Caregiver
Caregiver-child interactions scale	Caregiver
ARI past 14 days	0-59 months
Diarrhoea past 14 days	0-59 months
DPT3 immunization status	12-23 months
ANC/PNC attendance	Mother
Barriers from going to the health centre	Caregiver
Access to a safe water source	Household
Water management score	Household
Quantity of water per capita per day	Household
Use of hygienic and safe sanitation facilities	Household
Presence of soap or ashes in the house	Household

3.1.3. Sample size calculation

The Household (HH) average size has been considered as 4.5 members/HH, taken from the rural category of the Cambodian Demographic Health Survey (CDHS) 2014. The number of children for each age group per HH has been deduced from the rural children under 5 years population of 11.5% and the number of members/HH².

² National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

Sample size was calculated for a selection of relevant indicators (Table 2). Prevalence of wasting, stunting, diarrhoea, skilled assistance at birth, minimum diet diversity and early childbearing were taken from the CDHS 2014 for Preah Vihear/ Stung Treng strata.³ Exclusive breastfeeding, HDDS, caregivers completing primary education, PNC attendance, caregivers washing hands after defecating, and access to improved sanitation facilities were taken from the IMCF Baseline survey in Oddar Meanchey and Preah Vihear in 2013, where possible for the Preah Vihear strata only.⁴ Data on MAHFP and caregivers perceived workload were not available, and hence prevalence was taken as 0.5 to calculate the maximum size sample that would be needed.

Indicators for which data were not available were given a prevalence of 50% to calculate maximum sample size required.

Table 2 Sample size calculations for a selection of core indicators

Indicator	Age group (months)	D ¹	d ²	p ³	No. of measures needed ⁴	No. of measures/ HH visited ⁵	HH sample size ⁷
Stunting	6-59	2.0	0.08	0.44	322	- ⁶	691
Wasting (WHZ)	6-59	1.5	0.03	0.14	839	- ⁶	1785
Low HDDS (<5 groups)	Household	2.0	0.1	0.11	82	1.0	82
MAHFP	Household	2.0	0.1	0.50	209	1.0	209
Exclusive breastfeeding (EBF)	0-5	2.0	0.1	0.77	148	0.05	2960
Minimum diet diversity (4+ food groups)	6-23	2.0	0.1	0.28	169	0.16	1056
Caregivers completed primary education	Caregiver	2.0	0.1	0.07	54	1.0	54
Caregivers perceived workload	Caregiver	2.0	0.1	0.50	209	1.0	209
Diarrhoea (past 14 days)	0-59	2.0	0.1	0.19	129	0.52	248
PNC attendance	Mother	2.0	0.1	0.67	185	1.0	185
Skilled assistance at birth	Caregiver	2.0	0.1	0.55	207	1.0	207
Access to improved sanitation facilities	Household	2.0	0.1	0.19	129	1.0	129
Caregiver wash their hands after defecating	Caregiver	2.0	0.1	0.13	95	1.0	95
Early childbearing	Mothers	2.0	0.1	0.13	95	1.0	95

¹design effect; ²desired precision; ³estimated prevalence; ⁴Calculated using ENA Software; ⁵Calculated using data from the CDHS 2014 for household size and population by age group; ⁶calculated using ENA only; ⁷calculated by dividing the number of measured needed by the number of measures than could be taken per household

3.1.4. Number of households to be surveyed

Based on the calculated household sample sizes in Table 2, those highlighted in red were too large for the human resources, time and budget of the Link NCA study. Given this, the sample size for stunting

³ National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

⁴A. Reinbott et al, IMCF Cambodia in Preah Vihear and Otdar Meanchey Provinces: Cross-sectional Nutrition Baseline Survey, 2013

at 691 was considered with an additional 5% for non-response rate (NRR) and data errors, the final calculated sample size was $691 \times 1.05 = 728$ households as a minimum to be surveyed.

3.1.5. Number of clusters to be selected

With a proposed working day for survey staff of 9 hours, taking in to account 1 hour for lunch and an afternoon refreshment break and an average of 1 hour travel time each day, this would leave 7 hours to complete the survey questionnaires. The questionnaire is expected to take 1 hour, giving time for 7 surveys per day, not accounting for travel between households and completion of observations. Given that not all households will have a child under 5-years, it is hoped that each team will complete 4-5 questionnaires each day, leaving time for introductions, travel and to complete observations.

Given that 8 teams have been foreseen in the budget, working for 15 days the options in Table 3 were proposed.

Table 3 Options for selection of cluster sample size

Option	No. of teams	No. HHs/ day/ team	No. teams/ cluster	No. days/ cluster	Total survey days	No. HH/ cluster	No. Clusters	Target HH sample size	Actual HH sample size
A	8	7	2	1	15	14	60	728	840
B	8	7	2	2	15	28	30	728	840
C	8	7	2	3	15	42	20	728	840

Option B in Table 3 was decided upon based on keeping 30 clusters, which is more than the recommended minimum by the SMART methodology (i.e. 25 clusters), and given the logistical constraints. Some villages very remote 1 day in each village would not be sufficient.

Of the selected villages, 4 were purposively selected for the qualitative survey to ensure good representation.

3.2. Sampling Procedure for the Risk Factor and Anthropometric Survey

The method chosen for cluster selection was random cluster sampling given the size of the survey area and the distinct villages within the district. An exhaustive list of villages was created using official government data and meetings with the District Governor and Heads of Commune. Annex B lists all selected villages with population of households and people. Forty clusters were randomly assigned across 33 villages, and 5 reserve clusters (RC) were randomly assigned with ENA Software using Proportion Population Size (PPS) based on population in persons.

3.3. Sampling for the qualitative community enquires

Four villages were purposively selected for the qualitative survey in order to be representative of the demographic scope of the area. The selected villages are detailed in Annex C.

4. Data Collection Methods

4.1. Quantitative Risk Factor and Anthropometric Survey

4.1.1. Data collection methods

Quantitative data was collected through the Risk Factor Survey and Anthropometric Survey at household level. Questionnaires were conducted at randomly selected households in each cluster and fully addressed only where there was at least one child under 5 years residing.

4.1.1.1. *Random selection of households*

A definition of a household was defined during the survey with the survey staff. The definition approved was:

“All the members who eat from the same pot and sleep under one roof at night.”

The selection of households was done following a two-stage cluster sampling or three-stage cluster sampling methodology. For both of the ways used, the first stage was the cluster selection using ENA Software according to the PPS selection method.

For villages with a population exceeding 250 households, a geographical segmentation was done inside the village and one segment was randomly selected (second-stage). If each segment contained approximately the same number of households, one was randomly selected. If each segment contained different numbers of households, then the segment was selected using PPS. The third stage of sampling was to select households. This was done using simple random sampling with random number tables. Household were selected from household maps with each house numbered. This configuration follows a three-stage cluster sampling.

For clusters with a population less than 250 households, households were selected using simple random sampling (second-stage). This configuration follows a two-stage cluster sampling.

4.1.1.2. *Collection of data*

Data was collected through household interviews. Questionnaires were translated into Khmer and uploaded on to ODK for use on the tablets. Questionnaires can be found in Annex D.

The Risk Factor Survey consisted of four sections:

- Household Level data (Food Security, Livelihoods and Income, Resilience, and WASH)
- Caregiver data (including Maternal, Education and Well-being, MUAC of females aged 15-49 years)
- Child data (IYCF practices of children under 2 years, Health of children under 5 years, Children 6-59 months)
- WASH observations (Water source, Sanitation facilities)

Each section was completed in selected household with at least one child under 5 years. If there was no child under 5 years, the questionnaire was terminated.

4.1.2. Field Team Composition, Recruitment and Training

The survey team was composed of 4 team leaders and 16 surveyors, working as 8 pairs with one person in each pair assigned to conducting the questionnaire and anthropometric measurements, and the other assigned to observations and assisting with the anthropometric measurements. Each team leader was assigned two pairs, and assigned a Group from A-D.

All survey staff were trained for five days with one and a half days assigned to training for anthropometric measurements, two and a half days assigned to the RFS and one day assigned to a pilot field test. Candidates showing good understanding and leadership skills were selected as the team leaders. Assignment of roles in pairs was based on performance during training. Where possible pairs consisted of one male and one female surveyors. Data was collected using tablets and as such all surveyors were trained on how to use Open Data Kit (ODK) Collect. Team leaders were trained in how to submit questionnaires at the end of each survey day. Technical support was provided by the Link NCA Analyst during the survey when needed.

4.1.3. Main challenges

The main challenges of the Risk Factor Survey were poor roads between villages and very remote villages making the survey geographically challenging at times. Another challenge was poor signal in these villages, meaning survey data could not be submitted at the end of the day for some clusters.

4.2. Qualitative Community Enquiry

4.2.1. Research Instruments and methods

Data was collected through Key Informant Interviews (KII) and Focus Group Discussions (FGD) in four selected villages. Discussion guides can be found in Annex E.

Tools used included: proportional piling, working groups to create seasonal calendars, wealth ranking and rating exercises.

4.2.2. Data Collection

KIIs were conducted with relevant key persons (Village Health Support Group (VHSG)⁵, Traditional Birth Attendant (TBA), Health centre staff) as well as with mothers of positive and negative deviant children, where it was possible to identify them. FGDs were conducted with:

- Mothers of children under 5 years
- Fathers of children under 5 years
- Grandmothers caring for children under 5 years
- Village elders
- Key persons in the village (village chief, deputy village chief, VHSG, Teachers, Commune representatives, etc)

⁵ VHSG Leaders are the primary point of contact for all health activities in the villages. Their Roles and Responsibilities were defined by the Ministry of Health in order to support implementation of community-based health activities.

Topics discussed included: undernutrition, IYCF, health, WASH, care practices, gender roles and responsibilities, food security and livelihoods. Each group attended for 2 hours, with 3 topics discussed in 20-30 minute sessions.

Grandmothers were included due to their major role in some communities as a secondary caregiver. They attended as a separate group, as well as fathers, as it is anticipated that perceptions and knowledge will differ between the different demographic groups. In villages with over 30% middle income or rich households, groups of mothers were separated in to wealth categories based on village chief or the VHSGs perception.

4.2.3. Stakeholder consultations

Prior to the Link NCA, a number of KIIs were conducted with local stakeholders to gather information on the context to aid questionnaire design as well as providing useful information for use in the analysis. Stakeholders met with during this time were:

- ADRA and MKRK (local NGO) Field Coordinators
- Caritas Cambodia Community Health and Nutrition Programme Manager
- Cambodian Red Cross WASH Officer
- CWS Field Coordinator
- Resilience Expert, FAO
- Provincial Department of Agriculture
- Provincial Department of Rural Development
- Provincial Health Department
- ACF Wild Foods and Nutrition Intern
- Worldvision Nutrition Programme Manager
- TPO Mental Health Officer
- Provincial Department of Women's Affairs

4.2.4. Field Team Composition, Recruitment and Training

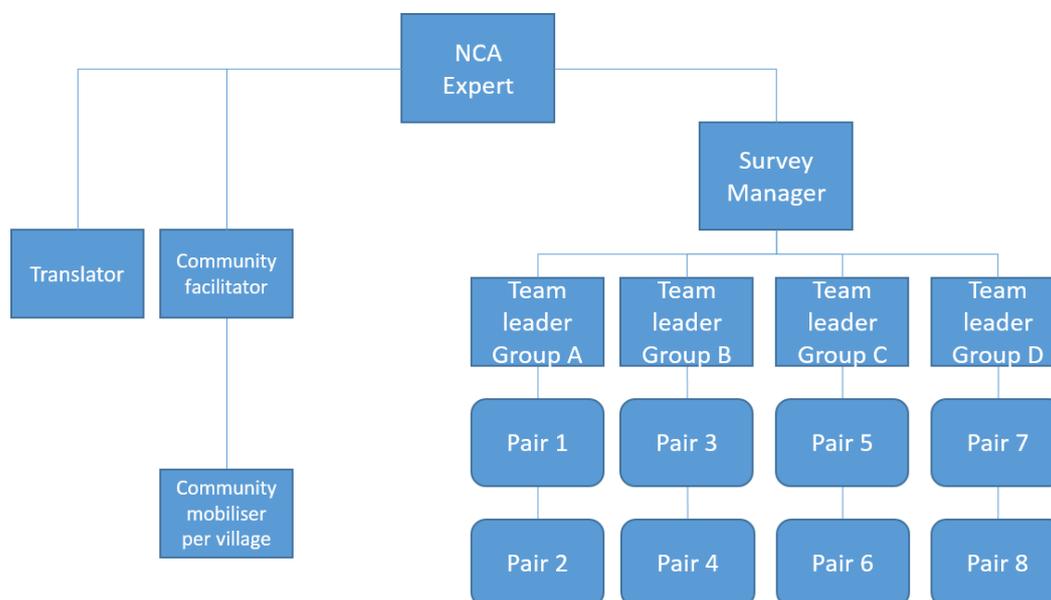
The Qualitative Team consisted of: Link NCA Analyst, field translator, community facilitator, and a driver. The field translator was trained in the Link NCA methodology, qualitative research, and field translation as well as tests of the discussion guides and tools to be used.

4.2.5. Main challenges

Participation of communities for the entire week was challenging at times. The decision was made to provide a small gift to groups who were being asked to attend on several days to encourage continued participation. Additionally, some groups were very poorly educated and did not wish to cooperate with the large number of questions, responses in these groups were harder to explore.

4.3. Team structure

Figure 2 team structure for Link NCA in Preah Vihear Province, Cambodia



5. Data Management and Analysis

5.1. Initial workshop

The proposed hypothesised risk factors were presented to technical experts at the Initial Stakeholder Technical Workshop. Technical experts were invited to discuss, modify and add hypothesised risk factors. At the end of the workshop stakeholders were asked to rate each hypothesised risk factor. These were then averaged for each hypothesised risk factor.

5.2. Quantitative Data Management and Analysis

Data was collected using ODK Collect and uploaded to a central, internet-based ACF ODK Aggregate. Data was exported and transferred to a database designed in Microsoft Excel 2013. For analysis Excel and Epi Info was used.

Anthropometric data was transferred to ENA Software 2011 (July 9, 2015) for calculation of Z-scores and analysis. Exclusion of z-scores from Zero (reference mean) WHO flags: WHZ -5 to 5; HAZ -6 to 6; WAZ -6 to 5 were applied.

5.3. Qualitative Data Management and Analysis

Qualitative data was analysed using ongoing thematic coding at the end of each day. Summaries of emerging themes were also developed. Discussions were transferred to Excel with assigned themes, group type and village and later analysed using content analysis methods.

5.4. Rating Hypotheses

Following data analysis, the Link NCA analyst assigned ratings to the field-tested causal hypotheses based on the following information:

- The prevalence of risk factors from secondary data (where available)
- The strength of the association between the risk factor and under-nutrition based on the current international evidence base
- Seasonality of the hypothesis and undernutrition
- Community participatory ratings

Ratings were assigned based on the Link NCA classifications:

CATEGORY	CRITERIA
MAJOR RISK factor and pathway	Prevalence of risk factor is classified as +++ for ++++ AND Strength of association from literature review is classified as ++ or +++ AND Majority of ++ or +++ for all other sources of primary qualitative and quantitative data collected during the study
IMPORTANT RISK factor and pathway	Prevalence of risk factor is classified as ++ for ++++ AND Strength of association from literature review is classified as ++ or +++ AND Majority of + for all other sources of primary qualitative and quantitative data collected during the study
MINOR RISK factor and pathway	Prevalence of risk factor is classified as + AND Strength of association from literature review is classified as + or - AND Majority of + for all other sources of primary qualitative and quantitative data collected during the study
REJECTED RISK factor and pathway	Prevalence of risk factor is classified as - AND Strength of association from literature review is classified as - AND Majority of - for all other sources of primary qualitative and quantitative data collected during the study
UNTESTED RISK factor and pathway	Information gathered not complete or not available

5.5. Final Stakeholder Technical Workshop

The findings and results of the rating exercise were presented and validated by technical experts at the Final Stakeholder Technical Workshop. Technical experts were asked to inform their level of confidence in each rating by giving a 'confidence note'. These were then averaged for each hypothesised risk factor.

6. Ethical considerations taken during the survey

6.1. Research Ethics

The main principles of human research are: respect for persons, beneficence, and justice:

Respect means to respect that each person can make their own choice about whether to participate, and to respect the culture and communities where the research is conducted.

Beneficence means that researchers are responsible for the participants' physical, mental and social wellbeing. Ethical research should reduce the risks of the participant to a minimum. Additionally, any benefits to the community should be made clear.

Justice means that participants must be recruited equitably, and the researcher should ensure special protected for vulnerable participants.

6.2. Ethical approval and informed consent

Approval was sought at Provincial and District level from the Governors. A meeting was held with the District Governor, Heads of Commune and Heads of Health Centres in Choam Ksant to seek approval and inform them of the intention of the Link NCA.

Verbal informed consent was obtained from all participants in the Link NCA.

Children identified as having SAM were referred to the health centre. If the caregiver was unable to attend, arrangements were made to support them with this through UNICEF.

6.3. SAM and severely ill referral Protocol

A referral form was obtained from a Health Centre in Choam Ksant and photocopied for the Team leaders. During the training, criteria for referral were highlighted and instructions also included in the electronic questionnaire. Team Leaders were asked to identify the closest Health Centre during introductions with the village chief in each village.

7. Limitations

7.1. Link NCA Methodology limitations

The Link NCA presents a detailed, contextualised and local model of the causes of undernutrition and as such the results cannot be generalised to other areas of Cambodia.

The Link NCA does not provide statistical causal associations. The Link NCA provides prioritisation of risk factors, with an inference of strength of causality.

7.2. Limitations encountered related to the study presented

Sample size was calculated for a number of key indicators. Due to time and resource constraints, the largest sample size could not be selected. For some indicators there is not adequate sample size for desired precisions.

For 'handwashing practices' and 'child-caregiver interaction', an oversight resulted in only part of the indicator being included in the questionnaire. These indicators are therefore weaker than anticipated.

Income was seasonal in the Link NCA context and as such it was decided not to measure monthly income. Instead, a subjective poverty score was calculated and used as a proxy for wealth groups.

The timing of the survey has two limitations: data collection was not at the peak of the lean season, and the data was collected during a period where migration for work is reportedly high. This introduced a sampling bias with anticipated poor inclusion of caregivers who had migrated.

Unforeseen circumstances resulted in the field translator for the qualitative community enquiries not completing the 4-weeks of qualitative data collection. This may introduce some discrepancies in interpretation of local terms and discussions from communities 1 and 2, to communities 3 and 4.

Section II: Link NCA Findings

1. Preliminary Stakeholder Technical Workshop

1.1. Causal hypotheses

On the 14th January 2016, Action Against Hunger (ACF) International conducted a Stakeholder Technical Workshop. There were 26 participating experts in Nutrition, WASH, FSL, DRR, Gender, and Health. The objectives of the workshop were to reach consensus on the causal hypotheses to be field tested during the Link NCA.

1.1.1. Initial causal hypotheses

A. High risk for mosquito-borne disease in children under 5 years

Mosquito-borne diseases such as malaria and dengue result in fever, vomiting, and lack of appetite. Stress of the immune system uses up micronutrients and energy and can lead to deterioration in nutritional status. Pregnant women with malaria have an increased risk of delivering a LBW baby. PVH is an area with high risk for malaria and dengue, particularly in forested areas and in the rainy season. MSF are conducting malaria prevention projects in PVH, however they have not been implemented in Choam Ksant district. It appears that most households own mosquito nets, but information on who sleeps under the nets is not available.

B. High prevalence of illness in children under 5 years

Acute infections have been shown to cause growth faltering in children under 5 years, with continual bouts of infection during the first 2-years of life reducing linear growth. Undernutrition also increases the risk of becoming ill, causing a dangerous cyclical relationship. In the last 14 days, diarrhoea was reported in 19% of children in PVH and fever in 32.6%. Deworming medication had been received by 62.2% of CU5 in the last 6-months (DHS 2014). High prevalence of illness in Choam Ksant appears to be in most part, due to poor hygiene and sanitation practices.

C. Delivery without skilled professionals

Those who deliver without a skilled professional are less likely to have attended PNC, and are less likely to attend ANC where they would receive skilled advice on IYCF and care practices as well as maternal health and nutrition. These factors increase the risk of low birthweight, poor child growth and poor nutritional status. In the last 5 years 48.8% of live births were at home in PVH, with 54.4% delivered by a skilled provider (DHS 2014). There is a suggestion that grandmothers play a role in this decision making (KII) and additionally, health seeking behavior in general is constrained by cost, distance and time.

D. Early child bearing

Early childbearing is associated with a higher risk of low birthweight and subsequent increased risk of poor growth of the child. Additionally, early childbearing is associated with a lack of knowledge of proper maternal and IYCF practices. Of women aged 15-19 years in PVH, 25.5% had begun childbearing (DHS 2014). Culturally in rural Cambodia women marry young, and there is an expectation to have children soon after.

E. Workload of mothers and seasonal migration

High workload of mothers increases the risk of poor breastfeeding and care practices due to the absence and lack of time of the mother, which increase the risk of child undernutrition. In PVH, women are traditionally responsible for household chores. In addition to this, 70.4% of women aged 15-49 years are currently employed, of which 78.4% work in agriculture (DHS 2014). During the dry season, mothers from poor families often migrate for work, increasing due to depleting of local resources historically used to generate income in the dry season. In both cases, children are left at home, with elder family members or older siblings taking care for them. In the absence of mothers, adequate infant and young child feeding are not adopted resulting in increased risk for child illness, wasting and stunting.

F. Maternal well-being

There is some evidence to suggest that poor maternal well-being can affect the care practices of children, impacting on child growth. In PVH, 31.8% of women had experienced violence since the age of 15. The perpetrator of violence was most often the husband/partner or parent. There are reports that poverty causes mothers to cry and complain, and also increase the risk of domestic violence (KII). In PVH 47.1% of HHs are in the lowest wealth quintile, and 27.3% in the second wealth quintile (DHS 2014). There is the suggestion that women experiencing domestic violence are more likely to migrate for work (KII), with effects on child feeding and care practices as children are often left at home

G. Lack of exposure to skilled health advice

Poor health seeking behavior leads to prolonged and more serious illness, as well as less access to skilled health advice, increasing the risk of poor health and care practices. Given the link between disease and nutrition, this increases the risk of poor child growth and nutritional status. In PVH it seems that mothers will use health centers, but it may not be the first choice with a historical preference to first seek local or traditional treatment methods. It seems this is due to the cost and distance/time associated with attending a health center, as well as poor perceived quality of health care. Not seeking skilled medical attention and advice will result in poor frequent and prolonged illness in children with a subsequent increased risk of undernutrition. Due to poor education, many do not have prior knowledge of health and nutrition, and with poor health seeking behaviour and poor coverage of nutrition and health activities in Choam Ksant district communities have poor exposure to skilled advice on health and nutrition, increasing the risk of illness, and deterioration with poor nutritional status.

H. Open defecation

Lack of access to sanitation facilities is linked to increased risk of disease such as diarrhoea and intestinal parasites. Open defecation and unsafe disposal of feces introduces germs into the environment. Increased illness leads to increased risk of poor child growth in communities, not just at HH level. In PVH, only 10-50% of HHs are reported to have access to latrines in Choam Ksant district (KIIs). Although there are a number of projects to improve latrine access in PVH, this doesn't seem to have reached Choam Ksant district. With a lack of knowledge about sanitation and hygiene with only 50% of child's stools are disposed of safely (IMCF Baseline Survey, 2013), and limited household income this is not likely a priority for families.

I. Inconsistent access to clean water

Contaminated water increases the risk of diarrhoea, intestinal parasites and other water-borne diseases, and subsequent deterioration of child nutritional status and growth. Access to clean water becomes limited in the dry season in PVH, with wells and hand pumps reported drying up due to overuse (KIIs). The main source of water in villages is hand pumps and wells in the dry season, and rain water in the wet season. It is reported that 87% of households have access to a clean water source

(IMCF baseline report, 2013). However, it is reported that handpumps and wells become contaminated due to improper use (KIIs). Additionally, it seems there is a lack of safe household storage for water; likely due to lack of knowledge as well as lack of income.

J. Poor hygiene practices

Poor hygiene practices increases the risk of diarrhoea and intestinal parasites leading to increased risk of poor child growth and nutritional status. In PVH 13% of caregivers reporting washing their hands after defecating (IMCF baseline survey, 2013). There are also reports of children appearing unclean (KII). Although there are health promotion activities in the area, these are not widespread and it may be feasible to suggest that the lack of access to water impacts on households practicing these new behaviours.

K. Inadequate breastfeeding practices

WHO recommends a child is breastfed within the first hour of life and exclusively breastfed for the first 6 months of life for optimal health, with strong evidence for its impact on reduction of illness. Early introduction of complementary foods has been associated with poor child growth. In PVH, early initiation of breastfeeding is at 77% (DHS 2014). However, it seems there is a cultural tradition to feed water and honey to newborns. It also seems many mothers stop exclusively breastfeeding at 4-5 months with the likely implication of increased illness and early introduction of foods with subsequent increased risk of undernutrition and poor child growth.

L. Inadequate care practices

Poor hygiene and sanitation practices during preparation or feeding of complementary foods increases the risk of child illness such as diarrhoea, which increases the risk of wasting and stunting. In Cambodia, it is common for children to eat alone which can result in small children not eating properly. Additionally, less than one third of respondents washed their hands with soap before preparing food leading to unsafe preparation of children's foods (IMCF baseline 2013). This is likely due to a lack of knowledge of good practices as well as cultural practices.

M. Micronutrient deficient diets of children under 5 years

Poor micronutrient status of children is due to poor dietary diversity and frequent illness. This results in increased risk of disease as well as poor child growth. Diarrhoea in particular causes zinc deficiencies, which have been linked to stunted growth in children. In PVH only 27.8% of children aged 6-23 months reach the recommended minimum dietary diversity (DHS 2014) and many are deficient in iron, zinc, vitamin A and thiamine. This is in part thought to be due to low crop diversity, with traditional rich-dominant diets. In Cambodia there is also a genetic mutation which is thought to cause anaemia. It is reported that mothers have poor knowledge on how to prepare nutritious meals for children, even when the food is available (KII), resulting in poor nutritional status and child growth as well as increased risk of childhood illness.

N. Poor nutritional status of women of child bearing age

The first 1000 days of life from -9months to 23months are a crucial stage for proper child development and growth. Poor nutritional status of women of child bearing age and pregnant women is associated with low birthweight and IUGR due to insufficient fetal nutrition. Low birthweight infants have an increased risk of child malnutrition, poor growth and poor health. In PVH, 16.4% of women aged 15-49 were defined as thin by BMI<18.5 and 53.7% were anaemic (DHS 2014). In Cambodia there is a genetic mutation which is thought to cause anaemia, but there is also poor diversity of diets. PNC attendance is reportedly low and health seeking behavior is not optimum, therefore knowledge levels of appropriate diets are likely to be low.

O. Household food insecurity

Household food insecurity means less food at the household, this results in less calorific intake for household members and/or lower quality of diets through coping mechanisms. This increases the risk of poor child growth, and malnutrition in PLW during the food insecure period. In PVH, availability of rice determines HH food insecurity and hunger. Periodic food shortages occur close to the harvest seasons where there is less food available, and less income for those whose primary income is sale of crops to be able to access adequate food. Recently, unpredictable rains have been causing problems for farmers and as such it is anticipated that household food security may increase.

P. Agricultural dependence

Farming systems in PVH are dominated by rice rain fed system. Rice is the main staple food for the villagers, and when stocks from own production are over (lean season) farmers are seeking jobs out of their farms to purchase food. This happens at a critical time when rice is growing in the fields and require particular attention. This reduction in workforce results in a reduction of the rice production, which then impacts on the rice stock for the next season. This rain fed system is particularly vulnerable to recent climate change and extreme weather events (droughts and floods). Farmers also borrow food or cash during the lean season, and reimburse from the sale of their rice production, after harvest when prices are low. This leads to a vicious cycle of rural poverty with 47.1% of HHs are in the lowest wealth quintile (DHS 2014). Rural poverty is associated with lower quantity and quality of diets, low education attainment, low healthcare access, and poor hygiene and sanitation facilities, all observed in PVH.

Q. Decreasing rural safety nets

With many in PVH sitting just above the poverty line (87.3% in the lowest-middle wealth quintiles) and agricultural-dependence, many household are 'transient poor' with a lack of rural safety nets making them vulnerable to shocks. Historically, natural resources such as the forest have acted as a safety net to communities, providing a way to diversify incomes and diets, especially during the dry season. Recent deforestation and the effects of climate change on natural resources such as fisheries, is putting these rural safety nets in jeopardy, as well as an increase in migration. Inability to deal with shocks can lead to sudden changes in food access and diet quality and quantity, increasing the risk of wasting and disease. Continual exposure to fluctuations (e.g. seasonal) are likely to result in poor childhood growth.

R. Poor knowledge attainment

Poor education is associated with risk of poor knowledge attainment of health and nutrition practices, which results in high risk of maternal and child undernutrition and illness. Whereas knowledge in itself will not lead to change in behaviours if there is not access to resources, poor education attainment is often linked to socio-economic factors and less health seeking behavior. Education attainment is poor for females in PVH with only 7.1% having completed primary education. It is suggested that this is, in part, due to children being required to begin work at an early age due to rural household poverty. Around 30% of respondents named unclean hands as a cause of diarrhoea, and around 4% poor sanitation (IMCF baseline survey, 2013). As well as poor education, a lack of coverage by health promotion activities is likely a contributing factor. Poor knowledge attainment of health, nutrition and hygiene increases the risk of poor nutritional status and health.

S. Poor awareness of malnutrition

Health workers have limited capacity in their understanding of the different types of malnutrition, and awareness in communities is also reportedly low with little understanding of the symptoms and effects of malnutrition. Poor awareness of malnutrition will lead to poor prioritization of malnutrition prevention.

1.1.2. Validation of initial causal hypotheses

Following a review of secondary data and KIIs with local Stakeholders, 19 causal hypotheses were presented to the workshop participants for discussion.

Hypotheses were validated, modified or added as follows:

Validated	A, B, C, D, G, I, J, K, L, N, O, R, S
Modified	E, F, H, M, P, Q,
Added	T, U

The discussion around the modified and added hypotheses was as follows:

- **Workload of mothers and seasonal migration:** Modified to: **Mother's employment and seasonal migration.** Discussion as to whether this was one or two causes. It was suggested that workload could be combined with gender issues/balance (shared responsibilities with men, etc) and this has now been included in **Hypothesis F.** This hypothesis is about the mother's work which takes her away from her child i.e. outside employment. Many participants felt this was a dominant risk factor in terms of effect on IYCF and care practices.
- **Maternal well-being:** Modified to: **Gender issues and maternal wellness.** The role of gender equity within maternal well-being was discussed and thought to be a risk factor within itself. Highlighted that gender issues and women empowerment can impact on many of the risk factors outlined. In terms of WASH practices, women are not the main decision maker for large purchases such as latrines. The issue of household workload in terms of shared responsibilities will be included here. Women are often responsible for all domestic household tasks, as well as employment, leaving limited time for care of children. These factors are thought to affect maternal wellness, as well as poverty and stress, which is also shown to impact negatively on child care practices.
- **Open defecation:** Modified to: **Open defecation and unhygienic environments.** Not only human faeces, also livestock and solid waste management which also spread bacteria and disease. During floods contaminated areas will spread bacteria through the whole flooded areas increasing the impact of open defecation and unhygienic environments.
- **Micronutrient deficient diets of children under 5 years:** Modified to: **Poor quality diets of children under 5.** There was discussion around this hypotheses in relation to a recent micronutrient survey. It was found that prevalence of iron and vitamin A deficiency is in fact not high. The micronutrients of concern are: zinc and thiamine. Also discussion about how children's diets are deficient in protein, and poor quality. Practice of giving processed snack foods. Discussion on meal frequency with one participant reporting that most rural families will only eat 2 meals a day.
- **Agricultural dependence:** Modified to: **Agricultural dependence and poor crop diversity.** Low diversity in markets causes low prices for rice and cassava, the common crops. Given this, this hypotheses will be renamed
- **Decreasing rural safety nets:** Modified to: **'Poor resilience'**. Extreme weather conditions such as floods and droughts are impacting livelihoods and food availability with loss and reduction of crops, and this is aggravating by decreasing rural safety nets, in part also a factor of climate change e.g. reduction of fish. This also encompasses a lack of technical skills and resources to cope with effects of weather extremes on crops. Discussion around the negative effects of flooding on access to clean water and unhygienic areas.
- **Low income and limited livelihoods:** Added. It was highlighted that income affected a large majority of the proposed hypotheses e.g. household food insecurity, nutritional status of WCBA and WASH. Whereas 'rural poverty' had been combined with 'agricultural dependence' as a risk factor, it was thought that low income, and limited access and diversity to livelihoods was multi-causal and should be a risk factor on its own. Specifically in its relation to WASH e.g.

access to household latrines. An exasperating factor is the practice of gambling, prostitution and alcoholism.

- **Limited access to markets and poor infrastructure:** Added. Remoteness of PVH and isolation of villages from each other was discussed. One of the reasons for this was thought to be poor road access and linear layout of villages. Markets within villages do not always exist, and if they do are very small. Links to larger markets and markets in other villages do not seem to exist. This impacts on diversity of markets and hence diets, as well as limiting the economic productivity of agricultural products. Additionally, poor infrastructure impacts on access to villages in terms of health education and other beneficial programmes. One reason for this is thought to be a lack of investment from the government and limited commune budgets leading to basic services, poor infrastructure and limited development.

1.1.3. Rating of proposed hypotheses

Technical experts gave individual ratings at the end of the workshop to each of the original hypothesised risk factors plus two hypotheses which were added during the workshop. The below is the rating key:

1-1.9 = Minor contributor to undernutrition in Preah Vihear	2-2.9	3-3.9	4-5 = Major contributor to undernutrition in Preah Vihear
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The hypothesised risk factor ratings are detailed in Table 4.

Table 4 Average ratings of hypothesised risk factors from the Initial Stakeholder Technical Workshop

Hypothesised risk factor	Average rating
A. High risk for mosquito-borne disease in children under 5 years	2.9
B. High prevalence of illness in children under 5 years	4.1
C. Delivery without skilled professionals	3.0
D. Early child bearing	3.3
E. Workload of mothers and seasonal migration	4.2
F. Gender issue and maternal wellness	3.3
G. Lack of exposure to skilled health advice	3.7
H. Open defecation	3.9
I. Inconsistent access to clean water	4.2
J. Poor hygiene practices	4.1
K. Inadequate breastfeeding practices	4.0
L. Inadequate care practices	3.9
M. Poor quality diets of children under 5	4.3
N. Poor nutritional status of women of child bearing age	3.9
O. Household food insecurity	4.0
P. Agricultural dependence	3.3
Q. Poor resilience	3.1
R. Poor knowledge attainment	3.4
S. Poor awareness of malnutrition	3.6
T. Low income and limited livelihoods	3.9
U. Limited access to markets and poor infrastructure	3.3
Average Rating	3.7

The final hypotheses for field testing can be found in Annex F.

1.2. Nutrition vulnerable groups

The following nutrition vulnerable groups were identified as nutrition vulnerable groups:

- children under 5 years;
- pregnant and lactating women;
- adolescent girls;
- older people and elderly poor;
- HHs with migrating members;
- HHs vulnerable to flooding; and,
- new villages with poor access to facilities

2. Characteristics of the studied population

2.1. Household composition

In total, 810 households were visited, 355 had no child under 5-years, and 20 refused to participate. In total 435 households completed the survey. In these 435 households, there were 542 children under 5-years of which 253 were under 2-years. The responding caregiver was the mother in the majority, 7% were grandmothers, 0.2% were aunty or other female family member, and 0.2% were fathers. The average number of people in a household was 5.3 persons, and ranged from 2 to 13 persons. There was an average of 1.2 children under 5 years of age.

2.2. Number of community enquires

The community enquires took place in four villages in Choam Ksant district. Table 5 details the number of FGDs and KIIs in each village, and the groups organised.

Table 5 Numbers of Focus Group Discussions (FGD) and Key Informant Interviews (KIIs) with participant numbers for each village by day

Day	Participants	Village 1	Village 2	Village 3	Village 4
1	<i>Key informants:</i>	3 FGDs (10)	3 FGDs (8)	3 FGDs (8)	3 FGDs (7)
	<i>Health workers:</i>	3 KIIs	3 KIIs	2 KIIs	1 KII
2	<i>Mothers x2:</i>	6 FGDs (16)	6 FGDs (18)	6 FGDs (12)	6 FGDs (21)
	<i>Grandmothers:</i>	3 FGDs (6)	3 FGDs (8)	3 FGDs (7)	3 FGDs (9)
3	<i>Mothers x2:</i>	6 FGDs (16)	6 FGDs (12)	6 FGDs (11)	6 FGDs (18)
	<i>Fathers:</i>	3 FGDs (9)	3 FGDs (9)	3 FGDs (5)	3 FGDs (7)
	<i>ND mothers:</i>	2 KII		1 KII	
4	<i>Mothers x2:</i>	6 FGDs (14)	6 FGD (16)	6 FGD (14)	6 FGD (20)
	<i>Village elders:</i>	1 FGD (9)	1 FGD (12)	1 FGD (10)	1 FGD(9)
	<i>PD mothers:</i>	2 KII	2 KII	2 KII	2 KII
5	<i>Mothers & fathers - 2 groups:</i>	Seasonal calendar, wealth ranking & rating exercises			
Total		28 FGDs 7 KIIs	28 FGDs 5 KIIs	28 FGDs 5 KIIs	28 FGDs 3 KIIs

2.3. Overview of villages from the qualitative enquiry

The main activities in this area were farming of rice and cassava. There was also a growing trend of casual labour for construction work or cassava chopping. In addition, this area is rich in natural resources and the forest is used to diversify livelihoods in many ways: collecting rubber from trees, collecting sap from trees, fishing, hunting, gathering of mushrooms and other wild foods, and collection of firewood. Distance to markets varied. Two villages were under 10 minutes from the market whereas one was over 1 hour from the market. This village, and others, had *moto*-markets (motorbikes selling goods). Most households had livestock, which were often used as a safety net when needed. Poor households did not own much else in the way of assets. Some middle-wealth households owned hand tractors and/or *motos*. Almost all households seemed to have some size of land for farming.

Water sources were mainly groundwater: handpumps, motorised pumps and wells. In addition one community had water trucks for purchasing water from a pond. Some communities also used ponds, streams and lakes, this was more likely in the field and forests. Rain water was used in the wet season, some had roof rainwater storage and some used dug ponds, whereas others stored this in the same clay jars as for groundwater sources. A minority of households had access to a latrine, open defecation was widespread in all communities. Distance to Health Centres varied, one village was 45 minutes from the nearest Health Centre whereas others were 10 minutes. All villages had VHSG as a community health worker, but they varied in activity and capacity.

3. Undernutrition

3.1. Anthropometric results

Table 6 presents the results of the SMART Survey of the Link NCA. According to WHZ, Global Acute Malnutrition (GAM) prevalence is 6.7%, with 1.3% of Severe Acute Malnutrition (SAM) cases. According to MUAC, GAM prevalence is 0.9%, with 0.2% SAM cases. Compared with the DHS 2014, the prevalence for GAM is much lower, this could be explained by the timing of the Link NCA as the study was not conducted at the peak of the lean season. However, the IMCF Baseline Survey 2013 was conducted in the lean season and found GAM to be 8.5% with 1.1% of SAM cases (n=1028)⁶. Stunting is also less than DHS 2014, but still at a level of high prevalence of 34.9% according to the WHO thresholds. Underweight is at 22.5% with 3.7% of children severely underweight, slightly less than DHS figures.



Table 6 Anthropometric results for 463 children aged 6-59 months

	Criteria	Prevalence (%)	Lower 95% CI	Upper 95% CI	Provincial data CDHS 2014
Global acute malnutrition (GAM)	WHZ<-2.0 and/ or oedema MUAC<125 and/ or oedema	6.7 0.9	4.8 0.3	9.4 2.2	15.1
Moderate acute malnutrition (MAM)	-3.0 ≤ WHZ < -2.0 11.5 ≤ MUAC < 12.5	5.4 0.6	3.7 0.2	7.9 1.9	13.8
Severe acute malnutrition (SAM)	WHZ<-3.0 and/ or oedema MUAC<11.5 and/ or oedema	1.3 0.2	0.6 0.0	2.8 1.2	1.3
Stunting		34.9	30.6	39.4	44.3
Severe Stunting	HAZ<-3.0	10.2	7.8	13.4	14.0
Underweight	WAZ<-2.0	22.5	18.9	26.5	30.7
Severe Underweight	WAZ<-3.0	3.0	1.8	5.0	5.9

3.2. Nutrition vulnerable groups

During the Initial Stakeholder workshop, children under 2 years and children over 2-years were identified as a nutritionally vulnerable group. Figure 3 shows that SAM increases at 6-17 months, moderate acute malnutrition rises after 30-41 months. However, prevalence of GAM was low at 6.7% (n=31) and as such age groups contain small numbers.

⁶ A. Reinbott et al, *IMCF Cambodia in Preah Vihear and Otdar Meanchey Provinces: Cross-sectional Nutrition Baseline Survey, 2013*

Figure 3 Prevalence of wasting based on Weight-for-Height (WHZ)^a, by age group

^athere were no oedema cases

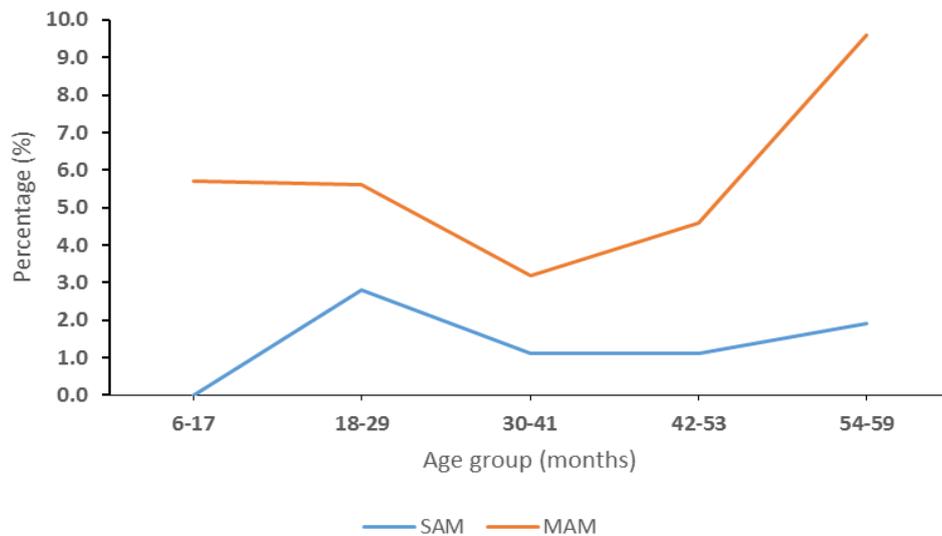
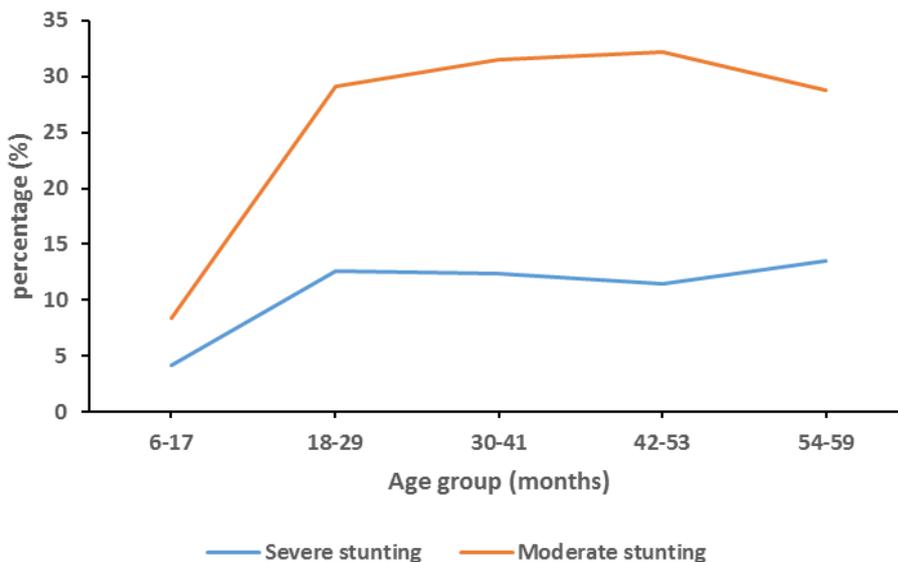


Figure 4 shows that the risk of stunting increases after 6-17 months of age as is expected from global results, this is often linked with the period of transition from exclusive breastfeeding to complementary foods.

Figure 4 Prevalence of stunting by age group



3.3. Local definition of undernutrition

Definitions of undernutrition varied across the four communities, but all had a common theme of ‘not eating enough’. In two communities this was specified as “not eating enough nutritious foods”. In one community there was a common perception that poor linear growth was due to genetics, with the justification that the child is not sick, or does eat enough, but they still don’t grow tall. In three of the villages the role of hygiene or illness in poor child growth was also noticed. The following were the accepted definitions of undernutrition for the four villages:

- *Poor growth due to not eating enough nutritious foods or due to your DNA. (Kouk Sralao)*

- *A disease caused by not enough nutritious foods or unclean foods, which leads to poor growth. (Tmat Peuy)*
- *Poor growth due to not enough food, not enough sleep or poor hygiene. (Sok Senchey)*
- *When a child does not grow well or is not clever because they do not eat enough food or are ill a lot. (Svay)*

3.3.1. Local perception of undernutrition

A common perception of undernutrition was not having enough food, or enough nutritious food. Nutritious foods were sometimes specified as vegetables. A less frequent perception was not having enough vitamins. Undernutrition was often described as a child being sick a lot or getting sick easily. Another common observation was when a child is eating a lot but still being small. Another was that a child does not want to eat.

The most common words used to describe someone with undernutrition were: ‘skom’ (thin), underweight, ‘slek slun’ (pale, weak, anaemic), ‘kres krun’ (small), and short. There was also a frequent perception of not having ‘clear skin’. Another common perception was having thin legs and arms with a big stomach.

Different types of undernutrition were sometimes defined, in one community they differentiated being pale, weak and anaemic was differentiated from not growing properly. In another, as some children do not grow properly, some are stunted, some have yellow skin, and some are pale with no power.

In one community, men had not heard of undernutrition, but were able to explain poor growth in children.

“Children are not growing equally. Know because not growing normally, sick a lot. Children not growing well look pale, eyes not bright, small legs and arms with big stomach, ‘skom’”. (Fathers of children under 5, Svay Village)

On talking with nutrition and health staff at local NGOs, some saw undernutrition as not enough vitamins, poor nutrition or lack of sugar. They described children as having ‘khan loung’ meaning yellow skin and hair, as well as the same words as the community meaning: thin and small.

3.3.2. Local perception of good nutrition

Key informants, mothers and fathers in three villages perceived a good diet as fish, meat, green leafy vegetables, borbor, eggs; fruit was sometimes mentioned. Rice was often only mentioned when promoted. In some villages there was much more of an emphasis on vegetables as the most important food for children for good health. There were many reports of chemicals on vegetables in all communities, with the perception that this was not good for child health. Therefore, some groups perceived home-grown foods as good for nutrition and health. In one village, perceptions differed. Both groups of mothers felt that a good diet was rice, borbor, breastmilk and bananas. Grandmothers mentioned only bananas when prompted for important food for children. In one village, poor-wealth mothers perceived infant formula to be good for children. In another village, grandmothers’ perceived infant formula as the best food for a child, this knowledge came from the Market Sellers.

Key people in one village felt good nutrition was eating the 3 food groups: foods that build the body, foods that protect the body and foods that are for growth. This came up a number of times in the perception of causes of undernutrition also.

4. Food Security and Livelihoods

4.1. Community perception of food security and causes of poor food security

Food insecurity was mainly perceived as not having enough foods. In one community, this was perceived to be due to problems with access when there was a lack of income, or depleting availability of wild foods. In another community, this was perceived as being due to low income for food expenditure, or low income meaning the need to sell rice crops and subsequently having insufficient rice stocks. Another perception of low food availability was due to poor crop yields and distance from markets. Extreme weather conditions were also linked to having shortages of food by rice crops or homegardens being affected. Groups in one community talked about the fact that wild foods have become harder to find in recent years impacting on household food and income.



4.2. Findings for FSL Hypotheses

4.2.1.E. Mother's employment and seasonal migration

A common discussion in communities was parents not having enough time to take good care of children because of work. This was seen as a reason for undernutrition, poor growth and poor hygiene practices; three communities perceived mothers working to be a key reason for undernutrition in the community. In Preah Vihear/Stung Treng, 70.4% of women were employed, the same as the National statistic. However, 78.4% of these women were working in agriculture compared to the national 43.7%.⁷ This was confirmed during community discussions, with almost all mothers working during the farming season. There was also an increase in mothers seeking causal labour in the dry season due to increased work opportunities and low household incomes. Both of these activities meant mothers were away from the household and not seeing their children for most of the day. Raising livestock and producing rice wine were the only home-based activities mentioned.

"Busy doing causal labour so not enough time to take care, or when go to field and leave child with other people, leads to undernutrition." (Mother, Svay)

[Main problems with keeping child health]: "income, so no time. Must spend time doing IGAs. No time to care, always go to the forest." (Fathers, Tmat Peuy)

The evidence base is mixed for the association between maternal employment and child's nutritional status, with some studies finding a positive relationship due to the extra income and improved child spacing, and some a negative relationship due to the impact on feeding and care practices. Evidence

⁷ National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

shows that the relationship appears dependent on a number of factors: age of child, distance of work from home, type of secondary carer, and use of additional income.⁸ When a woman possesses control of her income, it is more likely to improve the nutritional status of the child.⁹

The mother being the caregiver most of the time was identified as a positive deviant behaviour. However, Glick’s review found that above 1 or 2 years-of-age maternal working was beneficial to nutritional status.¹⁰ In some communities surveyed during the Link NCA, mothers were returning to work when their child was 6 - 12-months. When the child was very young it was more likely for the mother to take the child to work, which has also been identified as a risk factor for undernutrition.¹¹ The alternative was that children were left at home with a secondary carer, usually the grandmother. Grandmothers were perceived to be less likely to practice appropriate feeding than mothers and had less knowledge of diarrhoea prevention. If a grandmother was not available, children were often left with older siblings. It has been shown that preteen carers lack the maturity and knowledge to demonstrate positive child care practices.⁶ ⁷In some households children were left unattended at the household whilst the parents went to the forest, fields, or for shorter times when collecting water.

“Children older than 12-years look after younger children, especially in rainy and harvest season....Yes they will be feeding the child.” (Mothers, Tmat Peuy)

“Mothers and fathers are busy. But still take care of children. Sometimes leave children alone but for only 1-2 hours.” (Health Post Staff, Tmat Peuy)

The 2008 CFSVA found that 19% of households in Cambodia had a migrating member.¹²The RFS found that only 3.7% of caregiver respondents had migrated in the last 12 months despite this being a highlighted risk factor by many Key Informants in the preparatory stages (Table 7). The Link NCA community enquiries found that migration patterns varied from community to community. In some communities, it was mainly older children and young adults who were migrating, whereas in others it was also parents, most often the father.

“Migration to Thailand and to Phnom Penh. Usually children, but also parents. If mother and father go, child usually stays with grandmother in the village. Usually go in the wet season after planting, then come back for harvest.” (Key People, Sok Senchey)

“Some families migrate nearby for a few days, some men migrate further for 2-3 weeks. Normally the husband.” (Mother, Kouk Sralao)

Table 7 Migration Indicators for 434 surveyed caregivers

	n	Proportion (%)	Lower 95% CI	Upper 95% CI
Migrated in the last 12 months	16	3.7	1.3	6.1

When mothers did migrate, some would migrate with their families and some would go alone, the RFS found this mixed behaviour (Figure 5). In some communities, migration of mothers was dependant on the age of the child.

⁸ PL. Engle, *Maternal work and child-care strategies in peri-urban Guatemala: nutritional effects*, Child Dev, 1991

⁹ P L. Engle et al., *Care and Nutrition: Concepts and Measurements*, 1999

¹⁰ Glick, *Women's Employment and its Relation to Children's Health and Schooling in Developing Countries: Conceptual Links, Empirical Evidence, and Policies*, Cornell Food and Nutrition Policy Program Working Paper No. 131 2002

¹¹ *The Manoff Group and Save the Children Cambodia, Understanding the Context for Promoting Nutrition-Enhancing Behaviours among Households with Severe Resource Constraints, NOURISH Project, 2015*

¹² *World Food Programme, Comprehensive Food Security and Vulnerability Analysis (CFSVA): Cambodia, 2008*

Figure 5 Primary carer of child under 5-years whilst mother migrated in the last 12 months

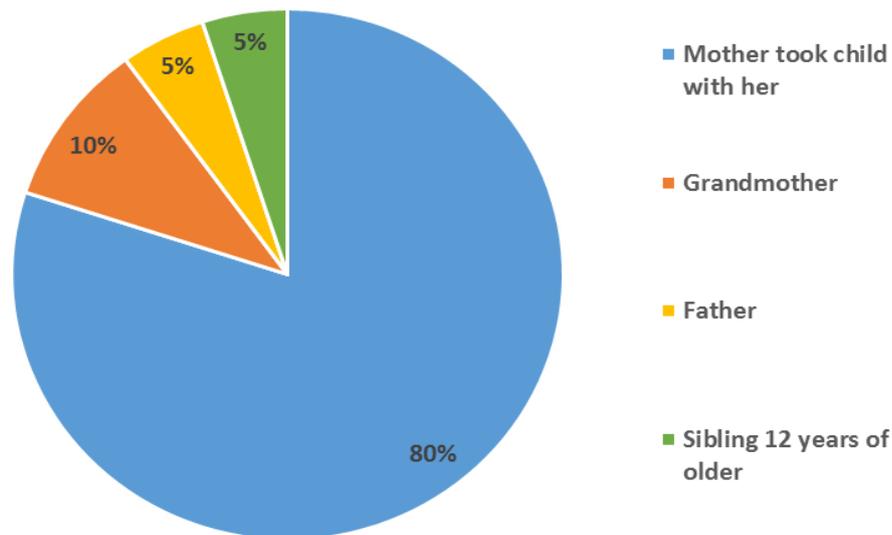
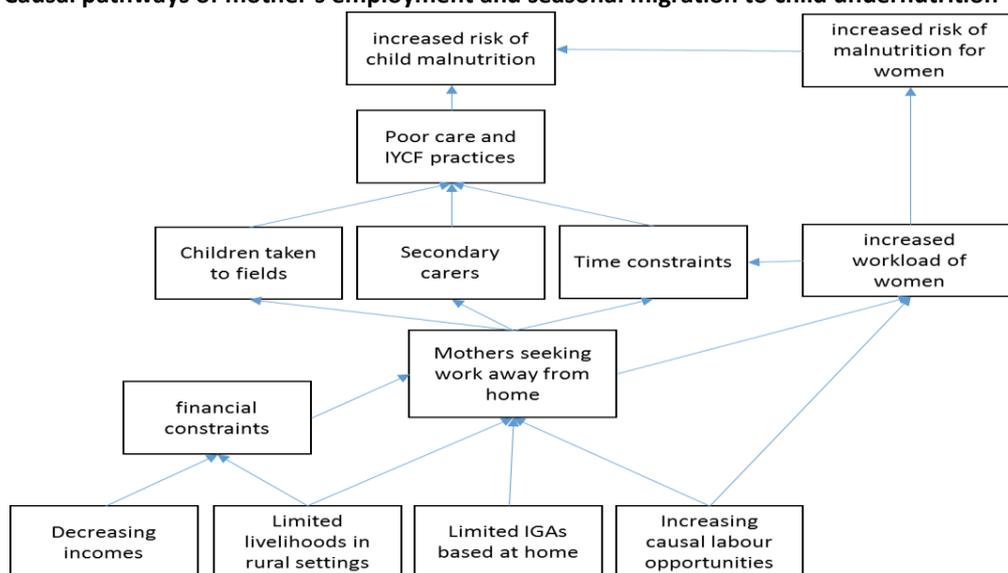


Figure 6 presents the pathway by which mother’s employment and seasonal migration leads to an increased risk of undernutrition for child and women of child-bearing age

Figure 6 Causal pathways of mother’s employment and seasonal migration to child undernutrition



4.2.2.O. Household Food Insecurity

In all communities, food is sourced throughout the year from the wild (leaves, vegetables, wild animals, fish and other aquatic species), homegardens and food markets. The majority of households owned chickens, used for consumption and sale. The majority of households grew rice for household consumption, some had enough land to feed their family, whereas some were too small or the crops were not growing well enough. The majority of households stocks ran out before the next harvest. Vegetables were not often grown as crops, but homegardens were present in some communities. In some villages, homegardens mainly consisted of green leaves but in others there were also pumpkins and aubergines. Water shortages were the main barrier to growing homegardens. In one village, poor households planted home gardens in the rainy season as they did not have water in the dry season, whereas middle-wealth households planted in the dry season as they had more free time, using well or handpump water.

Community perceptions of undernutrition were mainly around not having enough food to eat and subsequently household food insecurity was rated highly as a cause of undernutrition by communities. This was mainly linked with financial constraints to purchasing enough food or nutritious foods. Expensive foods were: meat, vegetables other than green leaves, fruits, seafood and infant formula. If extra income, mothers often responded they would purchase food.

Table 8 shows the average household consumed 7 food groups in the last 24 hours, indicating that in February-March the average household has acceptable access to diverse foods.

Table 8 Indicators of food security in 435 RFS Households

	n	Mean or Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial data
FCS (%)					
<i>Poor (0-25)</i>	9	2.1	0.1	4.0	13.35 ¹³
<i>Borderline (25-38.5)</i>	29	6.7	3.6	9.8	
<i>Acceptable (> 38.5)</i>	397	91.3	86.9	95.6	86.65 ⁵
HDDS (Mean (SE))	435	7.0 (0.2)	6.6	7.4	6.13 ¹⁴
MAHFP (Mean (SE))	435	10.5 (0.2)	10.1	10.9	-

As well as financial constraints, there were problems with accessing markets in some communities. The RFS found 36.1% of households had a market in the village (Table 16). During the community enquiries, the nearest market to one village was 45km away. This community would purchase foods from daily motorised-markets in the village and travel to big markets 1-2 times a month. Households were more reliant on gathering of foods from the wild such as fish, frogs, snails, and green leaves. Another community experienced seasonal difficulties as when there was a lot of rain the roads to the market became inaccessible. It was also difficult to gather foods and work in this time. Food prices increased in the village shops due to poor availability of food in the community. Table 9 presents consumed food groups with increasing food access. As household food access increased, vegetables became more accessible, followed by meat, fruit and sugary foods. Only those with highest food access had consumed oils and fats, eggs and pulses. Even though it was common for households to own chickens and ducks, in two communities eggs were kept to hatch with this seen as more of a priority than consumption; only one-third of households had consumed eggs.

Table 9 Food groups consumed by ≥50% of households by dietary diversity quartile

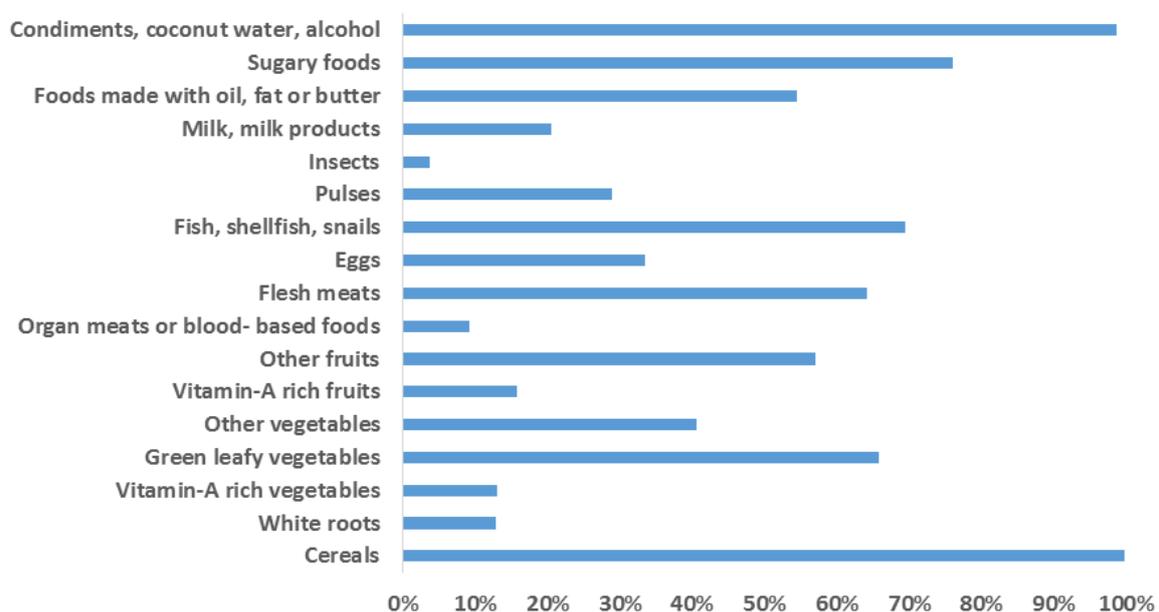
≤ 3 (16 HH, 3.7%)	4 - 5 (87 HH, 20.0%)	6-7 (168 HH, 38.4%)	≥ 8 (165 HH, 37.8%)
Cereals	Cereals	Cereals	Cereals
Fish, seafood or snails			
Condiments	Condiments	Condiments	Condiments
	Vegetables	Vegetables	Vegetables
		Meat	Meat
		Fruit	Fruit
		Sugary foods	Sugary foods
			Foods made with Oils or fats
			Eggs
			Pulses

¹³ National Institute of Statistics, Cambodia Socio-Economic Survey 2014, 2015

¹⁴ A. Reinbott et al, IMCF Cambodia in Preah Vihear and Otdar Meanchey Provinces: Cross-sectional Nutrition Baseline Survey, 2013

The Cambodian Comprehensive Food Security and Vulnerability Analysis (CFSVA) estimated that nationally 65% of calorific intake is made up of rice.¹⁵ The RFS results agree with that found by the IMCF Baseline Survey 2013, in that the most consumed food groups were: Cereals, Condiments, Fish, Seafood and Snails (Figure 7). The RFS also found sugary foods as one of the most consumed food groups. Around two-thirds of households in the RFS consumed flesh meats in the previous 24-hours. The least consumed groups were milk and milk products, insects, organ meats, vitamin-A rich fruits, vitamin-A rich vegetables and white roots. There were frequent reports of chemical contamination of vegetables from the market. It was thought to be a cause of poor growth and health. In some communities this was a hindrance to purchasing vegetables with increased reliance on homegardens and wild foods, which are predominantly green leaves. Figure 7 shows that whereas over 60% of households consumed green leafy vegetables, only 40% consumed other types of vegetables.

Figure 7 Percentage of households consuming specified food groups in the previous 24-hours



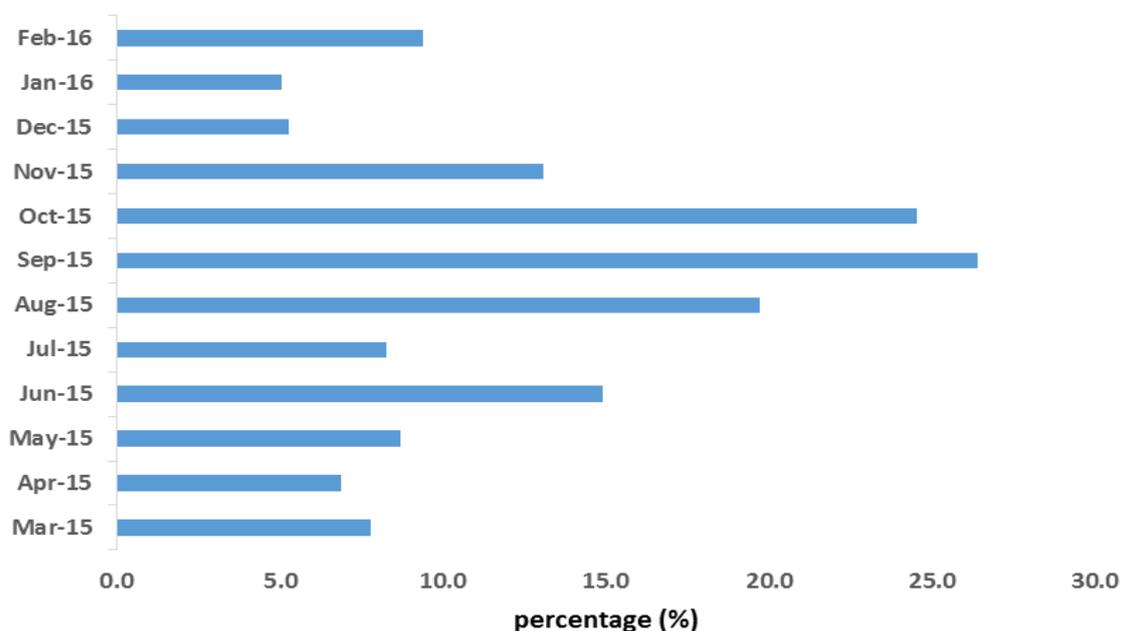
The Food Consumption Score (FCS) found 91.3% of households had acceptable food consumption over the last 7 days, with only 2.1% classified as poor food consumption, implying high food insecurity (Table 8). This is similar to the Cambodia CFVSA which found nationally 88.9% of households to have acceptable and 4.1% to have poor food consumption. Despite reasonable statistics for the HDDS and FCS, it must be considered that the Link NCA was not conducted at the peak of the lean season, and as such it can be inferred that these statistics may present more food insecurity during the lean season. The IMCF Baseline survey was conducted in the lean season, and reported a slightly lower average HDDS of 6.13. The MAHFP shows that on average households have adequate food provisioning for 10.5 months of the year. During community enquiries, some communities perceived themselves to be often short of foods, frequently eating basic foods such as rice with salt and chilli, or rice with *prahok*¹⁶, whereas others did not perceive food shortages as a major problem. Figure 8 shows that the months where the most households experienced food shortages were September and October, prior

¹⁵ World Food Programme, *Comprehensive Food Security and Vulnerability Analysis (CFSVA): Cambodia, 2008*

¹⁶ *Fermented fish paste*

to the harvest, in the previous 12 months. The IMCF Baseline Survey also found the hunger months were September and October.¹⁷

Figure 8 Percentage of households with inadequate food provisions, by month



Reported food shortages were often shortages of rice at the households pre-harvest. With the rice harvest in November to December, this is reflected in the results in Figure 8. Table 10 presents reported barriers to food access and availability of all foods dependent on the season. In the majority, foods were purchased more in the dry season when there was less wild food availability, creating a risk of food shortage for poor households. Food availability is closely related to market prices, increasing in the dry season when there is less food available and more households are purchasing.

Table 10 Barriers to food availability and access, by season

Dry season (harvest, and non-busy period) (October – April)	Rainy season (farming season) (May–October)
Shortage of wild foods	Rice shortages pre-harvest
Shortage of fish	Time constraints to gathering, hunting and fishing
More purchasing of foods from markets and shops	Rice prices increase pre-harvest
Food prices increase	Poor access to markets, access to forests when heavy rain (some)
	Livestock disease

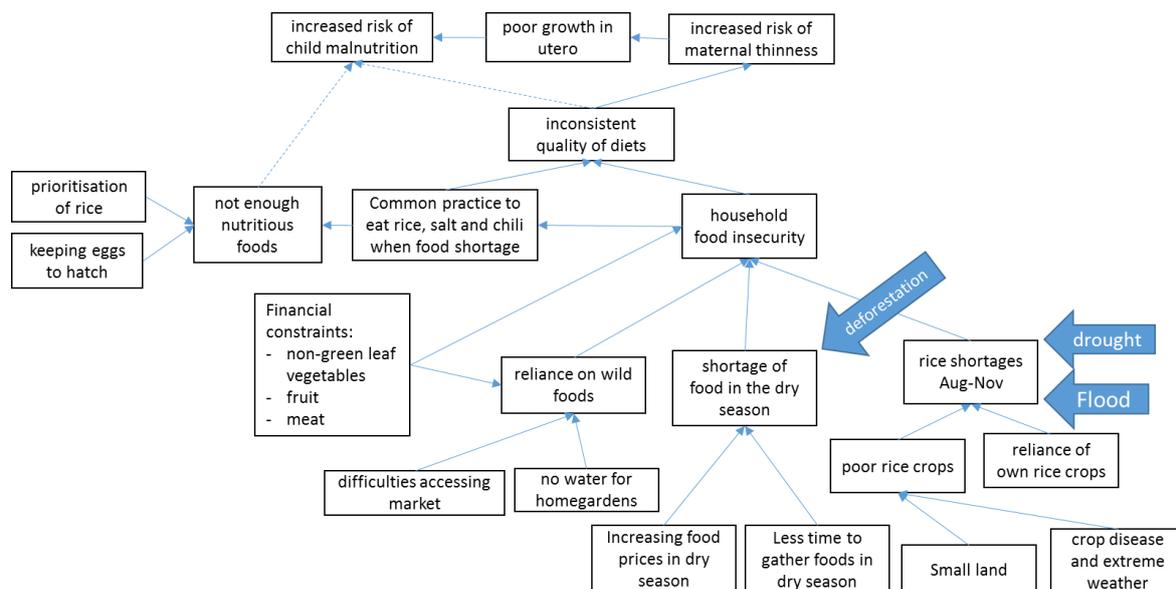
Food availability was affected by extreme weather events. In villages where there had been droughts, there were discussions on poor rice crops, death of livestock, and a shortage of fish. Additionally, wild foods were perceived in all communities to be less available than past years because of deforestation. In one community, they observed increased purchasing due to the decreasing availability of wild foods. When people do not have enough food, they cook rice as porridge, cook smaller family food, and use what they have available or can find through fishing or gathering. One group mentioned they

¹⁷ A. Reinbott et al, IMCF Cambodia in Preah Vihear and Otdar Meanchey Provinces: Cross-sectional Nutrition Baseline Survey, 2013

would kill a chicken. Often households will eat only rice with salt and chilli, or rice with 'prahok' (preserved sauce made of fish). Prahok is prioritised in some communities for purchase in times of financial constraint; in one community they would prioritise the purchase of vegetables as well.

Evidence for the association between food security and child undernutrition is lacking, in part due to the difficulty assessing food security. However, a study in Bangladesh found that underweight and stunting was significantly lower in food-secure households.¹⁸ However, a recent study in Cambodia found that risk of maternal thinness and anaemia increased as food insecurity increased, but there were no associations with child nutrition status.¹⁹ Figure 9 presents the pathway by which household food insecurity increases the risk of undernutrition for children and women of child-bearing age.

Figure 9 Causal pathway of Household Food Insecurity to increased risk of malnutrition



4.2.3.P. Agricultural dependence and poor crop diversity

In the community enquiry, the main livelihoods discussed were farming and casual labour, the RFS shows that casual labour is not often the main source of income (Table 11). Compared with the IMCF Baseline Survey in 2013²⁰, there is less dependence on sale of agricultural products, with the Link NCA population showing a larger number of households to depend on employment/salary as the main source of income. Despite this, sale of agricultural products is still the main reported source of income at 37.0%. This is similar to the National statistics, with the Cambodia Socio-Economic Survey 2014 finding 45.3% of households in Cambodia to be working in agriculture.²¹

As well as reliance on agricultural crops for income, communities rely on rice crops for staple food. The majority of households discussed taking loans. Often this was at the beginning of the farming season, but in some communities it was throughout the year. The majority of households relied on sale of agricultural products to repay these loans. Therefore, when crops do not grow households are

¹⁸ KK Saha, *Household Food Security was Associated with Growth of Infants and Young Children in Rural Bangladesh*, FASEB J, 2008

¹⁹ CM McDonald et al., *Household food insecurity and dietary diversity as correlates of maternal and child undernutrition in rural Cambodia*, Eur J Clin Nutr, 2015.

²⁰ A. Reinbott et al, *IMCF Cambodia in Preah Vihear and Otdar Meanchey Provinces: Cross-sectional Nutrition Baseline Survey*, 2013

²¹ National Institute of Statistics, *Cambodia Socio-Economic Survey 2014*, 2015

at risk of less income, problems repaying loans, and food shortages in terms of rice stocks. Additionally, income historically spent on the household was being spent on repayments. Coping mechanisms discussed were taking another loan, sale of livestock, sale of forest items, or casual labour.

Table 11 Main sources of income for 436 surveyed households

	n	Proportion (%)	Lower 95% CI	Upper 95% CI
<i>Sale of agricultural products</i>	161	37.0	25.6	48.4
<i>Sale of firewood/charcoal or non-food forest products</i>	11	2.5	-0.1	5.2
<i>Sale of wild foods</i>	26	6.0	2.2	9.8
<i>Casual labour</i>	31	7.1	3.4	10.8
<i>Petty trade small business</i>	63	14.5	9.5	19.4
<i>Employment/salary</i>	125	28.7	16.9	40.5
<i>Cash remittance</i>	1	0.2	-0.2	0.7
<i>Other</i>	16	3.7	-0.8	8.1
<i>None</i>	1	0.2	-0.2	0.7

The majority of farmers were growing rice, and additionally those with resources were growing cassava. More farmers had begun to grow cassava in recent years, diversified livelihoods in the area either by direct cassava growing or by providing casual labour for other members of the community. In one community, men had noticed that as more people began to grow cassava, the prices were decreasing. Water access was the main barrier for growing different crops, there was no discussion on irrigation systems. A second barrier was roaming animals destroying fruit and vegetable crops.

This hypothesis impacts on [Hypothesis O](#) and [Hypothesis T](#), as dependence on agricultural products for income and food stocks causes households to be vulnerable when extreme weather conditions and other shocks effect agricultural production. Meaning if households have insufficient safety nets or coping mechanisms, this can lead to financial difficulties and food insecurity. Heavy reliance on agriculture was evident in two of the communities where the Link NCA conducted community enquiries; poor crop diversity was evident in all. Communities rated this risk factor highly as a cause for undernutrition as if they had no crops; they had no food or income. Figure 10 presents the causal pathway by which agricultural dependence and low crop diversity lead to an increased risk of malnutrition.

As discussed under [Hypothesis P](#), the main ways to generate income were: sale of agricultural products, salary/employment, small business and casual labour. During community enquiries, people discussed sale of wild foods and animals, and non-food forest products to diversify incomes. In one community mothers discussed sale of vegetables, but they did not have market stalls so were selling at lower prices. In one military village, an estimated 50% of the men were employed by the military. The RFS only collected information on migration on caregivers, which was low, however many discussed household members, mainly fathers and older children, migrating for work.

Many household incomes were unreliable or seasonal, with sale of rice or vegetables only if enough was produced, and frequent poor crops Cassava farming was not accessible to all poor households, although community members were working as casual labourers for 'cassava chopping'. Agricultural products were often sold immediately after harvest, when prices were lowest. Livestock disease made sale of livestock unreliable. In one community they discussed not being able to sell their animals at certain times of the year as they had diseases. In the dry season, 8.8% of households' main income was sale of forest products but for many more this was a second/third income. One community acknowledged the impact reduced availability of these products was having on incomes.

"Income has changed: used to be easy to find food and things to generate money. Now it's difficult. Income a year much less than 5 years ago." (Mother, Tmat Peuy)

Incomes were seen by almost all groups as reducing over the years. However, one group of mothers felt that their income was increasing as there were more opportunities for generating money for women, such as casual labour. Groups who perceived their income as decreasing felt this was due to poor crop yields with the increasing effects of climate change, decreasing prices of rice and cassava, and less availability of forest products to sell. With increased borrowing of money, more people in the community were using income generate from sale of agricultural products for repayments.

"Decreasing income means: not enough money to pay debts, not enough money to buy food, not enough money for healthcare when child is sick, not enough money to repair machinery for agriculture. Most lead to increased borrowing of money." (Father, Svay)

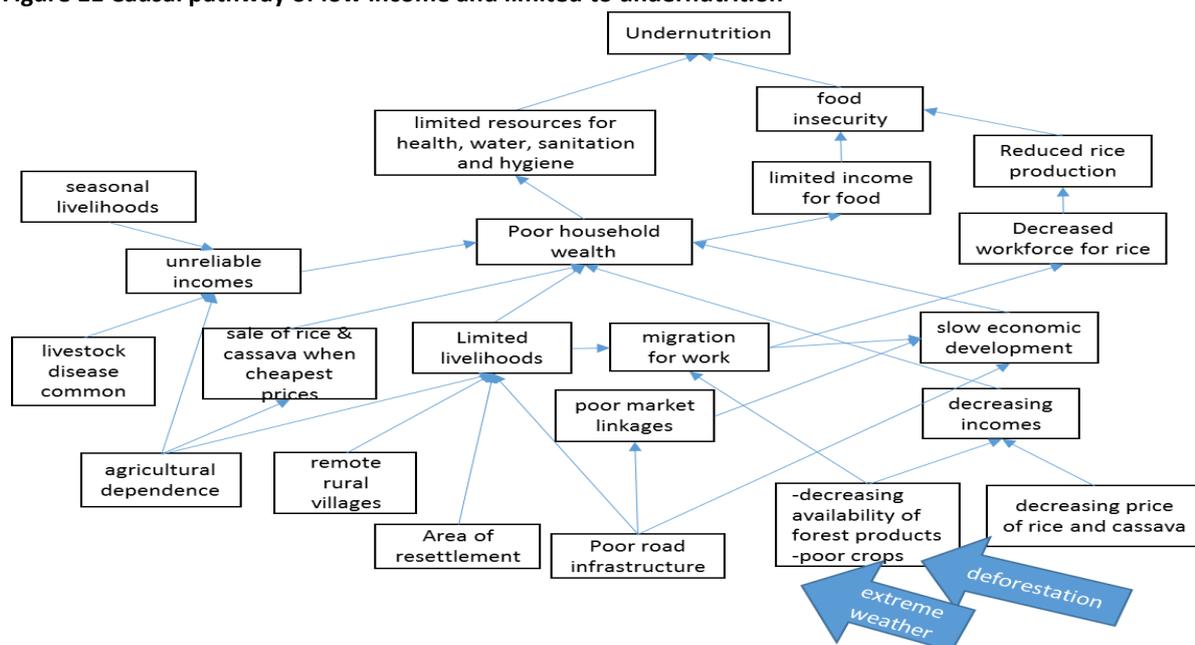
[Agricultural products income] "Lasts long time if don't need anything, but if need to buy something not long, and if need to repay debt then not long." (Mother, Tmat Peuy)

Evidence on the association of undernutrition with household socio-economic status and wealth is strong. A meta-analysis showed that household income had the largest impact on child nutrition out of a number of biological, demographic and sociological factors.²² Limited livelihoods and poor incomes could be having an effect on the outcomes of the whole community with Yang finding that village income had a greater positive effect than household income on exclusive breastfeeding, drinking boiled water, handwashing with soap, and reducing stunting.²³ Figure 11 presents the causal pathway for low income and limited livelihoods to undernutrition.

²² R. Charmarbagwala et al., *The determinants of child health and nutrition: A Meta-analysis, 2014*

²³ C Yang et al., *Effect of village income and household income on sanitation facilities, hygiene behaviours and child undernutrition during rapid economic growth in a rural cross-border area, Yunnan, China., J Epidemiol Community Health, 2009*

Figure 11 Causal pathway of low income and limited to undernutrition



4.2.2.Q. Poor resilience

Large numbers of households had experienced negative effects of climate change, extreme weather events, and deforestation on their livelihoods (Table 13). This was confirmed during community discussions, with all communities discussing the effects on their crops and availability of foods. There seemed to have been one bad flood in the past 5 years which had destroyed crops and some roads, but more frequently reported was the effects of droughts and poor rains. Compared to National statistics on exposure to floods and droughts, both at 11%, Choam Ksant is more vulnerable to these²⁴. Although limited, there is evidence to show a link between weather and stunting.²⁵

[Cope with droughts/poor rains] "Borrow money from organisation or bank to do farming. When crops die, take another loan to pay this one off. Take longer term loan to give time for causal labour or to plan farming to repay." (Father, Sok Senchey)

In one community, there were a number of land conflicts including: between families, between families and the military, and between families and private companies. With family and military conflicts, the land was usually split reducing the families land access.

Table 13 Effects of extreme weather conditions and deforestation as perceived in the last two years by the 436 households surveyed

Number of households experiencing:	n	Proportion (%)	Lower 95% CI	Upper 95% CI
Negative effects of droughts on crops	236	66.7	57.1	76.2
Negative effects of floods on crops	126	35.7	26.9	44.5
A reduction in fish & aquatic species in the wild	186	79.8	68.1	91.5
A reduction in foods & animals from the wild	254	86.1	78.4	93.8
A reduction in non-food items from the wild	176	81.9	70.5	93.2

²⁴ World Food Programme, *Comprehensive Food Security and Vulnerability Analysis (CFSVA): Cambodia, 2008*

²⁵ RK Phalkeya et al., *Systematic review of current efforts to quantify the impacts of climate change on undernutrition*, PNAS Plus, 2015. Accessed at: www.pnas.org/cgi/doi/10.1073/pnas.1409769112

Historically, natural resources have been used as a safety net when shocks occur. In times of financial strain and food insecurity, wild foods, animals and fish are often sought for sale or consumption. However, over 80% of respondents had noticed a reduction in wild foods and animals, and non-food products in the wild. Livestock were another commonly reported safety net when the household needed money. However, livestock disease was very common and animal deaths were happening yearly. Communities did not have resources or knowledge to prevent or treat animal disease. When there were droughts, livestock were getting diseases and dying.

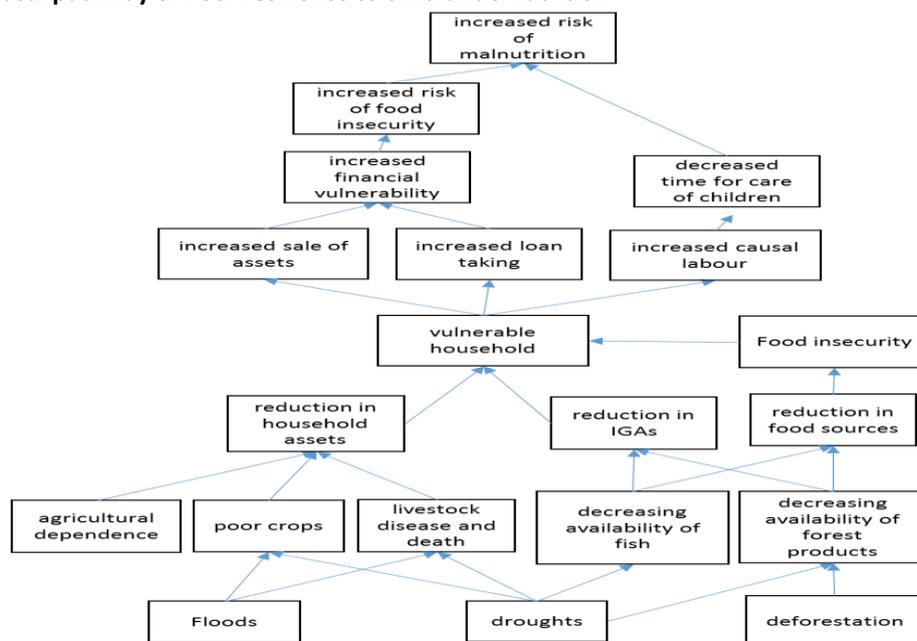
Other coping mechanisms when people did not have enough money were: doing causal labour or borrowing money. In the RFS, 53.8% [95% CI: 53.8; 45.9, n=234] reported having access to cash, savings, or loans. In some communities loans were regularly taken before the farming season, in others it was if crops failed. In one community, people were borrowing money 2-3 times a year. Loans were taken from banks or the microfinance institution, and loans were usually repaid over 2-3 years. One group would usually borrow from \$250-1000, and another group \$250-500.

“If need money do causal labour, find crabs and frogs to sell, some borrow money from Vision Fund or Microfinance institutions.” (Mother, Svay)

If not able to repay loans, some took another loan with a longer repayment period, others would seek causal labour opportunities, many mentioned selling livestock, and in one community selling land. As borrowing increased, incomes were reportedly decreasing and crops becoming more unreliable. Given the current coping mechanism this creates a reliance on: having livestock to sell and having opportunities for causal labour. All communities rated poor resilience as a main cause of undernutrition, with the perception that extreme weather events and health problems caused financial constraints. Figure 12 shows the causal pathway from poor resilience to undernutrition.

“Borrow money from others or organisations. Take loan for 2-3 years, 1-2 million riels. If have problems repaying, borrow from another for short term loan.” (Mothers, Sok Senchey)

Figure 12 Causal pathway of Poor resilience to child undernutrition



4.2.3.U. Limited access to markets and poor infrastructure

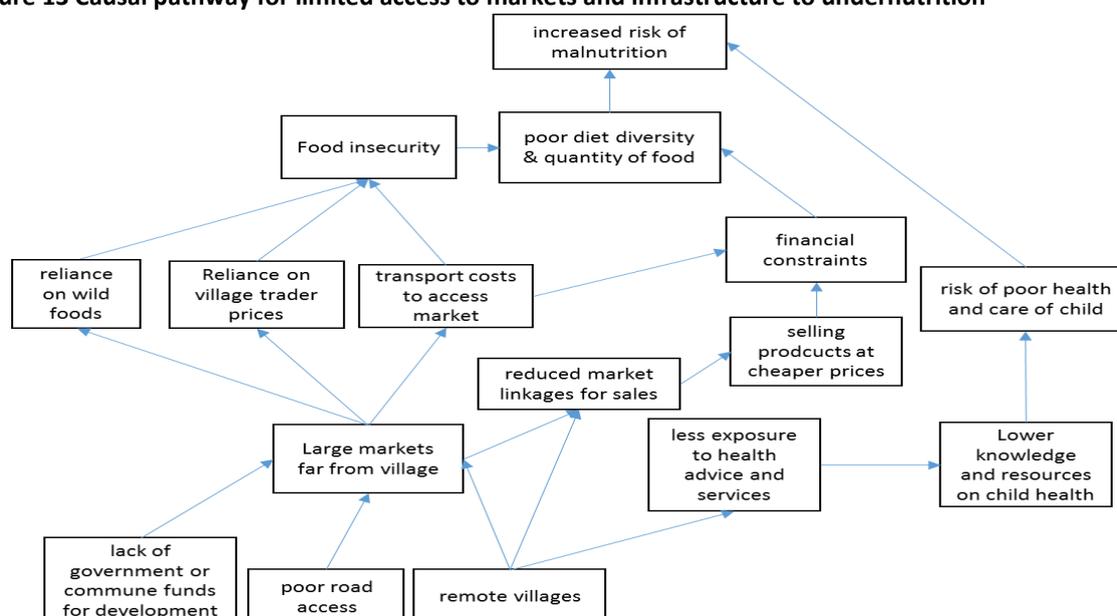
Limited access to markets was evident in two of the communities where the Link NCA community enquiry was conducted. The RFS showed that 63.9% had no markets in the village and 34.7% had to travel for more than 30 minutes to access a market (Table 14). This is more than in the whole of Cambodia, with only 20% of villages having a market in 2008, although this statistic could be outdated²⁶.

Table 14 Access to markets for the 435 households surveyed

	n	Proportion (%)	Lower 95% CI	Upper 95% CI
Market in the village	157	36.1	20.6	51.6
Time to Market	418			
<30 mins	273	65.3	51.5	79.1
30 mins – 2 hours	81	19.4	9.9	28.9
Half a day	19	4.5	1.0	8.1
More than half a day	45	10.8	3.2	18.3

Needing transport to markets far away increases the cost of purchasing foods. There is reliance on prices set by village shops, motorised-markets, and traders which were perceived to be a bit more or much more expensive than larger markets. One communities nearest market was 47km away, and in another the roads were poor meaning it became impossible to access the markets when heavy rain. In the community with consistently poor access to markets, there was more gathering of wild foods and animals, making them more vulnerable to the depletion of wild foods and fish. Limited access to markets was due to remote villages with poor road access, which is also likely to impact on coverage of community programmes as well as other basic services and facilities. This is likely to impact on the resources and knowledge of the community. Figure 13 presents the causal pathway of limited access to markets and infrastructure to undernutrition.

Figure 13 Causal pathway for limited access to markets and infrastructure to undernutrition



²⁶ World Food Programme, *Comprehensive Food Security and Vulnerability Analysis (CFSVA): Cambodia, 2008*

4.3. Relation with other sectors

4.3.1. WASH

Water access was a common constraint for: good crops, growing vegetables and other diversification of crops, as well as for keeping livestock.

4.3.2. Care practices

Mother's employment and seasonal migration is closely related to care practices of young children. With the majority of mothers working in the farming season, and more mothers beginning to do casual labour, more mothers are spending time away from their young children. This was closely linked with income in many communities.

5. Health

5.1. Health Context

Health Centres ranged from being close to very far to communities. Cambodia has the Health Equity Fund which supports households defined as ID Poor to access health services. However, according to the DHS 2015, only 3.6% used the Health Equity fund for illness or injury in the previous 30 days. In each community there was a Village Health Support Group (VHSG) who provides some level of health support to the community.

Child illness was common in all communities. Poor health was perceived by communities as being caused by poor hygiene, sanitation, care practices, and diets in terms of nutritious foods and eating enough, as well as drinking of unsafe water, with many giving financial reasons for these poor practices. A number of groups perceived that flies and/or chickens spread diseases from faeces in the environment to the household. Challenges to good health were perceived as income and having high workloads.

5.2. Findings for Health hypotheses

5.2.1.A. High risk for mosquito-borne disease in children under 5 years

All communities understood that malaria and dengue were caused by mosquito bites. The majority identified fever or high body temperature as symptoms. All communities reported having mosquito nets, with families sleeping all together underneath. Table 15 shows that 97.4% of respondents in the RFS had a mosquito net present where their children under 5-years were sleeping. The evidence for malaria causing weight loss is strong, however less so for poor linear growth. Malaria causes weight loss due to symptomatic vomiting and anorexia.²⁷ Malaria also increases the risk of other infection and malarial anaemia, impacting on



²⁷ RW. Snow et al., *Relation between severe malaria morbidity in children and level of Plasmodium falciparum transmission in Africa*, Lancet, 1997

healthy development.²⁸ Malaria in pregnancy increases the risk of maternal anaemia and significantly increases the risk of having a baby at low birthweight.²⁹ Low birth weight babies are nine times more likely to die in their first months of life than normal-weight babies.

Table 15 Proportion of 528 surveyed children under 5-years with risk factors for malaria or dengue fever

Of children under 5 –years, the number who had:	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial data
Mosquito net where they slept	528	97.4	95.9	98.9	99.7 ^{a, 30}
Fever in the last 14 days	289	53.3	48.2	58.3	32.6 ³¹

^a Statistic for number of households with mosquito net

In most communities, when a child had fever they would be taken to the Health Centre. The RFS found 53.3% of children to have had a fever in the last 14 days, with 60.1% of caregivers reporting taking their child to the Health Centre when they last had fever, but 25.4% a Private Clinic. Some mothers reported using paracetamol to begin, and then going to the Health Centre. Convulsions and unconsciousness, two possible symptoms of malaria, were both illnesses that many community members thought were due to bad spirits and needed a traditional healer.

[Bad spirit]: "Depends on whether believer or not. When child gets high temperature, or unconscious, think bad spirits. Sometimes its malaria." (VHSG, Svay)

"Some come to me for treatment for malaria, sometimes they get better but sometimes they don't. If they don't get better I advise them to go to the Health Centre. But many get better, and that's why they believe." (Traditional Healer, Tmat Peuy)

In two of the Link NCA community enquiries, it seemed that children rarely had dengue or malaria, in the other two communities it was common for children at certain times of the year. In some communities, it was seen as more common for adults due to the fact that they worked in the forest. During the farming season, some families slept in the field increasing their risk of malaria or dengue, some families would take their children with them, however in the rainy season children were more likely to be left at the village with a secondary carer. Some families reported having a small house with a mosquito net in the field. Malaria and dengue were perceived to be highest in the rainy season. As women continue to work whilst pregnant, the effects of malaria could also be evident *in utero*. Figure 14 presents the causal pathway of malaria and dengue to undernutrition.

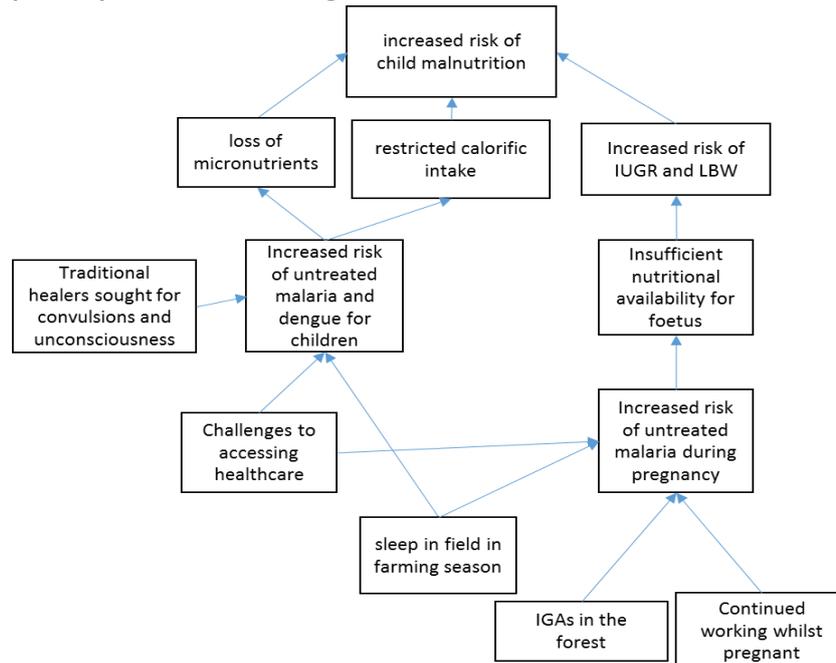
²⁸ OK. Kai & DJ. Roberts, *The pathophysiology of malarial anaemia: where have all the red cells gone?*, BMC Med, 2008

²⁹ M. Desai et al., *Epidemiology and burden of malaria in pregnancy*, Lancet, 2007

³⁰ Cambodia Malaria Survey, 2013

³¹ National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

Figure 14 Causal pathway of malaria and dengue to undernutrition



5.2.2.B. High prevalence of illness in children under 5-years

Under 2-years of age, infection is very common. The immune system requires nutrients to fight infections, meaning when there are repeated bouts of infection, micronutrients become deficient and are not available for healthy growth and development.³²

Among positive deviants, their children were not sick a lot. All four communities perceived child illness to be a main cause of undernutrition. Common child illnesses discussed in the Link NCA communities were: diarrhoea, vomiting, fever, respiratory disease, stomach aches, intestinal problems, coughs, and cold, and in some dengue and malaria. On prompting, it seemed that children also suffered from parasitic worms. Knowledge of causes of specific illnesses varied amongst communities, and amongst groups in the communities. All but one community knew some accurate causes of diarrhoea. Knowledge of causes and prevention of vomiting, coughs and colds was limited across all communities with the change in weather being the most commonly perceived cause. Mothers in one community discussed breastmilk spoiling from being in the sun as a cause of fever. Parasitic worms were perceived to be caused by too much meat and playing on the ground.

“Children do not often get diarrhoea. Caused by eating food not good for them e.g. orange juice drink or snacks.” (Grandmother, Sok Senchey)

“Diarrhoea caused by eating dirty food, don't wash hands. If poor, use traditional medicines, with advice from elders. If have money go to Health Centre. Get when weather changes in December.” (Mothers, Tmat Peuy)

The RFS shows that 68.3% of children under 5-years were reported to have had symptoms of Acute Respiratory Infection (ARI) defined as an illness with a cough (trouble breathing or breathe faster than usual with short, quick breaths) in the past 14 days, this is much higher than any other reported statistics and as such is not considered reliable (Table 16). In the IMCF Baseline 2013, 46% of children were suffering from a cough with just 9.9% having signs of ARI. This indicates that the results from the

³² KG. Dewey & DR. Mayers, *Early child growth: how do nutrition and infection interact?*, *Matern Child Nutr*, 2011

Link NCA may be representative of children with a cough in the last 14 days. Studies on the effects of ARI on child nutrition show it has a negative effect on weight gain, however its effect on linear growth are less clear.³³ Diarrhoea in children has been shown to be a strong predictor of stunting and wasting³⁴, the RFS shows 34.1% of children under 5-years to have had diarrhoea in the past 14-days, much higher than the DHS National statistic of 13% (Table 16). In most communities, the majority of mothers were seeking timely health advice. The RFS shows that when their child last had diarrhoea or fever, 60% sought treatment at the Health Centre (Figure 17).

There were frequent reports of stomach ache and intestinal problems in children, which could be symptomatic of environmental enteropathy, a condition caused when there is frequent exposure to faecal-oral contamination. Given the high levels of open defecation and poor handwashing after defecation, it could be anticipated that this exists for many children in the community. Environmental enteropathy has been shown to be associated with malnutrition in children.^{35 36}

Table 16 Child Health Indicators for 528 children under 5-years

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial data CDHS 2014
Diarrhoea in the last 14 days	185	34.1	28.8	39.5	19.0
Fever in the last 14 days	289	53.3	48.2	58.3	32.6
ARI in the last 14 days	370	68.3	64.2	72.3	1.7
Received deworming medication in the past 12 months	229	42.3	37.5	47.0	62.2
DPT3 vaccination (Source: Child Health Card)	277	60.7	52.1	69.4	68.6 ^a

^a national statistic for children 12-23 months

With unhygienic environments and poor hand practices there is a high risk of parasitic worms in children in these communities, and 57.7% of children under 5-years had not received deworming medication in the last 12 months, more than the 41.3% nationally in the last 6 months (Table 16).³⁷ Deworming medication was given during yearly vaccination campaigns in the communities, 60.7% of children under 5 years had a DPT3 vaccination according to a vaccination card. In the DHS 2014, they found that 68.6% of children aged 12-23 months had been vaccinated with DPT3 according to vaccination cards, and an additional 15.1% were self-reported. Given the similarity in the Link NCA and DHS statistics, this can likely be used as an estimate for those without vaccination cards having received the DPT3 vaccination. Figure 15 presents the causal pathway of child illness to child undernutrition.

³³ KG Dewey and DR. Mayers., *Early child growth: how do nutrition and infection interact?*, *Matern Child Nutr*, 2011

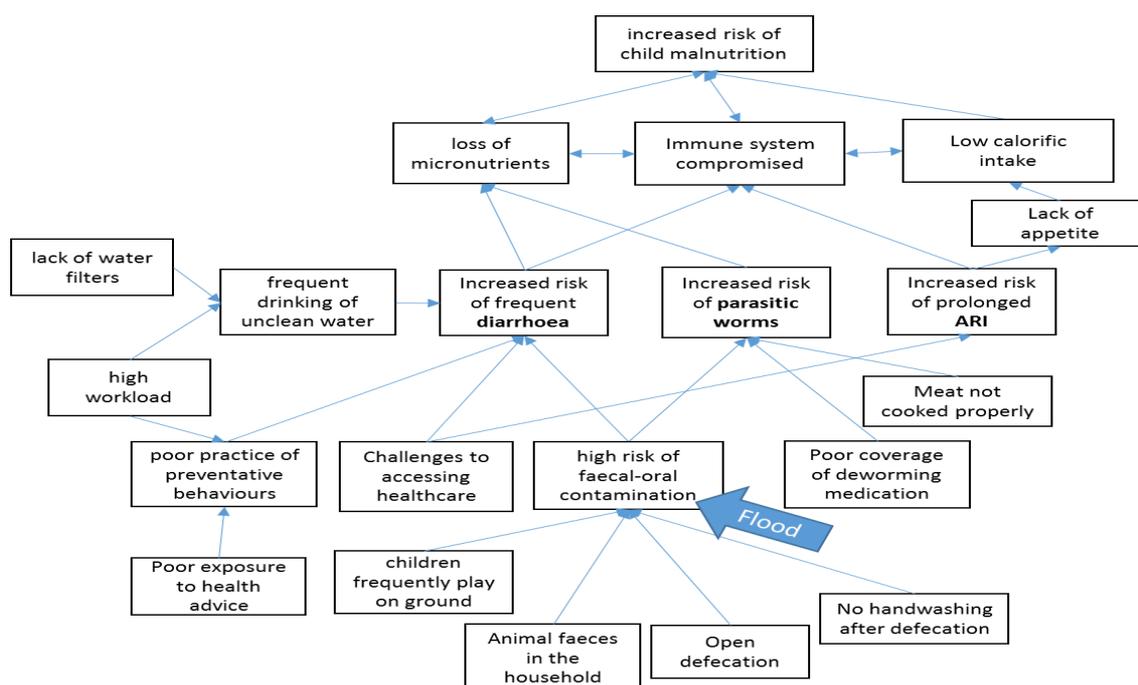
³⁴ CG Victora et al, *Pneumonia, diarrhea, and growth in the first 4 y of life: a longitudinal study of 5914 urban Brazilian children*, *Am J Clin Nutr*, 1990

³⁵ Campbell DI, Elia M, Lunn PG. *Growth faltering in rural Gambian infants is associated with impaired small intestinal barrier function, leading to endotoxemia and systemic inflammation*, *J Nutr*, 2003

³⁶ JH. Humphrey, *Child undernutrition, tropical enteropathy, toilets, and handwashing*, *Lancet*, 2009

³⁷ National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia

Figure 15 Causal pathway of child illness to child undernutrition



5.2.1.C. Delivery without skilled professional

The RFS found 29% of mothers delivered their last child at home (Table 17). However, during the community enquiries, the Traditional Birth Attendants (TBAs) did not seem to be active in delivering or assisting in births anymore and the Key People and Health staff discussed that less mothers were delivering at home than in previous years, with the inference that this trend is decreasing. Those mothers who had delivered at home were often due to the birth being ‘quick’. After giving birth, the baby was taken to the Health Centre for injections in all reported home birth cases.

Table 17 Indicators of Health Access

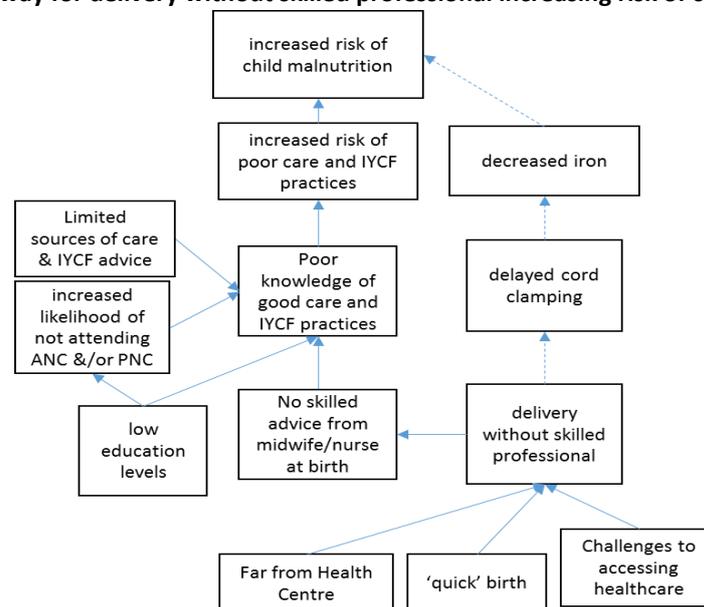
	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial data CDHS 2014 ^a
Location of last delivery					
<i>Hospital</i>	50	11.5	6.9	16.1	49.3
<i>Health Centre</i>	252	57.9	48.9	67.0	
<i>Home</i>	126	29.0	18.0	40.0	48.4
<i>Private Centre</i>	6	1.4	0.0	2.7	1.8
<i>Other</i>	1	0.2	-0.2	0.7	0.1
Birth assistance by skilled health professional	435	72.9	63.0	82.7	54.4

^a Live births in the last 5 years

The majority of mothers had decided to deliver at the Health Centre at the advice of the Nurses at the Health Centre and/or VHSGs. Mothers saw the Health Centre as the safest option for delivery. In two communities mothers discussed not being able to afford the injections after delivery and instead carrying out the cultural practice of lying on a bed with a fire underneath for 3 days known as ‘ang pleung’ or ‘roasting’, with the belief that this was an alternative to injections and would aid healing

and improve long-term health. In one case the mother explained how the grandmother had taken the newborn baby to the Health Centre after the home birth and she had stayed at home to carry out this practice. Figure 16 presents the causal pathway to undernutrition.

Figure 16 Causal pathway for delivery without skilled professional increasing risk of child undernutrition



5.2.1.G. Lack of exposure to skilled Health Advice

Lack of exposure to skilled health advice constitutes a number of healthcare factors: use of health care and health seeking behaviour, coverage of community health activities, and quality of care at Health Centres. UNICEF highlights a lack of Healthcare services for prevention or treatment as one of the main underlying causes of disease, and as detailed under [Hypothesis B](#), illness is a risk factor for child undernutrition. Studies have found that improved exposure to healthcare and education has a positive effect on child growth.^{38 39} A randomised trial showed that including a nutrition-education component to Health Centre programmes aimed at new mothers, decreased risk of stunting when the child was 6-8 months onwards, however there was no significant impact on weight ($p < 0.05$).⁴⁰

Nurses and midwives at the Health Centre were often the main source of advice on health and nutrition in communities. However outreach activities were minimal so this exposure was often limited to self-presenting at the Health Centre, either through ANC, PNC or health issues. Communities perceived that the majority of mothers attended ANC, the RFS shows 87.1% of caregivers had attended ANC for their last pregnancy (Table 18). However, only 54.1% attended at least four sessions. Health staff perceived there to be less attendance at PNC. In some communities, mothers would only go to PNC if there was a medical problem.

³⁸ M. Lagarde, A. Haines & N. Palmer, *Conditional cash transfers for improving uptake of health interventions in low- and middle-income countries: a systematic review*, JAMA, 2007

³⁹ P Gertler, *Do Conditional Cash Transfers Improve Child Health? Evidence from PROGRESA's Control Randomized Experiment*, The American Economic Review, 2004

⁴⁰ ME Penny et al., *Effectiveness of an educational intervention delivered through the health services to improve nutrition in young children: a cluster-randomised controlled trial*, Lancet, 2005

Table 18 Indicators of access to Healthcare for 435 caregivers

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	CDHS 2014
For female caregivers:	434				
Attendance of Ante-Natal Care (ANC)	378	87.1	78.9	95.3	85.8
Attendance of ANC delivered by skilled health professional	362	83.4	79.9	86.9	85.5
At least 1 visit to ANC	378	87.1	78.9	95.3	99.6 ^a
At least 4 visits to ANC	230	53.0	43.7	62.3	73.9 ^a
Barriers to accessing healthcare:^b					
<i>No barrier</i>	127	29.1	24.6	33.5	25.0
<i>Financial barrier</i>	218	49.9	45.4	54.2	57.4
<i>Time</i>	19	4.3	2.4	6.3	-
<i>Transportation</i>	127	29.1	23.9	34.3	-
<i>Geographical distance</i>	75	17.2	13.3	21.0	42.2
<i>Decision power</i>	16	3.7	2.1	5.2	14.8
<i>Perception of quality of care</i>	31	7.1	4.9	9.3	-
<i>Other</i>	6	1.4	0.3	2.4	-

^anational statistic; ^respondents were able to select more than one barrier

Each community had Village Health Support Group Workers (VHSGs). They varied in capacity, some having good knowledge and activity in the community whilst others appeared to play a minor role. In some they were giving advice, in one the VHSG was conducting Mother's Support Groups. VHSGs were mostly advising mothers to go to the Health Centre when the child was sick and supporting the Health Centre staff when there were community immunisation campaigns. Communities were engaged on this topic with mothers perceiving immunisations as beneficial. There were still a minority who did not want their children to be immunised due to the side-effects. The National Nutrition Strategy for Cambodia in 2009 highlighted the problem that Health Centre outreach sessions were primarily on immunisations, with minimal time spent in each village. This problem still appears to exist in the Link NCA study area. Additionally, NGO activities were scattered in the area.

"Some mothers don't believe in immunisations as they cause side effects and make them have to take time off work to look after child." (Key people, Kouk Sralao Village)

"Immunisations are a good thing, when child gets sick it's easy to cure." (Mother, Kouk Sralao)

Financial and transportation barriers were the most commonly reported challenges to accessing the Health Centre (Table 18). The DHS found that 3 in 4 respondents had challenges accessing the Health Centre which is similar to what the Link NCA finds. Many mothers reported borrowing money from neighbours to access healthcare when needed, as well as selling livestock or rice. In households with challenges in accessing healthcare, there was more practice of initially seeking traditional treatments or self-medicating. Additionally, traditional treatments were sought if the Health Centre treatment was not working or they were not able to provide any treatment. If a child was not getting better, the frequent belief was that bad spirits were the cause of the illness. There were also certain illnesses which were believed to be better treated by traditional healers: stomach ache, convulsions, unconsciousness, and when a child cried a lot. In some communities, this also included fever. In one

village, if the traditional healer’s attempts at helping the child did not work, they would refer the child to a more knowledgeable traditional healer or to the Health Centre.

“Sometimes it works and sometimes it doesn’t. If it doesn’t work he will advise the mother to consult a more knowledgeable traditional healer in the village.” (Traditional Healer, Svay)

During community enquiries, the majority of mothers reported taking their child to the Health Centre when they were sick. Figure 17 shows that 60% of caregivers took their children under 5-years to the Health Centre when they last had diarrhoea and fever, very similar to DHS National statistics. However, 24-25% took their child to a Private Clinic, a potentially risky practice as Private Clinics are not regulated and are often run out of people’s households.

Figure 17 Treatment sought by caregivers for diarrhoea and fever in children under 5-years

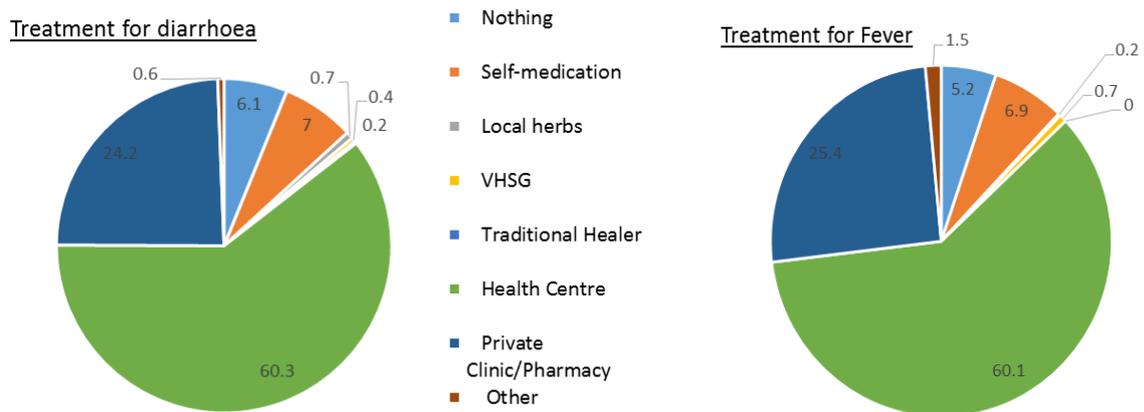
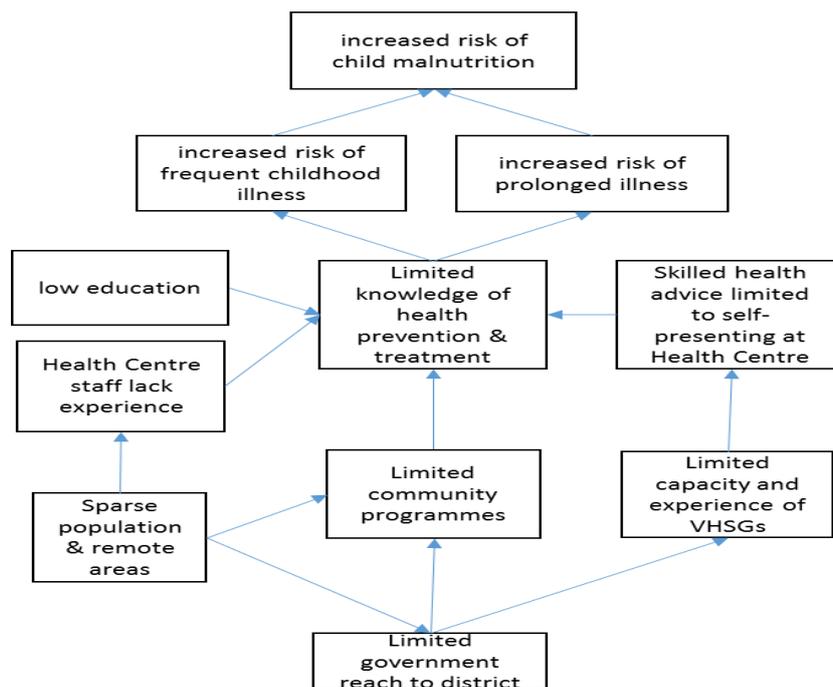


Figure 18 presents the pathway by which lack of exposure to health advice increases the risk of child undernutrition.

Figure 18 Causal pathway of lack of exposure to health advice to child undernutrition



5.3.Relation with other sectors

5.3.1.FSL

Frequent child illness impacts on the financial state and vulnerability of a household. Households with poorer wealth are at higher risk of poor food security and higher risk of poor nutritional status. Illness is often linked with change in weather throughout the year, with increasing frequency of extreme temperatures this is perceived to be causing more illness.

5.3.2.Care practices and IYCF

There were some households who slept at the fields during the busy periods, increasing the risk of exposure to mosquitos and drinking untreated water. There was a perception that too much meat causes parasitic worms, and chemicals on vegetables cause poor health. These two perceptions are likely to impact on the meat and vegetable intake of children. Increasing Health Centre births means increased exposure to a Health Professionals for advice on IYCF and care practices shortly after birth.

5.3.3. WASH

The environment is at high risk of faecal contamination, resulting in high risk of gastro-intestinal infections. Handwashing after defecation is poor, increasing the risk of faecal-oral contamination and illness. Household are not consistently treating water before drinking, unclean water is likely to contain germs and bacteria, and cause illness.

6. Care practices & Maternal Health

6.1.Child Care Practices and IYCF Context

The National Nutrition Programme (NNP) has produced a Nutrition Road Map for Cambodia with one of its six components as “Improve and accelerate the national campaign on exclusive breastfeeding and complementary feeding campaign”. This follows 10-years of promoting breastfeeding through a strategy which included changes at policy-level, health-system level and community level. The rate of exclusive breastfeeding has increased from 11% in 2000 to 74% in 2010, however it then decreased to 65% in 2014. From 2010 to 2015, children reaching the recommended Minimum Dietary Diversity (MDD) have increased from 36.9% to 47.6%, whereas Minimum Meal Frequency (MMF) has stayed the same from 74.5% to 72.2%.⁴¹



⁴¹ National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

6.2. Findings for Care practices and IYCF Hypotheses

6.2.1.D. Early Child Bearing

The culture in Cambodia is to have a child soon after marriage, with the reported average age for a first child from 18 - 20 years. Table 19 shows that 9.4% of the caregivers in the RFS had their first child when they were younger than 18 years. Nationally, according to the DHS 2014, 12.0% of 15-19 year olds had begun childbearing compared to 25.1% for Preah Vihear/Stung Treng. It has been shown that, in some contexts, children who are severely underweight are more likely to have mothers under 19 years, there is more chance of her not being ready or mature enough to care for a child.⁴²

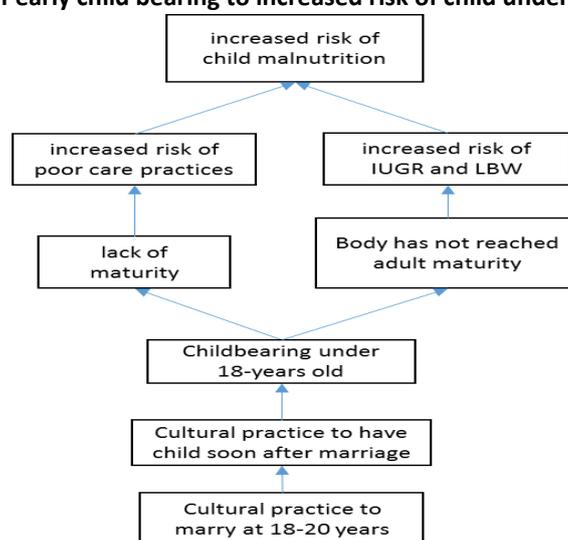
Table 19 Proportion of 434 caregivers whose first child was classified as early childbearing

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	CDHS 2014
Younger than 18 years at birth of first child	41	9.4	5.7	13.2	10.5 ^a

^a 25-49 year olds who gave birth by age 18-years

Most mothers thought the best age to have a first child was 18-20 years old. In one discussion one mother said 15-years as then she will have a 10-year old to help her when she is 25-years old, but other mothers in the group disagreed and felt that at 20-years women are strong and mature enough to have a child. The decision to have a child was perceived as being made by a discussion between the husband and wife. In one group, the mothers discussed how it was not a decision, but it happened by chance; even if they were using contraceptives. Figure 19 presents the causal pathway from early child bearing to increased risk of child undernutrition.

Figure 19: causal pathway of early child bearing to increased risk of child undernutrition



6.2.1.F. Gender issues and maternal wellbeing

High household workload, poor women's empowerment and maternal mental health have all been shown to impact on a child's wellbeing. Risk of depression was very high in the RFS, with 55.2% of caregivers being classified as at risk of depression (Table 20). A meta-analysis found a moderate linear but significant association between maternal depression with underweight and stunting, however

⁴² B Nahar et al., Risk Factors Associated with Severe Underweight among Young Children Reporting to a Diarrhoea Treatment Facility in Bangladesh, J Health Popul Nutr, 2010

there were a number of problems with the quality and comparability of individual studies.⁴³ One study found that household food insecurity, poor mental health, and socioeconomic status had independent and negative impacts on children’s weight for age.⁴⁴ Another study found no significant effects of maternal depression on the WAZ or HAZ of their infants at 6 months.⁴⁵

The Provincial Department of Women’s Affairs (PDWA) had noticed families which were very poor but were satisfied as they had respect in the family. Save the Children also found parents desired good relationships and stress-free lives over wealth however, they frequently worried about having resources to properly care for their children.⁴⁶ Culturally in Cambodia women keep the household money, however decision making for women varied from community to community. In all communities, small day-to-day household decisions were made by the wife. Some mothers felt they had equal decision making power to their husbands, but in most communities the husband would still have the final decision. In one community, women felt their husband made all the decisions.

“For big decisions there is a discussion between husband and wife. Final decision is husbands. For small decisions, women can decide alone.” (Mothers, Svay)

“Husband makes most of the decisions in the household. Wife can make some decisions after discussion with husband, but just small decisions.” (Mother, Sok Senchey)

Table 20 Indicators of maternal wellness for 434 caregivers

	n	Proportion (%)	Lower 95% CI	Upper 95% CI
Risk of depression (WHO5≤13)	240	55.2	50.0	60.3
Less than 40 days rest after delivery	372	85.7	82.4	88.99
Perceived social capita	-			
<i>Not at all</i>	72	16.6	9.1	24.0
<i>Not very</i>	138	31.7	24.0	39.4
<i>Somewhat</i>	89	20.5	14.6	26.3
<i>Very</i>	136	31.3	19.1	43.4

Marital arguments were frequent in all communities. Common reasons for arguments were: alcohol use, not having enough money, and not having enough food, the most common discussion being about arguments when the husband had been drinking alcohol. Despite the DHS showing Preah Vihear/Stung Treng to have the highest rates of domestic violence, this was reported as happening sometimes in the majority of communities. When violence did happen in a family, intervention of the Village Chief or police was only if serious. The PDWA thought that communities perceived domestic violence as bad for the reputation of the family and would therefore not tell anyone. They also perceived domestic violence to be reducing due to increased awareness and increasing education.

“Frequent arguments in village. Argue about alcohol, not helping with household work, not having enough to eat, jealousySome people can have violencefeel worried and afraid that may happen to uscommunity tell commune head or report to police.” (Mothers, Svay)

⁴³ PJ Surkan et al. *Maternal depression and early childhood growth in developing countries: systematic review and meta-analysis*, *Bulletin of the World Health Organisation*, 2011

⁴⁴ C Hadley et al., *Household food insecurity and caregiver distress: Equal threats to child nutritional status?.*, *American Journal of Human Biology*, 2012

⁴⁵ N Husain, et al. *Maternal depression and infant growth and development in British Pakistani women: a cohort study*. *BMJ open*, 2012

⁴⁶ *The Manoff Group and Save the Children Cambodia, Understanding the Context for Promoting Nutrition-Enhancing Behaviours among Households with Severe Resource Constraints, NOURISH Project, 2015*

The RFS found that 48.3% of caregivers perceiving having 'none' to 'not very much' support (Table 20). Support was not specified, and was down to the respondents own perceptions. However, social capital is thought to represent the quality and quantity of social relationships in a community of which the respondent can rely on for support, this can be economic, information or other types of support.⁴⁷ One study found that families with more social capital were better able to cope with weather shocks, however this was less so when the entire community suffered losses.⁴⁸ Another study showed that existence of social capital from other individuals was associated with child nutritional status.⁴⁹ Mothers discussed borrowing money or transportation when the family needed to access healthcare. Other support mentioned was borrowing rice or food at times of household food insecurity. On an average day the husband was out of the house generating income. Husbands would help with heavy duties such as collecting water or firewood when they were at home, and sometimes childcare. However most mothers clarified this was only when they were at home, which was not often. When a husband migrated, this was increasing the household workload for mothers and affecting the care of children. Having support for child care was identified as a positive deviant practice. In households with grandparents and/or older children, they were a main support to the mother with child care and household chores.

"When husband migrates, everything is woman's responsibility. Have to collect all the water. Sometimes have to leave child alone." (Mother, Kouk Sralao)

"Men out of the house working. When home, exhausted so don't help much." (Mother, Sok Senchey)

Mothers workload did not change during pregnancy in most cases, however many women stopped doing 'heavy work' towards the end of pregnancy. The RFS found 95.8% of caregivers rested for less than 40 days after they delivered their last child, an indication of high maternal workload (Table 40). Perception of maternal workload varied in communities, some mothers felt their workload was not too much and not too little but other mothers perceived themselves to be very busy. In one community, mothers related how busy they were to how much support they had from their children. Figure 20 presents the pathway of gender issues and poor maternal wellness to child undernutrition.

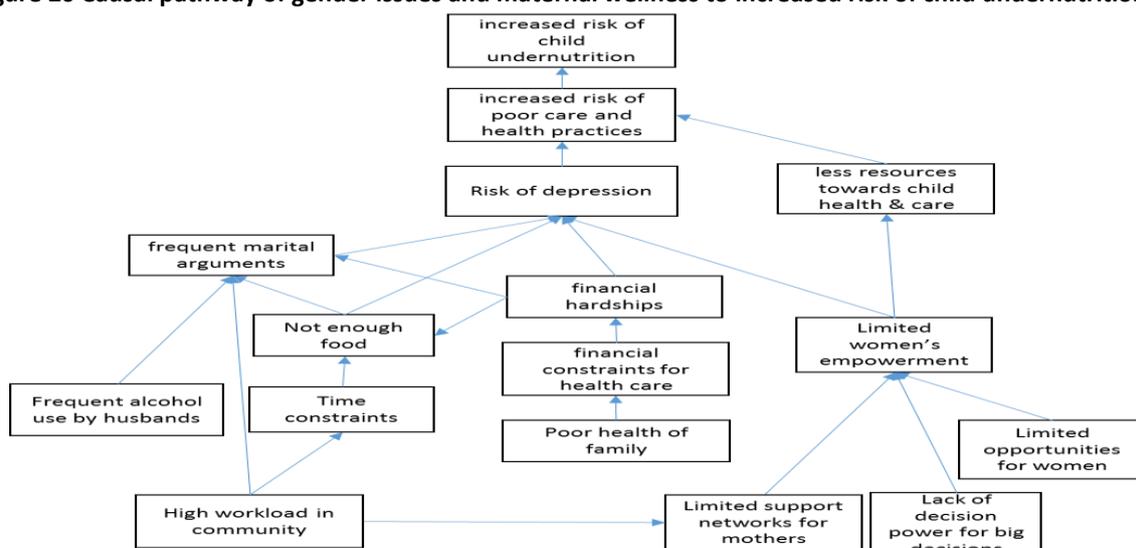
"Not very busy. If have children to help then not busy, but if don't then busy." (Mother, Sok Senchey)

⁴⁷ Sujarwoto et al., *Child Health and Mothers' Social Capital in Indonesia through Crisis*, 2011. Available at SSRN: <http://ssrn.com/abstract=1856029>

⁴⁸ MR Carter et al. *Social Capital and Coping with Economic Shocks: An Analysis of Stunting of South African Children*, World Development, 2002

⁴⁹ MJ De Silva et al., *Maternal social capital and child nutritional status in four developing countries*, Health and Place, 2007

Figure 20 Causal pathway of gender issues and maternal wellness to increased risk of child undernutrition



6.2.2.K. Inadequate breastfeeding practices

Cambodia follows WHO recommendations on breastfeeding practices: breastfeeding should be initiated within the first 1-hour of life; an infant should be exclusively breastfed for the first 6-months of life; and, at 6 months complementary foods should be introduced whilst continuing to breastfeed to 24-months. The evidence for the protective effect of breastfeeding against illness is strong, however the evidence for improved nutritional status with prolonged breastfeeding over 1-year is weak.^{50 51} For example, one study with data from South Asia and Sub-Saharan Africa found that breastfeeding was associated with lower stunting rates in Bangladesh while in Nigeria it was a risk factor.⁵² The RFS shows that 96.1% of children under 2-years were ever breastfed, and that 75.6% were breastfed yesterday (Table 21). Initiation of breastfeeding within 1-hour of birth was 82.8%, more than the national level reported in the DHS of 63%. During the community enquiries there were discussions about nurses or midwives advising immediate initiation of breastfeeding and exclusive breastfeeding to 6-months at delivery.

Table 21 Breastfeeding indicators for 254 children 0-23 months

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	CDHS 2014
Ever breastfed	244	96.1	93.5	98.6	98.9
Breastfed yesterday	192	75.6	67.6	83.6	-
Breastfed within 1 hour of birth	202	82.8	78.5	87.0	77.3
Breastfed within less than 24 hours	232	95.1	92.2	97.9	97.7

Given the anticipated small sample sizes for the age groups needed for the indicators of exclusive breastfeeding (EBF), and continued breastfeeding at 1-year and 2-years it was decided to explore these through the qualitative enquiry. In the IMCF Baseline 2013, EBF for Preah Vihear was 77.1%.⁵³

⁵⁰ Kramer et al., Health and development outcomes in 6.5-y-old children breastfed exclusively for 3 or 6 mo, *Am J Clin Nutr*, 2009

⁵¹ Lamberti et al. 2011, Breastfeeding and the risk for diarrhea morbidity and mortality, *BMC Public Health*, 2011

⁵² M Misselhorn, and K Harttgen, A Multilevel Approach to Explain Child Mortality and Undernutrition in South Asia and Sub-Saharan Africa, Conference report, 2006

⁵³ A. Reinbott et al, IMCF Cambodia in Preah Vihear and Otdar Meanchey Poviches: Cross-sectional Nutrition Baseline Survey, 2013

Despite the fact that EBF is decreasing nationally, the majority of mothers in the Link NCA communities reported practicing EBF until their baby was 6-months old. Those who had not practiced EBF were due to problems with breastfeeding, or the perception that the child needed food with one mother giving ‘borbor’ (rice porridge) at her mother’s advice. A very small number of mothers had given water or infant formula in the first 6-months. There was only one reported practice of giving first foods other than breastmilk, this being condensed milk as the mother had no breastmilk. Health workers had recommended one mother use infant formula when she had twins, and it was recommended when a 3-months old was very weak. Mothers see infant formula as expensive. In two communities, grandmothers perceived infant formula as being very good for a baby.

“Best food for child under 6 months is infant formula. The seller at the market tells you if will make the child clever and grow quickly.” (Grandmother, Kouk Sralao)

Mothers who did not breastfed or EBF often reported problems with breastfeeding. They discussed not having anyone to ask for advice. In some communities, traditional healers were consulted for traditional medicines. One healthcare worker had observed that mothers were breastfeeding their children too much, for example every time they cried, and it was making them vomit.

“Yes I had problems with breastfeeding....no I didn’t ask anyone for advice. I stopped breastfeeding and gave borbor.” (Mother, Tmat Peuy)

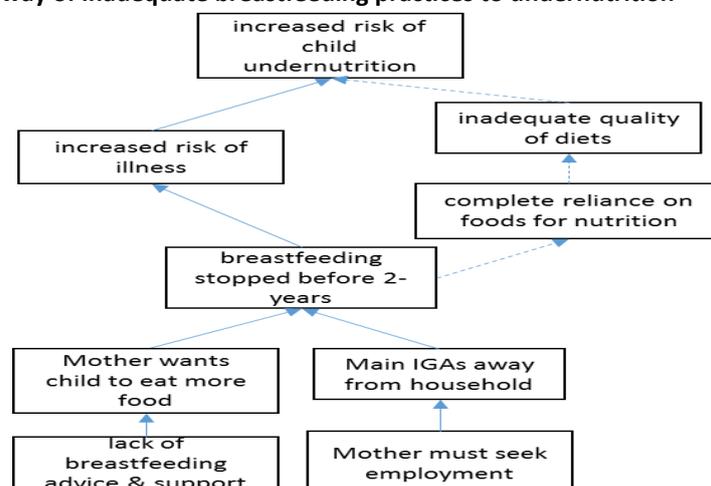
The IMCF Baseline found Continued Breastfeeding at 1-year was 93% for Preah Vihear/Odtar Meanchey. In the community enquiries, mothers mainly reported stopping breastfeeding because they were busy or because they wanted their child to eat more foods. In two communities mothers had stopped at 18-24 months. In another community, one group of mothers stopped breastfeeding around 12-14 months, as they were working outside and they explained their milk was getting hot, which was thought to be bad for the child’s health. In another community, one group of mothers stopped breastfeeding when the child was big enough, this was perceived to be around 1 year. Figure 21 presents the causal pathway of inadequate breastfeeding practices to undernutrition.

“I stopped breastfeeding as I wanted my child to eat more food and wanted to be able to leave the house for work.” (Mother, Kouk Sralao)

“Stop breastfeeding when child is big enough or stop breastfeeding as they don't eat a lot when breastfeeding. Learn from each other, from each other’s experiences.” (Mother, Tmat Peuy)

“60% continue breastfeeding to 2 years, mothers stop if need to work.” (Midwife, Choam Ksant HC)

Figure 21 Causal pathway of inadequate breastfeeding practices to undernutrition



6.2.3.L. Inadequate child care practices

Responsive feeding stimulates and develops a child's appetite.⁵⁴ The RFS showed that 53.2% of children under 2-years were helped to eat (Table 26). The RFS showed that 87.4% of these caregivers had a positive response when the child refused to eat, however through community enquiries the Link NCA found that the main practices were: to follow them whilst they play trying to feed them, and to give packaged snacks instead, a practice discussed by Key Informants and Health Workers as increasing. However there were also mothers who gave nutritious alternatives. Letting the child Playing whilst feeding does not provide an adequate feeding environment and likely leads to less calorific intake, and packaged foods are not nutritiously adequate, both components of what is considered as good feeding practices.

"If child wont' eat, let them play and give little by little. Or give snacks." (Mother, Svay)

"If won't eat, try to persuade them. Only one way won't cry when hungry - give them snacks." (Grandmother, Tmat Peuy)

The community perceived frequent eating of packaged snacks as a negative practice; however caregivers continued to do so. Snacks were seen to be non-nutritious, to cause children to eat less of their meals, and in one community, to cause illness. A common discussion was how children cry until they are given money to purchase snacks. Mothers gave them money.

Table 22 Responsive feeding of children under the age of 2-years

	n	Proportion (%)	Lower 95% CI	Upper 95% CI
Child helped to eat	254	53.2	43.8	62.5
Reported responsive feeding				
Nothing	16	11.9	4.5	19.2
Positive practice	118	87.4	79.2	95.6
Negative practice	1	0.7	-0.8	2.3

The mother being the main caregiver the majority of the time was identified as a positive deviant behaviour among poor mothers with healthy children. However, in the working periods of the year for many mothers, children were often left with secondary carers. A full discussion of the impact of secondary caregivers on care practices is detailed under [Hypothesis E](#). When mothers were collecting water or firewood, some left their children at home alone. Additionally, children are often 'left to play' when mothers are busy at the household or doing causal labour. Given the lack of community cleanliness, it was a frequent observation that children will pick food up from the floor to eat.

"Leave children with grandmother or neighbour when collecting water, or leave child if sleeping." (Mother, Kouk Sralao)

"Grandparent first choice to care for child, but if grandmother also needs to go to fields, then elder child." (Mother, Kouk Sralao)

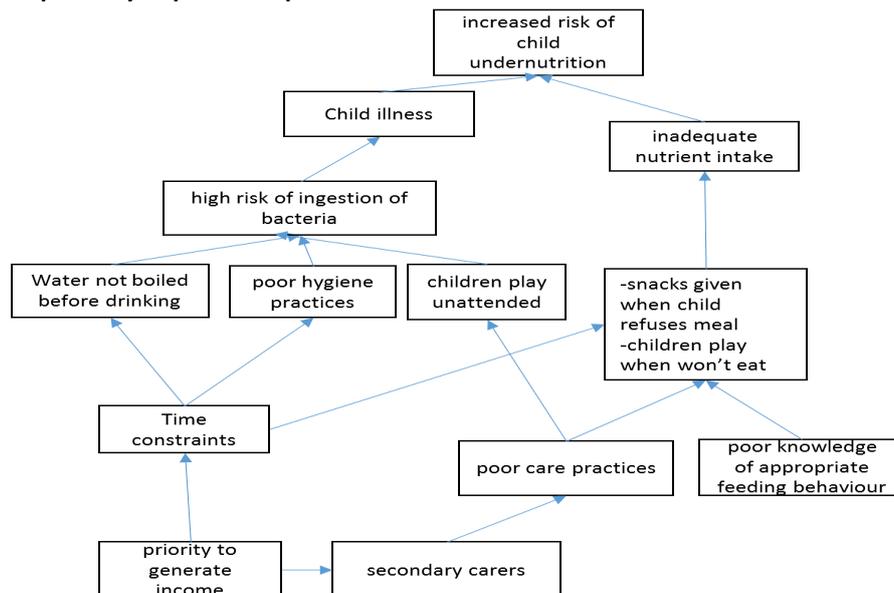
Poor care and lack of time was often perceived as a cause of undernutrition and poor health by mothers, fathers, key people and health workers, and was ranked as one of the main causes in three communities. In one community, a child not getting enough sleep was a common reason given for undernutrition by key participants and mothers. The main cause of poor care was seen to be high workload, and not enough time to properly care for children. It was specified that high workload was

⁵⁴ Bentley et al., *Responsive Feeding and Child Undernutrition in Low- and Middle-Income Countries*, JN, 2011

caused by the necessity to generate income. In one community, mothers felt that being busy was the main difference between healthy households and unhealthy households. High workload impacted on a number of practices identified as positive with the community: boiling of water, washing of hands, not watching the child, and not feeding packaged snacks, all increasing the risk of child illness and inadequate intake. Figure 22 presents the causal pathway of poor care practice to undernutrition.

*“Challenges in keeping a child healthy are family income, don't have time to care for children.”
(Mothers, Kouk Sralao)*

Figure 22 Causal pathway of poor care practices to child undernutrition



6.2.4.M. Poor quality diets of children under 5-years

Proper complementary feeding is defined as “timely introduction of safe and nutritional foods in addition to breastfeeding”.⁵⁵ Appropriate practices of complementary feeding are crucial from 6 to 24 months for healthy growth and development, impacting on both weight and height gain.⁵⁶

Mothers or grandmothers were the main decision makers when it came to food-related decisions. Table 23 presents dietary indicators for children 6-23 months old. Compared to the DHS, more children were found to reach the recommended MMD of 4 food groups, and less children were found to reach the recommended MMF. In comparison to National statistics of the DHS, MDD is similar at 47.6%, but MMF is much higher at 72.2%. Consumption of Vitamin-A rich foods was lower than found in the DHS with plant based and animal-source vitamin-A rich foods consumed by less than 50% of children, but consumption of iron-rich foods was similar. A recent study in Cambodia found linkages between consumption of animal source foods and stunting.⁵⁷

⁵⁵ A. Imdad, MY. Yakoob, & ZA. Bhutta, *Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries, BMC Public Health, 2011*

⁵⁶ KG. Dewey, & S. Adu-Afaruwah, *Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries, Matern Child Nutr, 2008*

⁵⁷ C. Darapheak et al., *Consumption of animal source foods and dietary diversity reduce stunting in children in Cambodia, International Archives of Medicine, 2013*

Table 23 dietary indicators for children 6-23 months old

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial Secondary data DHS 2014
Minimum Dietary Diversity (MDD)	182	44.5	34.4	54.6	27.8
6-11 months	70	40.0	25.9	54.1	
12-17 months	57	49.1	34.0	64.2	
18-23 months	55	47.3	30.7	63.8	
Minimum Meal Frequency (MMF)	182	45.1	36.1	54.0	72.0
Vit-A rich plant-based foods in the last 24 hours	86	45.7	37.5	57.0	78.6 ^a
Vit-A rich animal-source foods in the last 24 hours	87	47.8	35.6	60.0	
Fe-rich rich foods in the last 24 hours	122	67.0	57.8	76.3	75.1

The majority of mothers were introducing solid, semi-solid or soft foods at 6-months as is the WHO recommendation. In one community, it seemed that grandmothers were not giving food until 8 to 10-months. The majority first foods were ‘borbor’ a porridge made with rice and water, or rice mashed with soup water. Grandmothers in one community believed that a child could only eat rice and borbor until 1-year. At 1-year, the majority of mothers discussed changing the child’s diet. Some gave pieces from the family food, including green-leaves, fish, meat, eggs, and rice. On further investigation some mothers were only giving the soup water or a small piece of fish with rice. Increasing the quantity of food had different perceptions: more rice, more of everything, giving snacks and desert.

[Under 1-year]: “Gave borbor or rice. With salt or soy sauce. Nothing else usually.” (Mother, Sok Senchey)

Figure 23 shows the most consumed food groups were cereals/grains, fish, seafood, crabs or snails, and condiments. Save the Children found that consumption of fish distinguished well-nourished from under-nourished children.⁵⁸ Just under 50% of children had consumed meats, dark green leafy vegetables, and sugar. These patterns reflect the practices discussed in the community. Figure 23 shows similar numbers of children eating green leafy vegetables as other vegetables, however in one community, when talking about feeding vegetables, mothers clarified they meant only green-leafy vegetables. They were only able to access other types of vegetables once a week or less because of the cost whereas green-leafy vegetables were gathered from the wild or homegardens.

“No money to buy vegetables and meat for children.” (Mother, Svay)

⁵⁸ *The Manoff Group and Save the Children Cambodia, Understanding the Context for Promoting Nutrition-Enhancing Behaviours among Households with Severe Resource Constraints, NOURISH Project, 2015*

Figure 23 Percentage of children 6-23 months consuming specified food group in the last 24-hours

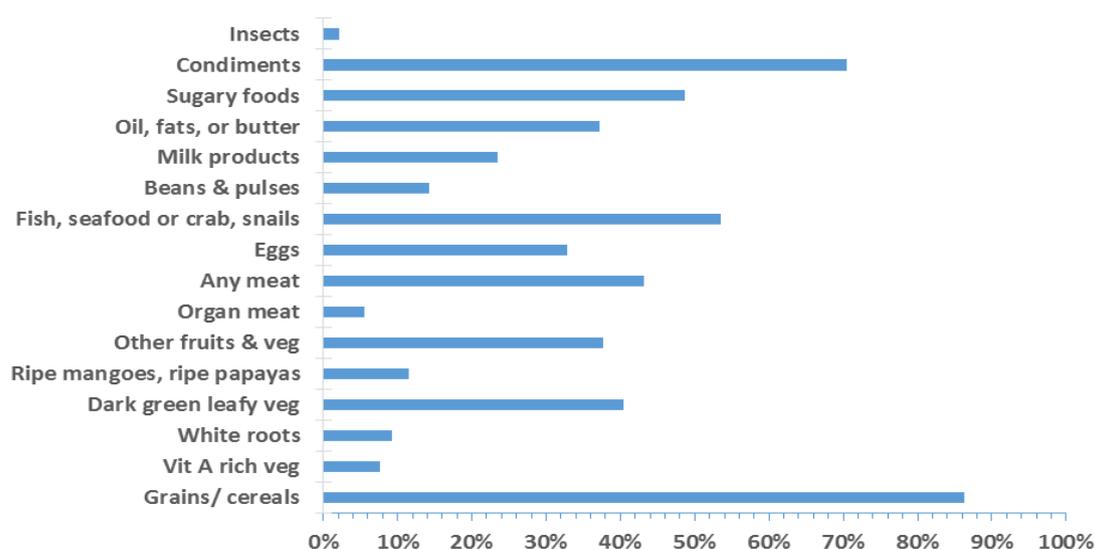


Figure 23 shows that consumption of sugary products is high at 49%. In one community, mothers said their children were eating packaged snacks every day, including: crisps, ice-cream, biscuits and cakes, all high in sugar. At household level, 76% had consumed sugary products in the last 24 hours, and 54% every day in the last 7-days. Although mothers all identified packaged snacks as bad for children, they discussed the problem with their child crying until they were given money to buy snacks. Mothers discussed how children were not hungry for their meals. This is an added expenditure for households which already perceived income to be the main barrier to good diets. A number of mothers from poor households spoke of the pressure they felt to give their child money for snacks.

“Children stand and cry if you don't buy them snacks.” (Key People, Tmat Peuy)

A small number of mothers had received advice on child's diets from their mothers or neighbours, but mostly advice was from Health Centre staff or no one at all. In some communities, advice on diets was only given when a child was identified as having malnutrition. Mothers who had received advice were advised to give *borbor* enriched with vegetables, bananas, eggs etc. The majority of mothers were doing this rarely, or not at all with income given as the main constraint. Foods which mothers were not able to afford were: fruits, vegetables other than green leaves, meat, fish, seafood, sterilised milk, and infant formula. In one group mothers discussed the child's preference was not for enriched *borbor*. As well as financial constraints, in one group of mothers they discussed not giving meat as they felt that then when they did not then have meat to give the child, they would not want to eat. Additionally, there was the belief that too much meat caused worms.

“There is no plan or programme to give advice to parents on child's diet. But when doing immunisations give advice to malnourished children.” (Nurse, Kandukan Health Centre)

[From 6-12 months] “Only borbor and breastmilk. Plain borbor as child does not want to eat borbor with other ingredients, or I cannot buy other ingredients.” (Mother, Sok Senchey)

“Prevent parasitic worms by not letting them play with dirt, and don't let them eat much meat.” (Mother, Svay)

When there were food constraints, rice was often cooked as porridge or everything was reduced. One community specified that vegetables were prioritised for purchasing, then fish and then meat. Many households would search for wild foods like frogs, crabs and green leaves. Some mothers were

feeding the child until they were full before they ate themselves. When there were financial constraints, children were given rice with salt or soy sauce or whatever could be found in the wild.

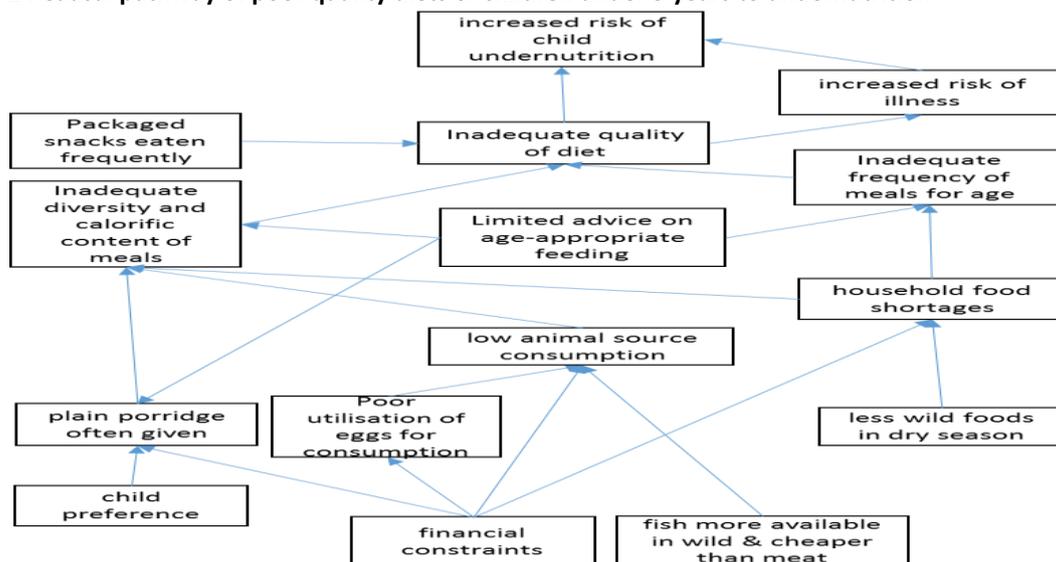
“Main challenge is having enough money, when don't have enough money feed child what can find, like Prahok. Happens frequently. Sometimes also just rice with salt.” (Grandmother, Sok Senchey)

“Find only small food, but give child until they are full to be healthy. Child eats first.” (Mother, Tmat Peuy)

Poor quality of diets was perceived as one of the main causes of malnutrition by all communities, with the perception that children were being fed until they were full but not nutritious foods. Positive deviant behaviours identified were: feeding enriched *borbor* 1 – 3 times a week, and introducing family foods from 8 – 12 months. Figure 24 presents the causal pathway of poor quality diets to undernutrition.

“Give porridge with other ingredients but the child doesn't want to eat it. This causes undernutrition.” (Mother, Svay)

Figure 24 Causal pathway of poor quality diets of children under 5 years to undernutrition



6.2.1.N. Poor nutritional status of Women of Child Bearing Age (WCBA)

Poor maternal nutrition increases the risk of poor child growth *in utero* as the child is completely dependent on the mother’s nutritional stores with poor pre-pregnancy stature and weight, and poor gestational nutrition have been shown to increase the risk of IUGR and child underweight.⁵⁹ Poor maternal nutrition status may be due to inadequate food intake, illness or high energy expenditure.⁶⁰ Additionally, one study found that severely underweight children were more likely to have a mother who was undernourished.⁶¹

⁵⁹ D Alasfoor, *Determinants of Persistent Underweight among Children, Aged 6-35 Months, after Huge Economic Development and Improvements in Health Services in Oman*, J Health Popul Nutr, 2007

⁶⁰ U. Ramakrishnan *Effect of Women's Nutrition before and during Early Pregnancy on Maternal and Infant Outcomes: A Systematic Review*, Paediatric and Perinatal Epidemiology, 2012

⁶¹ B Nahar et al., *Risk Factors Associated with Severe Underweight among Young Children Reporting to a Diarrhoea Treatment Facility in Bangladesh*, J Health Popul Nutr, 2010

Table 24 Nutritional Status of Women of Child Bearing age (15-49 years) as measured by Mid-Upper Arm Circumference

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial secondary data DHS 2014
Average age (years)	483	29.4	28.8	30.0	-
Pregnant	29	6.0	3.6	8.4	
Extreme wasting (MUAC<16.0)	0	0	-	-	
Severe wasting (MUAC<19.0)	0	0	-	-	
Undernutrition (MUAC<22.0)	28	5.8	3.4	8.2	5.2
Food evolution during last pregnancy					
<i>Ate less or the same</i>	191	47.0	40.3	53.8	
<i>Ate more</i>	215	53.0	46.2	59.7	

The DHS found that in Preah Vihear/Stung Treng, 5.2% of women aged 15-49 years were moderately or severely thin defined by BMI, and 53.7% of women were anaemic.⁶² In the NCA, 5.8% of women 15-49 year were defined as underweight by MUAC<22.0, equivalent to a BMI<17.0, the statistic for the NCA is similar to national statistic based on BMI of 4.0%.⁶³

It was not possible within the resources of the study to measure women's height, and as such it was not possible to measure the extent of adult stunting. However, the DHS 2014 reported that 8.0% of women aged 15-49 years in Preah Vihear/Stung Treng Province were below 145 cm, defined as small stature and at risk of obstructed labour.⁶⁴ To overcome the effects of poor pre-pregnancy nutritional status, it is important to eat adequate amounts of food during pregnancy to ensure healthy gestational weight gain; however 47.0% of caregivers reported eating less or the same amount of food during their last pregnancy (Table 24). During community discussions, many mothers initially said they ate less during pregnancy, however once probed mothers explained at first they ate less due to morning sickness but eventually ate more, this could mean this statistic is an over-estimation. The majority of mothers continued to work whilst pregnant, many until delivery. This was partly dependent on the season, in farming season they were more likely to have to work until delivery to support the household.

Despite indicators showing sufficient diversity of household diets at this time of year, a common discussion in communities was food shortages. When there was low food availability or access, households would often eat rice with chilli and salt or what they could find in the wild, mainly frogs, crabs, fish, and green leaves. Some mothers reported this being a common occurrence and occurring during pregnancy. Although the majority of mothers knew recommended diets for pregnancy, there were financial barriers to these practices,

⁶² National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

⁶³ Ferro-Luzzi and James, *Use of body mass index of adults in assessing individual and community nutritional status.*, Bull World Health Organ, 1995

⁶⁴ National Institute of Statistics, Directorate General for Health, and ICF International, Cambodia Demographic and Health Survey 2014, 2015

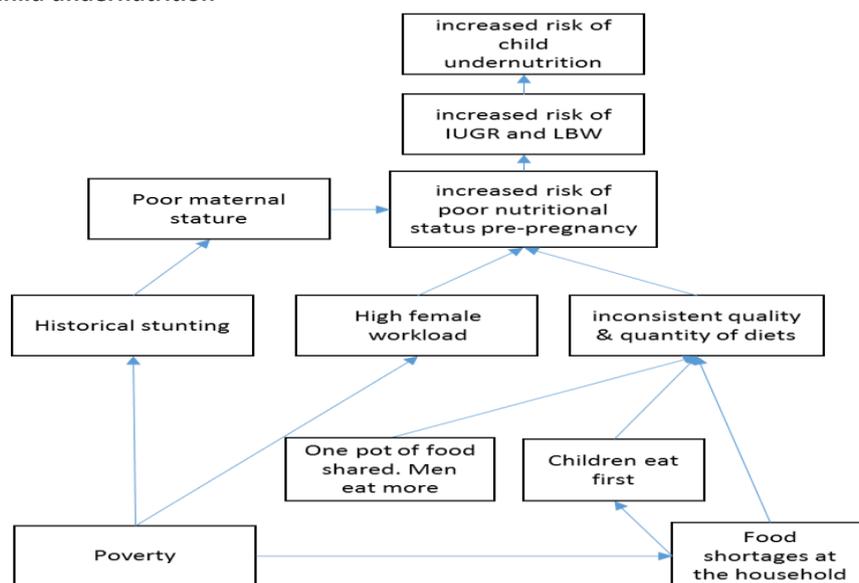
mainly meat and fruit. Action Against Hunger’s Resilience Survey 2016 found that women in the community talked about how they often did not eat until they were full, with men eating a larger portion of the household meal. During the NCA community discussions, mothers discussed how food was shared amongst the family, with one pot which everyone ate from, with no perception of gender differences. However, during times of food shortage, some mothers spoke of letting their children eat until they were full and then eating what was left.

*“Try our best, when we have money. But if not, just eat rice salt and chili when wife pregnant.”
(Father, Tmat Peuy)*

“If not enough food: make less. Sometimes can't eat meat so find crab or frog in forest, or collect wild food. Prioritise Prahok as keeps for long time.”(Mother, Svay)

“When not enough food, most try to change the meal: rice to porridge, reduce everything. No priority within family, eat as family.”(Mother, Tmat Peuy)

Figure 25 Causal pathway of poor nutritional status of women of child bearing age to increased risk of maternal and child undernutrition



6.3. Relation with other sectors

6.3.1. FSL

High maternal workload creates time constraints for caregivers, and increases the chance of secondary caregivers. Many communities linked poor care practices to the need to prioritise income generating activities and farming. The main barrier to feeding a nutritious diet was low income. Poor diets are exasperated at times of household food insecurity.

6.3.2. Health

Dietary advice is limited to Health Care workers, and as such presentation at the Health Centre during pregnancy, at delivery and following pregnancy is a crucial contact point to receive this advice and support. Additionally, poor breastfeeding, care and diets can all lead to increased morbidity.

7. Water Access, Sanitation and Hygiene (WASH)

7.1.WASH Context

Access to improved water supply and sanitation is low nationally in rural areas. The National Strategy for Rural Water Supply, Sanitation and Hygiene 2011-2025 reports that the estimated annual economic loss due to poor sanitation and hygiene is US\$448 million. The objectives of the strategy are improved water supply, sanitation, hygiene behaviour change, enabling environment, and funding. Despite plenty of national data on improved water source and sanitation facility access, there is little information in the way of safe and hygienic sources and facilities.

In the 2015 the Provincial Department of Rural Development Workplan, there were no plans to build latrines in Choam Ksant district. There were plans to construct wells, ponds and repair handpumps in a selection of communes in the district as well as promotional and educational activities for good hygiene and water management. Community-Led Total Sanitation (CLTS) was being implemented elsewhere in the Province, but not in Choam Ksant.

7.2.Findings for WASH Hypotheses

7.2.1.H. Open defecation and unhygienic environments

The height of a child reflects their genetic predisposition as well as the childhood health and nutrition environment, in developing countries the latter becomes more important. One study found that households without latrines were significantly more likely to have children under 6-years who were wasted.⁶⁵ In the RFS, only 17.0% of households were using a sanitation facility (Table 25). Of these 0.0% were observed as being safe and hygienic. Open defecation and unhygienic environments were perceived by communities to be a main causes of undernutrition, with the perception that it spread viruses and bacteria causing illness. Compared to national statistics of 50.4%⁶⁶, open defecation was much higher at 83.0% in the NCA context. The main discussion on why households did not have latrines was because of not having money to construct a latrine, with other priorities for saving. However, all communities saw having a latrine as a good thing, reasons ranged from: ease of use, comfortable, being able to flush the faeces, no bad smells, privacy, and having soap.

“Don't have toilets as not enough money. Cannot save for a latrine, have to spend money on other things - education, health services, and weddings.”
(Father, Svay)

“Some save to buy latrines. One person had spent \$700 and his still was not finished.” (Key People, Tmat Peuy)



⁶⁵ A Sharghi, et al., *Evaluating risk factors for protein-energy malnutrition in children under the age of six years: a case-control study from Iran*, *Int J Gen Med*, 2011

⁶⁶ National Institute of Statistics, Directorate General for Health, and ICF International, *Cambodia Demographic and Health Survey 2014, 2015*

Adults openly defecate away from the household whereas children defecate at the household. The majority of the time, mothers reported burying children’s faeces in nearby forest, bush or fields, however the RFS shows only 50.4% of caregivers disposed of faeces in a safe way (Table 25). This is much lower than in the KAP, which found 78.7% was safely disposed of.⁶⁷ In one community, one group of mothers said that in the rainy season they did not always bury faeces, however the other group of mothers said that they did not bury in the dry season as the ground is too hard. Increasing open defecation has been shown to be strongly linked with decreasing average height of children globally, independent of wealth, maternal literacy or access to infrastructure. There is an effect known as a “spillover”, meaning open defecation introduces faecal germs to the environment affecting not just that person or household but everyone in the community, even those who have latrines or come from wealthy households.^{68 69} An example of this arose in one community discussion about the practice of defecating in dry streams and ponds in the dry season; they were aware that when the stream or pond filled again this would contaminate the water where people drank from.

“Most go to the toilet in the forest. No latrines. Don't dig a hole in forest as far away from HH, and big. Also lazy to take equipment to dig the hole.” (Key People, Tmat Peuy)

“Dig small hole to go to the toilet, bury young children’s in small hole. About 10m from the house.” (Grandmother, Kouk Sralao)

Table 25 Household and child sanitation indicators

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial secondary data DHS 2014
Using Sanitation facility	74	17.0	10.0	24.0	
Use of safe & hygienic sanitation facilities	0	0.0	-	-	-
Open Defecation	361	83.0	76.0	90.0	50.4 ^a
Caregivers practicing safe disposal of faeces of children 0-23months	128	50.4	41.2	59.6	50.0

^a statistic for all rural areas

Household members were mostly urinating on the household premises. Additionally, animals were freely roaming, and all mothers reported regularly finding animal faeces inside the household. This is collected, mostly once a day, and put in the yard or under a tree. Additionally, although household waste was collected once a day and burnt, communal spaces contained a lot of waste. Children commonly played on the ground, and in all communities this was one of the main perceptions of poor care, and a cause of poor health and hygiene due to dirty foods on the ground and children getting visibly dirty. Recent research found that chicken faeces in the environment has an effect on intestinal health and subsequent stunting.⁷⁰ IFPRI found that households keeping poultry indoors had

⁶⁷ Department of Rural Health Care, Ministry of Rural Development, National Sanitation and Hygiene Knowledge, Attitudes, and Practices (KAP) Survey, 2010

⁶⁸ D Spears, How much international variation in child height can sanitation explain? 2013. Accessed at: <http://riceinstitute.org/research/the-nutritional-value-of-toilets-how-much-international-variation-in-child-height-can-sanitation-explain/>

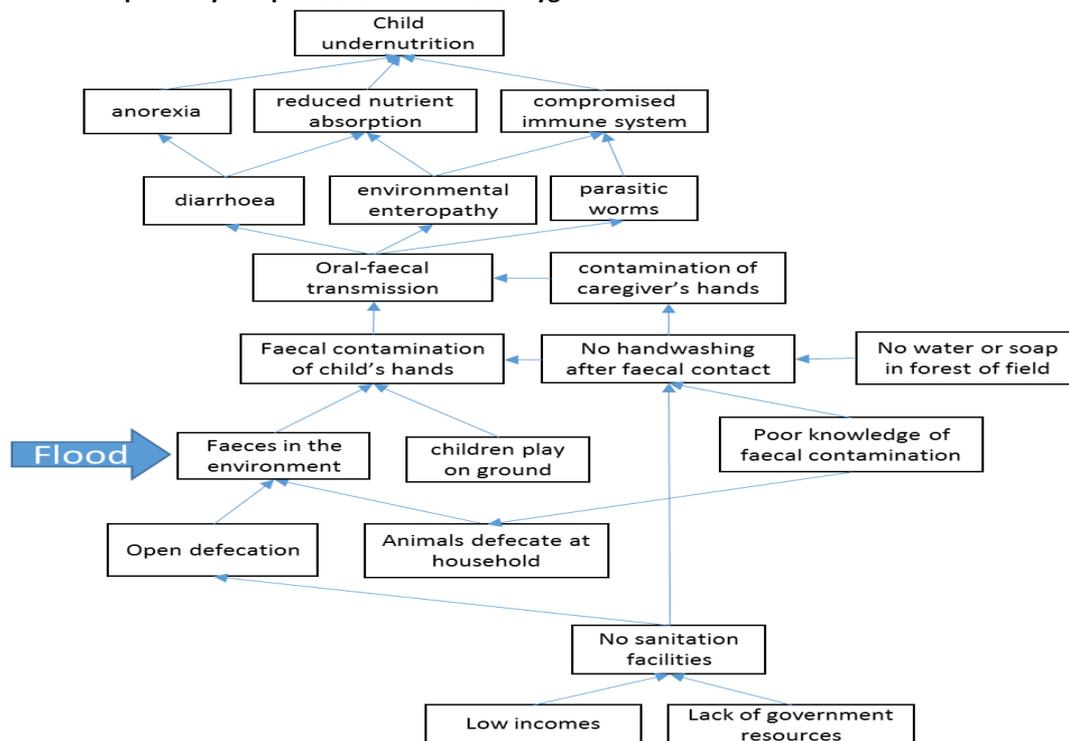
⁶⁹ I Günther and F Günther, Water, sanitation and children's health: evidence from 172 DHS surveys, World Bank Policy Research Working Paper Series, 2010

⁷⁰ M.N.N. Mbuya and J.H. Humphrey, Preventing environmental enteric dysfunction through improved water, sanitation and hygiene: an opportunity for stunting reduction in developing countries, MCN, 2015

significantly higher rates of child stunting than household where poultry were kept outside.⁷¹ Communities focused on chickens spreading viruses by scratching at faeces in the environment.

Open defecation and unhygienic environments increased exposure to germs and hence more risk of disease, impacting on child nutrition. Use of unsafe water, presence of faeces in the yard and lack of sanitation facilities have been shown to be associated with increased diarrhoeal incidence.^{72 73} Figure 26 presents the causal pathway to child undernutrition.

Figure 26 Causal pathway of open defecation and unhygienic environments to child undernutrition



7.2.2.1. Inconsistent access to clean water

Having sufficient domestic water supply is necessary for good hygiene and sanitation practices at the household. The RFS found that the average household meets the Sphere standards and Fanta standards for basic water needs per capita per day, however it did not meet the standards for drinking water or hygiene and sanitation purposes for either standard (Table 26). The RFS found that a large amount of daily water was used for 'other purposes', mainly agricultural needs.

⁷¹ D. D. Headey and K. Hervonen, *Exploring child health risks of poultry keeping in Ethiopia: Insights from the 2015 Feed the Future Survey*, 2015. Accessed at: <http://www.ifpri.org/publication/exploring-child-health-risks-poultry-keeping-ethiopia-insights-2015-feed-future-survey>

⁷² Van der Slice, *Drinking-water quality, sanitation, and breast-feeding: their interactive effects on infant health*, *Bull World Health Organ*. 1994.

⁷³ Günther et al., *Water, sanitation and children's health: evidence from 172 DHS surveys*, *World Bank Policy Research Working Paper Series*, 2010

Table 26 Average access to water in litres for all people in the 436 surveyed households, by category

Quantity of water per capita/day	n	Mean (SE)	Lower 95% CI	Upper 95% CI	FANTA standards (L)	SPHERE standards (L)
Total water	436	60.8 (2.7)	55.3	66.3	50	7.5-15
Drinking		2.3 (0.1)	2.2	2.5	5	2.5-3
Bathing		22.3 (0.7)	20.9	23.8	15	2-6
Food		5.0 (0.2)	4.5	5.5	10	3-6
Hygiene and sanitation		7.7 (0.3)	7.2	8.3	20	20

Access to water varied across communities. There were seasonal access issues, with handpumps and wells becoming dry in the dry season, rainwater was often used in the wet season. In one community water had to be purchased from Water Trucks, in this community groups of middle-wealth mothers rated their proportional expenditure on water as almost three times as much as poor-wealth mothers. In one community, households would dig wells near streams and ponds in the time of water shortages. Water shortages were a barrier to: growing homegardens, raising livestock, and drinking clean water. With purchase from Water Trucks, this was also limiting water usage on hygiene. Collection of water took more time in the dry season. Household reported collecting water 4-5 times a day. Time to collect water depended on the distance of the water source and type of water source. Those who were using a dug well reported the longest water collection times.

“Every year have problems accessing water - pump has no water, sand blocks holes.” (Mother, Tmat Peuy)

“Not difficult to access water. Most have hand pump access. No problems with water in handpumps in dry season. 10 families have handpumps, so can be far from some households. Sometimes 20 families have 1 handpump.” (Key people, Svay)

“Many family members collect water. Go 4-5 times a day. Each time collect 2 buckets. Each time takes 10-20 minutes, depends on distance. Sometimes have to queue for 10 minutes. Takes longer in dry season.” (Mother, Svay)

There is evidence to show that households using improved water sources have children with better growth.⁷⁴ The main source of water in 92.7% of households was groundwater, 11.7% used surface water, 4.8% used sealed bottled water, 0.5% used roof rainwater and 0.2% Water Trucks. In the rainy season, groundwater sources reduced to 48% and 48% used mainly roof rainwater. The remaining 5% were using surface water. Although many use improved water sources at the village, when in the fields many use surface water. Figure 27 shows that 48.5% of household’s main water sources during the dry season had a moderate to severe risk of contamination. In one group they discussed how water in Wells becomes dirty because each household puts their own bucket in to the well to collect the water. Additionally, water sources are often used for animals and agriculture too. Maintenance of water sources was predominantly through raising community funds. In some communities, the household where the water source was situated was in charge of maintenance. In the rainy season the risk will increase of contaminants being washed in to unprotected or damaged water sources.

“Water becomes unclean because pump not clean properly, or because people shower at the pump. Animals drink water at pump.” (Mother, Tmat Peuy)

⁷⁴ SA Esrey et al., *Drinking water source, diarrheal morbidity, and child growth in villages with both traditional and improved water supplies in rural Lesotho, southern Africa.*, *Am J Public Health*, 1988

“Use handpumps all year. Main problem is when handpumps not working, another handpump is far away. Only happens sometimes. Members who use handpump collect money to fix handpumps.”
(Mother, Svay)

Figure 27 Risk of contamination of main water source of 436 households in the dry season

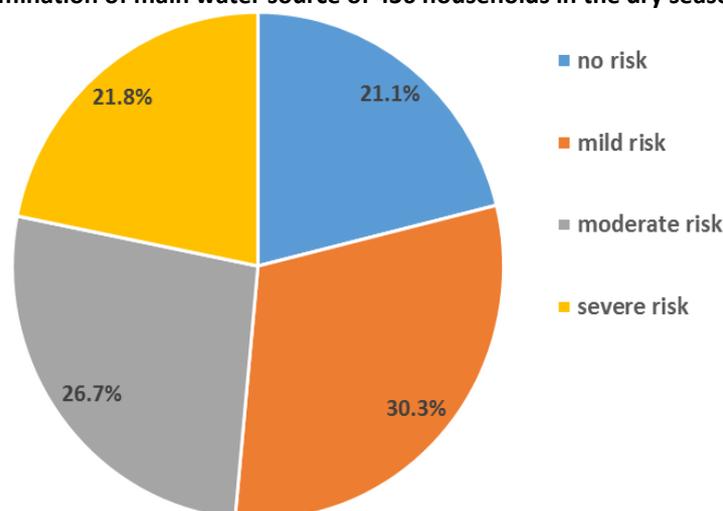


Table 27 shows that 46.9% of households were at severe risk of water contamination between collection, transportation and use at the household. Water was often collected and transported in old paint pots without lids, although some communities used purchased buckets with lids for transportation and storage. Household storage was predominantly in large clay pots or plastic buckets. Use of plastic buckets made water being covered during transportation and at the household more likely. If the household had the resources they would store water for different purposes in different places.

Table 27 Average Water Management Score and proportion of households in each category of risk

	n	Proportion (%)	Lower 95% CI	Upper 95% CI
Water Management Score (mean (SE))	436	4.3 (0.2)	3.9	4.7
Mild risk (0-1)	17	4.1	0.8	7.4
Moderate risk (2-4)	203	46.7	35.6	57.8
Severe risk (5-7)	194	46.9	34.6	59.1

Use of unclean water for drinking has been shown to increase childhood illness, in particular diarrhoea. One study found that improved water quality interventions had a greater impact on reducing diarrhoea than interventions aimed at improving sanitation, hygiene education or provision of soap.⁷⁵ The NCA identified consistent treatment of drinking water as a positive deviant behaviour. Figure 28 presents the methods of treating water, with 25% reporting not treating water, similar to the National Statistic of 19.2%.⁷⁶ However, during community enquiries, the majority of each group reported drinking water without any treatment, either “usually” or “sometimes”. Drinking from ponds and streams increased when away from the household. Barriers to treating water were: high workload and time constraints, and not having a water filter. Therefore, despite the RFS findings, it

⁷⁵ H Waddington, and S. Birte, *Effectiveness and sustainability of water, sanitation, and hygiene interventions in combating diarrhoea*, J Dev Effect, 2009

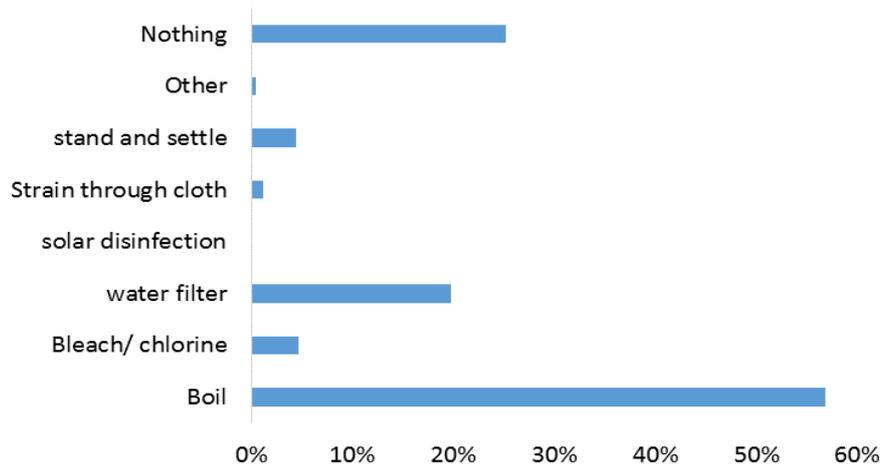
⁷⁶ National Institute of Statistics, *Cambodia Socio-Economic Survey 2014, 2015*

can be inferred that this method of treatment is not consistently applied. The National WASH KAP survey found similar results, with 83.2% treating water, but only 53.3% doing this always.⁷⁷

“Drink water directly. Give to children directly. Stream, pond, well.” (Fathers, Tmat Peuy)

“Some drink water directly from hand pump, some use filters. No one boils water. CWS gave filters, but some people don't use them still. But doesn't always cause problems like diarrhoea.”(Key People, Svay)

Figure 28 Methods used for treatment of water before drinking

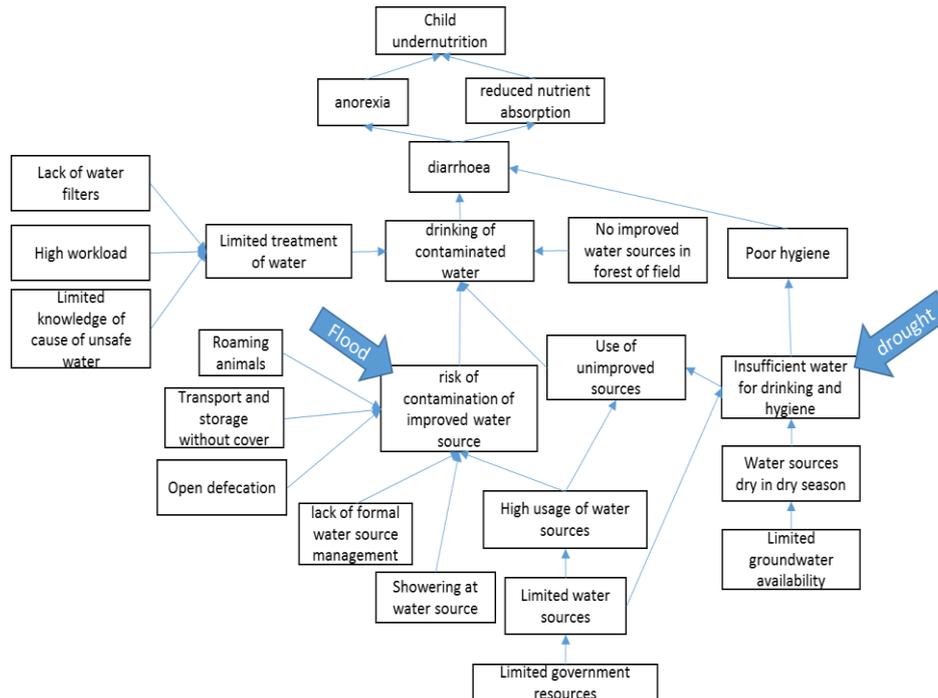


In the majority of groups, communities were aware that drinking unclean water was not good for health and drinking unclean water was perceived as a main cause of undernutrition. Some groups mentioned it causing diarrhoea and illness, and others that it caused their children not to grow properly. One group mentioned that water sources are not clean and they do not have filters. Perception of clean water was often no visible dirt in the water, a common discussion was about ‘carbon’ in the water as a white powder. In some groups there was discussion on contamination of water from animals.

“Use water direct from handpump. Boil if seen animal faeces near the pump.” (Mother, Svay)

⁷⁷ Department of Rural Health Care, Ministry of Rural Development, National Sanitation and Hygiene Knowledge, Attitudes, and Practices (KAP) Survey, 2010

Figure 29 Causal pathway of inconsistent access to clean water to child undernutrition



7.2.3.J. Poor hygiene practices

Leading causes of diarrhoea have been found to be poor household sanitation and caretaker hygiene. Gastrointestinal infections and parasites can be caused by unhygienic food and water, and faecal-oral transmission. These situations are at high risk of arising in the NCA context, with human and animal faeces in the environment, limited handwashing after defecating and cleaning infants' faeces, and before food preparation.⁷⁸ Poor hygiene was perceived to be a main cause of undernutrition by all communities. There is evidence to show that when soap and water are available to households, handwashing can reduce childhood diarrhoea.^{79 80} Use of soap was identified as a positive deviant behaviour. Soap was reported in 94.5% of households, with 90.3% reporting use today or yesterday (Table 28). However, during the community enquiries this behaviour was not reflected. The majority of people would only sometimes use soap, even if it is present at the household, or would “usually” wash hands with just water. This behaviour was particularly prominent when working away from the household. Barriers to soap use were normally related to convenience, for example not having a latrine with a hand washing station or not having the time.

*“90% of men use only water to wash hands. When openly defecating, 90% of men don't wash hands.”
(Fathers, Kouk Sralao)*

“When go to the forest, don't have soap. At home, sometimes do sometimes don't. Sometimes they are already clean, or sometimes in a hurry.” (Fathers, Svay)

In communities, the most frequently reported time for washing hands was “before eating”. The RFS found that this was the most common time, however only 24.3% of caregivers reported washing their

⁷⁸ M Sheth, and R Dwivedi, *Complementary foods associated diarrhoea, Indian J Pediatr, 2006*

⁷⁹ V Curtis and S Cairncross, *Effect of washing hands with soap on diarrhoea risk in the community: a systematic review, The Lancet infectious diseases, 2003*

⁸⁰ RI Ejemot-Nwadiaro et al., *Hand washing for preventing diarrhoea, Cochrane database of systematic reviews, 2008*

hands before eating today or yesterday (Table 28). Compared to National Statistics of 78.4%, this is dramatically lower, however this result was questioned at the time of publication of the KAP survey. One group of mothers discussed only washing hands when they were visibly dirty, but others seemed to have an understanding of invisible contaminants. Washing hands after defecating is also lower at 19.5% compared to national levels of 29.8%.⁸¹ The RFS also found 80.5% (n=331, 95%CI: 72.1; 88.9) of caregivers said they washed their hands at a non-critical time, this was clarified as when washing dishes, clothes, and when bathing.

Table 28 Indicators of hygiene practices for 436 surveyed respondents

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial secondary data ⁸²
Households with soap	411	94.5	90.9	98.1	98.6
Use of soap today or yesterday	371	90.3	84.3	96.2	96.4
Handwashing at all critical times	411	1.4			
<i>After defecation</i>	80	19.5	13.8	25.2	13.1 ^a
<i>After cleaning babies bottom</i>	48	11.7	6.7	16.7	
<i>Before preparation of food</i>	62	15.1	8.7	21.4	
<i>Before eating</i>	100	24.3	16.9	31.7	35.1 ^a
<i>Before feeding child</i>	51	12.4	6.0	18.8	
Child cleanliness observation	437				
<i>Clean</i>	45	10.3	6.1	14.5	-
<i>Medium</i>	285	65.2	56.1	74.3	-
<i>Dirty</i>	107	24.5	14.8	34.2	-

^aHandwashing with soap

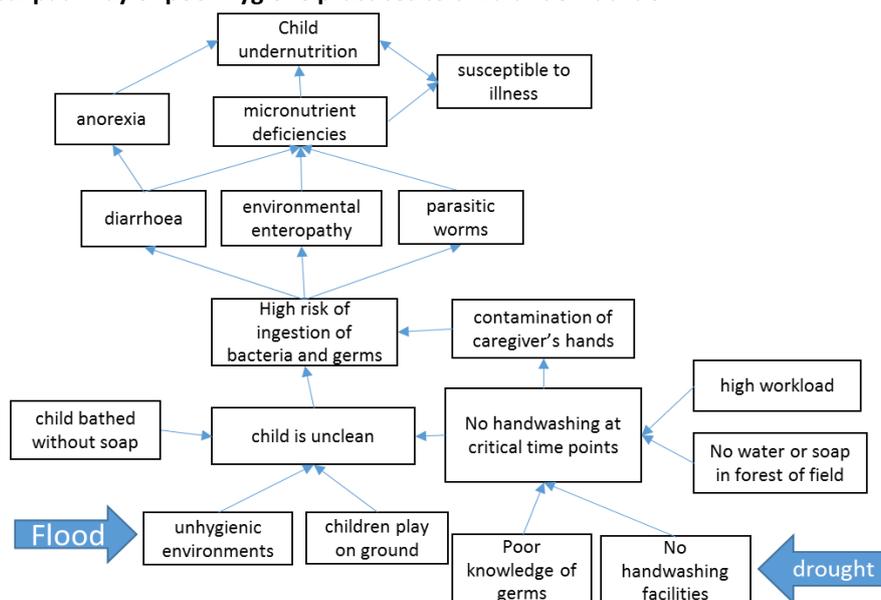
Water quantity for bathing was found in the RFS to be much higher than standards set for basic needs. Mothers and grandmothers often reported washing their children more than 3 times a day due to them getting dirty from playing on the ground and the dusty environment. Some groups of mothers discussed how difficult it was to keep their children clean. Of children aged under five years observed during the RFS, 24.5% were perceived to be dirty and only 10.3% as clean.

Basic food hygiene was investigated, with all mothers reporting storing food with a cover away from animals. However, the RFS found that only 15.1% of caregivers washed before preparation of food.

⁸¹ Department of Rural Health Care, Ministry of Rural Development, National Sanitation and Hygiene Knowledge, Attitudes, and Practices (KAP) Survey, 2010

⁸² A. Reinbott et al, IMCF Cambodia in Preah Vihear and Otdar Meanchey Povinces: Cross-sectional Nutrition Baseline Survey, 2013

Figure 30 Causal pathway of poor hygiene practices to child undernutrition



7.3.Relation with other sectors

7.3.1.1. Health

Disease is the pathway by which poor water, sanitation and hygiene lead to undernutrition. There is poor access to health advice of prevention of water-related diseases.

7.3.1.2. FSL

The main reason for open defecation was not having access to sanitation facilities, due to poor income. When caregivers were aware of good practices, the main reason given for not practicing these was high workload, by both mothers and fathers.

8. Knowledge

8.1.Findings for Knowledge Hypotheses

8.1.1.R. Poor Knowledge attainment

Communities rated poor knowledge highly as a cause of malnutrition in their communities and during community discussions it was clear that some form of education was seen as a priority for children. There is strong evidence showing the link between caregiver's education and child nutrition and health. In one large study, women's education was ranked at the top priority for child malnutrition reduction.⁸³ Education is thought to work through a cyclical link, with a relationship with measures of socioeconomic status. Studies which have controlled for wealth show varying results of the impact of education on child



⁸³ LC Smith and LJ Haddad, *Explaining child malnutrition in developing countries*, IFRPI Research Report Abstract, 2000. Accessed at: <http://www.ifpri.org/publication/explaining-child-malnutrition-developing-countries-0>

nutritional status.⁸⁴ ⁸⁵ Another suggestion for how maternal education affects nutritional status is through maternal knowledge or ability to attain knowledge. One study suggested knowledge of nutrition may have more of an impact on nutritional status of the child than on formal education of the mother.⁸⁶ ⁸⁷ However, as Bhutta et al acknowledge, knowledge can only do so much to improve practices if the household do not have resources, or specifically sufficient foods.⁸⁸

The RFS shows that 33.1% of caregivers had no education, and 33.8% had not completed primary but had some primary education showing that education levels were generally very low in the communities (Table 29). Caregivers with no education is higher than the national level of women with no education, at 12.8%.

Table 29 Education levels of Caregivers

	n	Proportion (%)	Lower 95% CI	Upper 95% CI	Provincial secondary data DHS 2014
Education levels	435				
<i>None</i>		33.1	24.9	41.3	23.7
<i>Some primary</i>		38.4	33.0	43.8	45.1
<i>Completed primary</i>		12.9	8.6	17.2	7.1
<i>Some secondary</i>		12.6	6.6	18.7	19.7
<i>Completed secondary</i>		2.8	0.7	4.9	2.2
<i>Higher education</i>		0.2	-0.2	0.7	2.1

Sources of knowledge were mainly from the Health Centre staff during presentation for illness or pregnancy care. There were limited community outreach activities for education. There was a discussion with one Health Post member of staff about those who are less educated not attending the community education and awareness sessions. Knowledge of undernutrition was not always strong in communities, however knowledge of health and hygiene was better. The majority of groups were knowledgeable about what a good diet was for a child, however their knowledge of age-appropriate feeding was poor. Despite adequate knowledge levels around hygiene and health, many good practices were not being frequently done with lack of resources and time given as the reason. In the majority of communities, where discussions were disaggregated in to wealth of households, better knowledge and ability to cooperate were noticed in the middle-wealth households.

Schools seem to be including health and hygiene education in the curriculum. In one community they discussed how children have better handwashing practices than adults through improved knowledge and awareness from school, however children often left school to work on the fields or help at the family home from 12-15 years. In some groups there was the observation that poor child growth leads to school being more difficult, and the child being less clever.

“Children wash hands as taught at school” (Mother, Svay village, Rumdaoh Srae)

⁸⁴ F Burchi, *Child nutrition in Mozambique in 2003: the role of mother's schooling and nutrition knowledge*, Economics & Human Biology, 2010

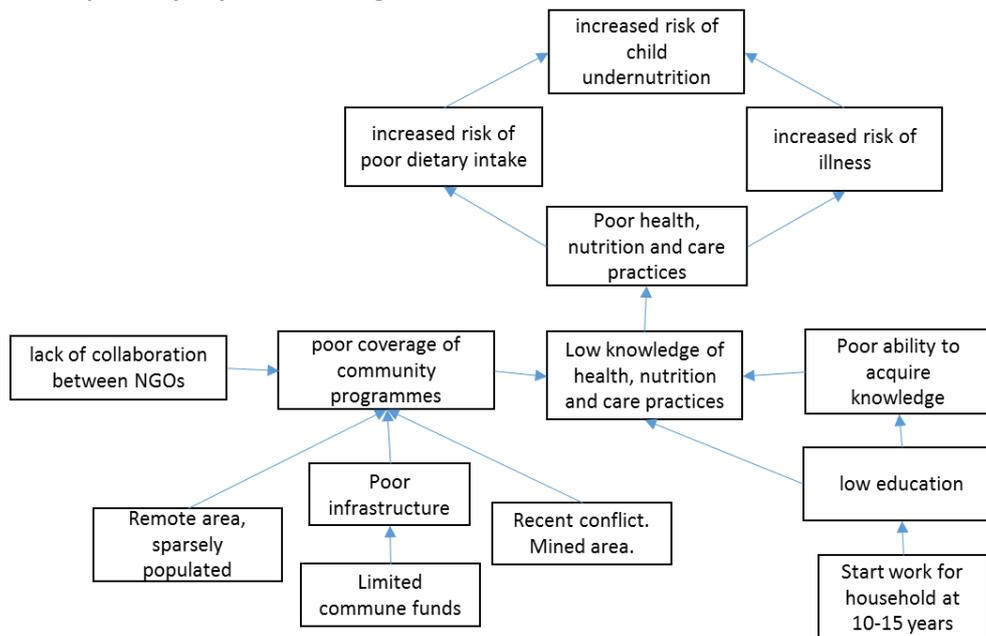
⁸⁵ V Vella et al, *Determinants of nutritional status in south-west Uganda*, j Trop Pediatr, 1995

⁸⁶ P Glewwe and J Hanan Jacoby, *Student achievement and schooling choice in low-income countries: Evidence from Ghana*, Journal of Human Resources, 1994

⁸⁷ LY Appoh, and K Sturla, *Maternal nutritional knowledge and child nutritional status in the Volta region of Ghana*, Matern Child Nutr, 2005

⁸⁸ Bhutta et al., *What works? Interventions for maternal and child undernutrition and survival*, Lancet, 2008

Figure 31 Causal pathway of poor knowledge attainment to child undernutrition



8.1.2.S. Poor awareness of undernutrition

The National Nutrition Programme in Cambodia is implemented through the Referral Hospitals and Health Centres, in practice they provide supplements and therapeutic feeding for acute malnutrition, and education on optimal nutrition for children. However, according to the National Nutrition Strategy, the capacity of health staff for inter-personal communication skills and counselling is low. Children identified as having SAM are referred to the Provincial Referral Hospital, from Choam Ksant district this is a minimum of 1.5 hours away and a maximum of 4 hours away. However, there were reports that mothers sometimes refused to go due to the cost of the transport and health care, and lack of awareness of the consequences and impact of their child having malnutrition. Despite UNICEF covering the costs of inpatient treatment for SAM in Cambodia if the Government Health Equity Fund was not applicable, there appeared to be low awareness of this process at Health Centres and at the Provincial Hospital itself.

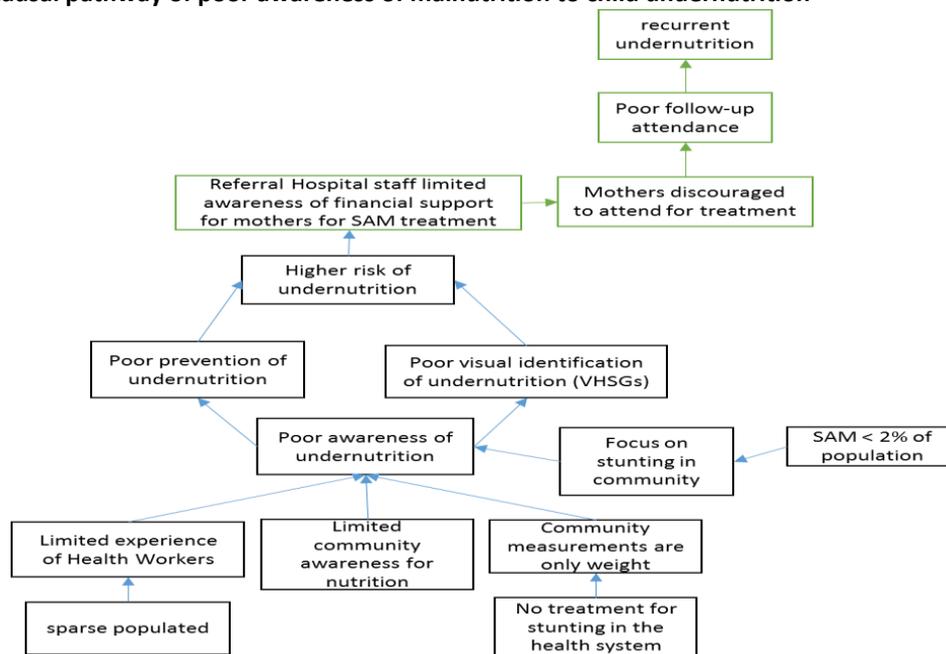
Despite there being more community awareness and discussion of stunting as a form of malnutrition, children are monitored routinely by only their weight. In terms of identifying SAM cases in the community, WAZ is used, they are then referred to Health facilities where they have length/height measuring equipment. On trying to identify positive and negative deviants based on their WAZ in the community during the NCA, it was found that village chiefs, VHSGs and Health Centre staff were unable to identify the children who were currently underweight, or who they perceived to be undernourished following a visual description.

Even when there seemed to be knowledge on causes of undernutrition in groups of the community, awareness of undernutrition was often low in terms of visually identifying cases and realising they needed medical attention. In one community, they had heard of undernutrition but the community were not able to determine undernutrition from other child illnesses. Mothers knew their child had undernutrition when they were measured, this was also the way the VHSG in this community reported being about to tell if a child had undernutrition. In one community, one group of mothers and the fathers had never heard of 'undernutrition'. But they had noticed that all children were not

growing equally, with a focus on linear growth. In the majority of communities, when discussing poor child growth, the focus was on stunting. However, although all groups were aware that children were not growing tall they were not sure why. On a number of occasions parents stated that their child was eating a lot, they weren't sick, but they were not growing properly. In two communities, a number of groups thought that being short was due to genetics due to observing small parents with small children. This was also a perception of stunting by nutrition staff at a local NGO. Other reasons given by NGOs were early marriage and not knowing how to care for a child during pregnancy.

It was not possible to test this risk factor within the means of the Link NCA. However, there is findings to suggest that this may be a risk factor for undernutrition, supported by Technical Stakeholders and as such a focused study is recommended. Figure 32 outlines the hypothesised pathway to undernutrition.

Figure 32 Causal pathway of poor awareness of malnutrition to child undernutrition

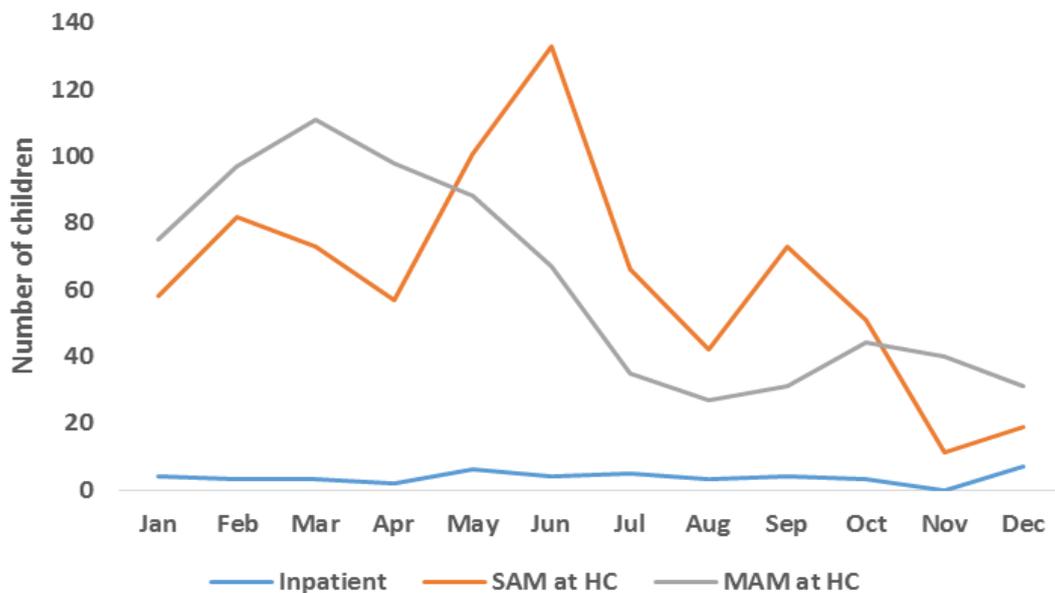


9. Seasonality, historical trends and shocks

9.1. Seasonality and medium term trends of undernutrition and risk factors

Seasonality has been discussed under each hypotheses where relevant. Seasonal calendars for each community visited in the qualitative enquiry can be found in Annex G. Figure 33 presents the cases of acute malnutrition identified and treated by the Provincial Health Department in 2015. This data is not given much weight in the ratings as the data was not perceived to be reliable or representative of all cases of acute malnutrition in Choam Ksant due to poor identification and referral. This data presents those cases that were identified and treated only.

Figure 33 Acute malnutrition case load of the Provincial Health Department for 2015



From this data, it seems that there are more cases in February, May – July and September.

There is an initial peak in February, hypothesised causal risk factors to explain these trends are:

- Cassava planting and harvest occurs in January and February;
- Casual labour was more common in December to March;
- Secondary carers were more common from and November to February;
- From November to January, the weather changes – though to be a cause of child illness.

There is a sharp decline in SAM from June to August, this may better reflect access to healthcare than the prevalence of malnutrition as this data is based on treatment only. During this time families are busy working on their rice crops. It is likely that there is more malnutrition from May through to September. Hypothesised causal risk factors to explain these trends are:

- In April, the rainy season begins, likely to spread the areas with faecal contamination;
- From April to May, all communities reported child illness when the “weather changes”: ARI, fever and diarrhoea. Malaria and Dengue were later in July to September;
- Drinking of unclean water increased from May to September during time in the field;
- Women were busy from May to September, associated with a number of risky care practices;
- Secondary carers were more common from May to September;
- Most income is generated in December to February with sale of crops, most casual labour is also in this period. Incomes were mainly less for the rest of the year;
- Less availability of fish and other wild foods from May to June;
- Food shortages reported pre-harvest in August to September; and,
- Increased food prices from April to June.

9.2. Historical trends of risk factors and undernutrition

Historical timelines were generated through discussion with village elders and community members who had been in the village for a long time. The historical timelines can be found for each community visited in the qualitative enquiry in Annex H. The risk factors with a historical trend were:

- Eating of packaged snacks was increasing and affecting quality of children's diets;
- Women working away from home was seen to be increasing with more opportunities for work, meaning mothers were spending more time away from their children;
- Natural resources were decreasing, impacting on income and food availability;
- Extreme temperatures were seen to be increasing;
- Animal disease is seen to have increased in frequency in recent years;
- Incomes were seen to be decreasing due to poor crops and depleting natural resources;
- Prices of rice and Cassava were seen to be decreasing;
- Borrowing of money and loans was seen to be increasing;
- Exclusive breastfeeding and timely initiation have improved in Cambodia and the NCA context;
- Delivery at Health facilities had increased, meaning more exposure at birth to skilled health advice;
- Children being vaccinated had increased;
- Use of traditional medicine and traditional healers is seen to have decreased with many more seeking treatment at health centres;
- Roads are still poor in some areas, but they have improved and many reported building of roads in the last 5-years

9.3. Recent shocks

Recent shocks included droughts, poor rains and less frequently, floods. This is difficult to summarise as one set of shocks as they differed across the four communities. They are detailed in the Historical timelines for each village in Annex H.

10. Positive deviant behaviours

10.1. Positive deviant case studies

10.1.1. Case study 1

The mother was 29 years old and her daughter was 23 months old. She displayed positive practices during pregnancy, attending the Health Centre each month and adjusting her diet to eat more and diverse foods. She had to work until 9-months gestation as it was the harvest season. She delivered her baby at the Health Centre, and initiated breastfeeding as first foods. She exclusively breastfeed, and introduced plain *borbor* at 6-months. Once a week she gave enriched *borbor*. From 1 year, she gave porridge, rice, and family foods. She finds vegetables at home, and her husband finds fish and

frogs in the wild. When the household experiences food shortages, the children eat first. They also reduce the amount of meat and vegetables and have more rice. She had a water filter and uses this for treatment drinking water. She washes her hands with clothes detergent before eating, after defecating, and when hands are dirty. She washes the child's hands before eating. She disposes of her daughter's faeces in a small hole in the backyard. Her daughter has rarely been sick. She has financial barriers to accessing healthcare and has no transportation. When her husband is at home he cares for the children, and sometimes cooks when she has work. This season she is not busy, but in the farming season she is very busy. She takes her daughter to the field and sets up a hammock for her. She perceived her main issues in raising her children to be not having much money so can't buy things for the children like other families.

10.1.2. Case study 2

The mother was 26 years old, and the child was 10 months. During pregnancy she ate a healthy diet and increased her food intake. She went to the Health Centre three times during pregnancy, and delivered her son there. She worked up until delivery as the elders told her that if she did her delivery would be easy. She exclusively breastfed until 7 months, when she introduced enriched *borbor*. She continued to give this three times a week, with plain *borbor* or rice the rest of the time. From 9 months she began to give fish and vegetables from the family foods. If her son refuses to eat, she will give him breastmilk. When there is a shortage of food in the household they reduce the amount the children eat. She boils the water from the clay storage pot before he drinks, or gives him bottled drinking water. She washes her hands before eating, and when taking a shower. She always has soap, and uses this or ash. She washes her son's hands before eating, sometimes with soap. She disposes of his faeces in a hole, she also defecates in the backyard in a hole. Her son has only been ill with a cold and infrequent diarrhoea. She does not have any challenges getting to the Health Centre as she has a moto, but sometimes she has to borrow money to pay for the medicine. She receives help with childcare from neighbours and her husband. When she gets work or goes to the forest, the husband stays home with the children and cooks and feeds them. The main problem she has with raising her children is money. But also because she has lots to do at home, and her husband is always in the field.

10.1.3. Case study 3

The mother was 25 years and the child was 9 months. During pregnancy she went to the Health Centre every month, and once attended a Mother Support Group. She changed her diet, eating more fruit and more bananas, and increased her intake. She worked up until delivery, but with decreased workload. She went in to labour early and had to have surgery, delivered at the Hospital. She gave infant formula for the first 3 months until she started to express breastmilk. She used a baby bottle and cleaned the bottle every time she used it with hot water. After 3 months she gave only breastmilk until 6-months when she gave *borbor*. The Nurse came to the village for a meeting and gave her advice on what to feed her baby. She now gives her son *borbor*, UHT milk snacks and rice with family foods such as fish, soup, sometimes beef and a lot of eggs. Her household lacks food almost every day, but it is worse in the dry season. She does labour work in this time and when she works she takes the baby with her. Sometimes she will get food from the shop but pay for it later, or sometimes they will eat more rice. She gives the baby more rice as a priority. She will always boil water before giving it to her son. Her grandmother supports her in caring for the child. She washes her hands before eating and before feeding her child, mostly with soap. She cleans the child's hands when they are dirty and gives him lots of baths. She uses a disposable nappy for the child, and throws it far from the house. The adults in the household defecate in the open field near the house. He has only been ill with a high temperate since being born, and she took him to the HC for medicine. She does not have any challenges in going to the Health Centre as she has a moto. The main problem she thinks they are

facing in raising their child is not having enough money. She tries to overcome this by working and earning money.

10.1.4. Case study 4

The Mother was 22 years old and her daughter was 13 month old. During pregnancy, she went to the Health Centre 4-5 times and also asked her mother for advice. She changed her diet, eating more and eating fish and vegetables. At 5 months she stopped doing heavy work. She delivered her baby at the health centre, and initiated breastfeeding within 30 minutes of delivery. She exclusively breastfed until 6-months when she gave *borbor* with salt. She also gave rice, snacks and UHT milk cartons. From 7-8 months she gave the same foods as the family: rice, meat, vegetables, snacks. When the household experience food shortages she borrows rice from other people and buys less meat and vegetables. She gives her daughter water directly from the handpump as she sees that it is clean. She washes her hands with soap before eating and after holding something dirty. She washes the child's hands before she holds a snack, and always uses soap. Her daughter defecates in a potty, she buries this in a hole. Herself, she defecates in the bushes far away and also always digs a hole to bury it. Her daughter has only been sick twice with a respiratory disease, she took her to the health centre and she then got better. She does not find it difficult to go to the Health Centre and has no problems with the healthcare costs. She has help caring for her child from the grandmother, grandfather and uncle. She is always at home with her child in the dry season, in the wet season she may go to the field and leave her baby with the grandparents. She feels her main issue she is facing in raising her child is when she is sick, and not having enough money to buy food for her baby. This happens frequently. She copes by doing casual labour and leaving the baby with the grandmother.

10.2. Negative deviant case studies

10.2.1. Case study 1

The mother was 32 years old and her child was 4 years and 1 month (the child was malnourished when she was under 2 years, and was still). During pregnancy, the mother visited the Health Centre 4-5 times, she changed her diet eating a lot and more vegetables and fruit. She stopped doing heavy work at 8 months. She delivered her baby at home as it was a quick birth, assisted by the TBA. She then went to the Health Centre. She exclusively breastfed until 5 ½ months, when she gave powdered rice porridge as the baby cried a lot. She had got advice on this from other mothers. Until 2-years her daughter ate dried fish, meat, vegetables and rice. The mother feeds the child herself, and if the child does not want to eat she will stop feeding her. Sometimes the children ask for money for packaged foods and she will give them money. When the household experience food shortages she gives the same amount of food to the child and the parents eat less. She boils or filters water before drinking, however when they are in the field they drink from streams and ponds. She washes her hands before eating, but does not use soap. She washes the child's hands before eating. The daughter's faeces is disposed of by throwing it in the rice field next to the house. At 4-5 months her daughter started to get sick and has always been sick a lot. She has fever, and white spots on her tongue. Her daughter used to have diarrhoea almost every day when she was 1-3 years old. When this was happening, she was going to the health centre daily. She has support from the grandmother, the grandmother will watch the child when the mother goes to the rice field or does labour work. She felt that her main issues in raising her child were that she is sick a lot and she has to generate or borrow money to pay the costs.

10.2.2. Case study 2

The mother was 35 years old, and her child was 3 years and 10 months (she was malnourished when she was under 2 years and was still). During pregnancy she went to the Health Centre 4 times. She did not change her diet, but ate more. She worked in the fields until delivery and delivered at the Health Centre. She gave breastmilk immediately and exclusively breastfed until 6-months when she gave *borbor*. Under 2-years of age she gave rice, fish, eggs and packaged cakes. She gives meat a few times a month. When the household experience food shortages they reduce the amount they eat. She reported boiling the water for drinking, however an observation in the interview was the daughter helping herself to water from the storage bucket, and this water had not been treated. She washes her hands after chopping wood, or before eating, sometimes with soap. She washes her child's hands when they are dirty. She disposes of her daughter's faeces by burying it on the other side of the fence. The adults defecate in the forest. Her daughter has had diarrhoea a few times, she took her to the Health Centre. She has some challenges in going to the Health Centre as she does not have a moto. It takes 2-3 hours to walk with the small child. Sometimes she will borrow transport. She does not have any support caring for her child. On rare occasions, the grandma will look after the child if she must go to work or if she needs to go to collect wood. In the farming season she takes the children to the field and they sleep there. They stay in a small house, and the children are left there behind a fence for 2-3 hours at a time if sleeping, and 1 hour if sleeping. She sometimes argues with her husband when he has been drinking alcohol, as he does not do anything. There is never any violence. She feels her main issue with raising her children is that she has no money, no jobs to do, and no tractor so they have to rent farming equipment.

10.2.3. Case study 3

The mother was 33 years and her daughter was 2 years and 10 months old. During pregnancy, she went to the Health Centre 6-7 times, she ate more during pregnancy. She worked up until delivery. She delivered at the Health Centre, and exclusively breastfed until 6-7 months when she gave *borbor* with salt. At 7 months she gave rice with water and soy sauce. Now she gives her daughter family foods. Her household have enough food for all months of the year. She boils water for her daughter to drink. She washes her hands with soap when she gets home from work and before eating. She washes the child's hands before eating with soap. However, during the interview both hers and her daughter's hands and nails were very dirty. She disposes of her daughter's faeces by burying it near the household. She defecates in a hole far from the house. Her daughter has been sick a lot, mainly with respiratory disease, cold and cough. She takes her to the Health Centre, or the Referral Hospital. She also sometimes has diarrhoea, when she does she will give tablets which she has bought from a Private Clinic. She believes diarrhoea is caused by eating the wrong type of food, such as bottled orange juice and snacks or mango. She does not have any idea how to prevent diarrhoea. She has challenges in going to the Health Centre as she does not have money for transport. She will overcome this challenge by asking the moto-taxi if she can pay later. She is on her own most of the time as her husband works away and comes home every 2 weeks. When he is home he also helps to care for the child. Her normal daily schedule is to go to work as a labourer, she brings her daughter with her. She did not think that she had any problems in raising her child.

10.3. Summary of positive and negative behaviours and practices

On conducting in-depth interviews with negative and positive deviant mothers, the main difference noticed was that the negative deviant mothers had children who were sick a lot. Positive practices and behaviours were identified as:

- Giving enriched *borbor* 1 – 3 times a week from 6-12 months;
- Giving ‘family foods’ from 8-12 months;
- Consistent treatment of drinking water;
- The mother being the primary caregiver for the majority of the time;
- Having support from a husband in caring for the child;
- The child not being sick very often; and,
- Use of soap for washing hands.

11. Final rating exercise

11.1. Rating exercise with the communities

At the end of the community enquiries in each village, participants were invited to discuss the results. Presented to them were the most relevant hypotheses to their community. They were then asked to pick those which they thought were most important, and to give each a rating from 1 (minor contributor to undernutrition) to 5 (major contributor to undernutrition) The below summarises the average rating of both groups of mothers and the group of fathers in each community of the qualitative enquiries.

	Kouk Sralao	Tmat Peuy	Sok Senchey	Svay	Average
A. High Risk of Mosquito-borne disease					
B. High prevalence of illness in children under 5	4.6	5.0	4.7	4.9	4.8
C. Delivery without skilled professionals					
D. Early child bearing		4.2			4.2
E. Mother’s employment and season migration	3.0	3.9		4.2	3.7
F. Gender issues and maternal wellness		2.8	4.4		3.6
G. Lack of exposure to skilled health advice		3.8	4.4	4.8	4.3
H. Open defecation and unhygienic environments	4.7	4.6	4.6	4.9	4.7
I. Inconsistent access to clean water	5.0	4.6	3.5	4.5	4.4
J. Poor hygiene practices	4.4	4.0	2.9	3.6	3.7
K. Inadequate breastfeeding practices					
L. Inadequate care practices		4.1	4.7	4.8	4.5
M. Poor quality diets of children under 5 years	4.5	3.8	4.5	4.8	4.4
N. Poor nutritional status of WCBA					
O. Household Food insecurity		4.2	4.5		4.4
P. Agricultural dependence and poor crop diversity	4.5	4.6			4.6
Q. Poor resilience	3.6	3.8	4.6	4.9	4.5
R. Poor knowledge attainment	3.7		4.3	4.9	4.3
S. Poor awareness of malnutrition	4.5	3.9	4.8	4.6	4.5
T. Low income and limited livelihoods	4.3	3.6	4.4	4.9	4.3
U. Limited access to markets & poor infrastructure		3.6	2.6		3.1

11.2. Initial rating from the Link NCA Analyst

A score from [-] to [++/+++] was given to each source of evidence as detailed in the column headers in Table 30. Using these ratings an overall ratings assigned to each hypothesised causal risk factor in line with the Criteria in Figure 34.

Figure 34 Criteria for rating categories of hypothesised risk factors

CATEGORY	CRITERIA
MAJOR RISK factor and pathway	Prevalence of risk factor is classified as ++ for +++ AND Strength of association from literature review is classified as + or ++ AND Majority of + or ++ for all other sources of primary qualitative and quantitative data collected during the study
IMPORTANT RISK factor and pathway	Prevalence of risk factor is classified as ++ for +++ AND Strength of association from literature review is classified as + or ++ AND Majority of + for all other sources of primary qualitative and quantitative data collected during the study
MINOR RISK factor and pathway	Prevalence of risk factor is classified as + AND Strength of association from literature review is classified as + or - AND Majority of + for all other sources of primary qualitative and quantitative data collected during the study
REJECTED RISK factor and pathway	Prevalence of risk factor is classified as - AND Strength of association from literature review is classified as - AND Majority of - for all other sources of primary qualitative and quantitative data collected during the study
UNTESTED RISK factor and pathway	Information gathered not complete or not available

Table 30 NCA Expert ratings of hypothesised causal risk factors

Hypothesised risk factor	Secondary data	NCA Survey	Strength of association with undernutrition	Seasonality of risk factor	Community rating	Interpretation
	Compared to national prevalence:		The evidence base shows in a few contexts:	Seasonality of risk & undernutrition:	Selected as top 5 risk factor	See Figure 34 above
	[-] = Lower [+] = The same [++] = Higher [+++] = Much higher		[-] = Weak association [+] = Medium association [++] = Strong associations, or context specific	[-] = No correlation [+] = No seasonality [++] = As expected [+++] = Match	[-] = Never [+] = Rarely [++] = Frequently [+++] = Consistently	
A. Mosquito-borne disease in children under 5-years	+	+	+ (wast)	++	-	Minor
B. High prevalence of illness in children under 5-years	+	+++	++	+++	+	Major
C. Delivery without skilled professional	+	+	n/a	+	-	Minor
D. Early child bearing	+	+	+	+	-	Minor
E. Mother's employment & seasonal migration	++	n/a	+	++	+	Important
F. Gender issues & maternal wellness	n/a	+++	+	+	-	Important
G. Lack of exposure to skilled health advice	+	+	+	+	+	Minor
H. Open defecation & unhygienic environment	+	++	++	+	+++	Major
I. Inconsistent access to clean water	+	+	+	++	+++	Minor
J. Poor hygiene practices	++	++	+	+	+	Important
K. Inadequate breastfeeding practices	+	+	-	+	-	Minor

Hypothesised risk factor	Secondary data	NCA Survey	Strength of association with undernutrition	Seasonality of risk factor	Community rating	Interpretation
	Compared to national prevalence:		The evidence base shows in a few contexts:	Seasonality of risk & undernutrition:	Selected as top 5 risk factor	See Figure 34 above
	[-] = Lower [+] = The same [++] = Higher [+++] = Much higher		[-] = Weak association [+] = Medium association [++] = Strong associations, or context specific	[-] = No correlation [+] = No seasonality [++] = As expected [+++] = Match	[-] = Never [+] = Rarely [++] = Frequently [+++] = Consistently	
L. Inadequate care practices ⁸⁹	+	++	+	++	++	Important
M. Poor quality diets of children under 5 years	+	++	++	++	++	Important
N. Poor nutritional status of Women of Child Bearing Age (WCBA)	+	+	+	+	-	Minor
O. Household food insecurity	+	+	+	+++	++	Minor
P. Agricultural dependence & poor crop diversity	+	+	-	+	+	Minor
Q. Poor resilience	n/a	++	+	+	++	Important
R. Poor knowledge attainment	+	+	++(stun)	+	+	Minor
S. Poor awareness of malnutrition	n/a	n/a	n/a	+	++	Untested
T. Low income & limited livelihoods	++	++	++	+	++	Important
U. Limited access to markets & poor infrastructure	n/a	+	n/a	+	+	Minor

⁸⁹ Care practices encompassed a broad spectrum of practices: feeding practices, hygiene practices, healthcare seeking practices, prevention of disease practices and as such was rated using an average of a number of different risk factors: not treating drinking water, not washing hands before preparing food and after defecation, non-responsive feeding, MDD and MMF, and seeking treatment for last episode of diarrhoea. The rating presented here is an average of these risk factors.

11.3. Final rating with Technical Stakeholders

Table 31 Ratings of causal hypotheses from the Final Stakeholder Technical Workshop

	Risk factor	Initial rating (NCA Analyst)	Final rating	Average individual confidence notes (Results)	Comments
A	Mosquito-borne disease in children under 5-years	Minor	Minor	2.43	Health Information System shows malaria is high in Choam Ksant along the border. Discussion on whether this was for children or all people, was not clear.
B	High prevalence of illness in children under 5-years	Major	Major	2.93	
C	Delivery without skilled professional	Minor	Minor	2.57	
D	Early child bearing	Minor	Minor	2.79	
E	Mother's employment and seasonal migration	Important	Important	2.79	
F	Gender issues and maternal wellness	Important	Important	2.50	Felt that gender and maternal health impacted on many other pathways.
G	Lack of exposure to skilled health advice	Minor	Important	2.79	Road access in rainy season – less access to HC. As includes advice on nutrition, should be important. Low education of VHSGs means capacity is low for community education from them. Poor links between HCs and community.
H	Open defecation and unhygienic environment	Major	Major	3.00	
R	Inconsistent access to clean water	Minor	Important	2.71	
I	Poor hygiene practices	Important	Important	2.86	
J	Inadequate breastfeeding practices	Minor	Minor	2.57	Practice in Cambodia to not use colostrum. Practice to stop breastfeeding baby girls earlier – at 1 year. Links to illness, care practices and wellbeing.

K	Inadequate care practices ⁹⁰	Important	Important	2.93	
L	Poor quality diets of children under 5 years	Important	Important	3.00	
M	Poor nutritional status of Women of Child Bearing Age	Minor	Minor	2.36	If mother has malnutrition she is weaker, more susceptible to illness. Impacts on many other risk factors. Also impacts on breastmilk consumption.
S	Household food insecurity	Minor	Important	2.71	Food insecurity is linked with many other risk factors. Strong links with diets.
N	Agricultural dependence and poor crop diversity	Minor	Important	2.71	Impact on income, and income relates to most other risk factors. Prices decreasing of agricultural crops as no market diversity.
O	Poor resilience	Important	Important	2.71	
P	Poor knowledge attainment	Minor	Minor	2.64	Lack of time to attend awareness sessions. Poor knowledge of home gardens, impacting on food security and income.
Q	Poor awareness of malnutrition	Untested	Untested	n/a	Although untested, groups felt this was an important risk factor for undernutrition and merited further investigation.
T	Low income and limited livelihoods	Important	Important	2.64	Water access decreasing, affecting crops and livestock and home gardens and then income. Prices of rice and cassava decreasing. Forest products decreasing.
U	Limited access to markets and poor infrastructure	Minor	Important	2.64	Villagers can't sell their products at good prices. Buyers come to village and pay lower price when roads are bad. Can't sell in their communities very well as others producing same crops and livestock. Seen improvements when roads improved.

⁹⁰ Care practices encompassed a broad spectrum of practices: feeding practices, hygiene practices, healthcare seeking practices, prevention of disease practices and as such was rated using an average of a number of different risk factors: not treating drinking water, not washing hands before preparing food and after defecation, non-responsive feeding, MDD and MMF, and seeking treatment for last episode of diarrhoea. The rating presented here is an average of these risk factors.

Section III: Recommendations

1. General programme and policy recommendations

Prior to implementation of the programme, it is recommended to spend time to ensure community buy-in. Some communities were less inclined to participate in the NCA survey, and there were similar reports from Health staff for community awareness activities. Additionally, an overarching recommendation is the consideration of all caregivers (mothers, fathers, grandmothers, possibly adolescent siblings) for activities to ensure secondary caregivers are improving practices and fathers are support wives in good practices. In some communities, knowledge is not the issue but there are barriers to behaviour change, therefore SBCC approaches should be carefully designed to provide optimal behaviour change, and progress of positive behaviours should be monitored with strategies adapted and improved with operational learning and observations. Additionally, education levels are poor in many households and as such interactive and demonstrative SBCC tools should be used to deliver educational messages.

Many risk factors showed seasonality – with worse practices during the farming season when adults tended to be away from the household. Many behaviours that are often promoted such as hand washing with soap, treatment of water, using latrines etc are not possible in the field or forest setting. This should be considered, with possible options for how to enable these practices when adults are working away from home as this constitutes a large proportion of the year. On this note, timing and location of activities should be carefully thought about to ensure activities have maximum participation. It is likely that in the farming season, the best location for any group meetings or educational sessions would be in the fields. Migration season should also be factored in to timings.

The below presents recommendations from the analyst for programme activities and the risk factors addressed through these activities. Major risk factors are in bold and underlined, important risk factors are in bold, and minor risk factors are in normal text type.

Recommendation	Risk factors addressed	Beneficiary
<ul style="list-style-type: none"> ▪ Support the PDRD to begin CLTS in Choam Ksant (PDRD) 	<ul style="list-style-type: none"> ➤ <u>Open defecation and unhygienic environments</u> 	Community
<ul style="list-style-type: none"> ▪ Micro financing or social enterprise for latrine construction (iDE) 	<ul style="list-style-type: none"> ➤ <u>Open defecation and unhygienic environments</u> 	Community
<ul style="list-style-type: none"> ▪ Facilitation of sanitation and hygiene committees, to include clearing communities of rubbish from communal areas, and promotion of construction of latrines and hand-washing points 	<ul style="list-style-type: none"> ➤ <u>Open defecation and unhygienic environments</u> ➤ <u>High prevalence of disease: diarrhoea, environmental enteropathy and parasitic worms</u> 	Community
<ul style="list-style-type: none"> ▪ Establish/promote baby-friendly play areas, protected from animals and free of faeces, foods and other contaminants on the ground 	<ul style="list-style-type: none"> ➤ <u>High prevalence of disease: diarrhoea, environmental enteropathy and parasitic worms</u> 	Caregiver and child
<ul style="list-style-type: none"> ▪ Promote purchase of water filters 	<ul style="list-style-type: none"> ➤ <u>High prevalence of disease: diarrhoea,</u> 	Caregiver and

(IDE)	<u>environmental enteropathy and parasitic worms</u>	child
<ul style="list-style-type: none"> ▪ SBCC and education to include: prevention of diarrhoea, EE, worms; hand-washing practices, bacteria and germs, transmission routes of faecal bacteria, safe disposal of child and animal faeces, etc (gender mainstream) 	<ul style="list-style-type: none"> ➤ <u>High prevalence of disease: diarrhoea, environmental enteropathy and parasitic worms</u> ➤ Poor knowledge attainment 	Household
<ul style="list-style-type: none"> ▪ Support the PHD to strengthen links between the Health Centres and communities (PHD) 	<ul style="list-style-type: none"> ➤ <u>High prevalence of disease</u> ➤ <u>Exposure to skilled health advice</u> 	Community
<ul style="list-style-type: none"> ▪ VSLA or similar between caregivers for the use of accessing Healthcare only 	<ul style="list-style-type: none"> ➤ <u>High prevalence of disease</u> ➤ <u>Exposure to skilled health advice</u> 	Caregiver and child
<ul style="list-style-type: none"> ▪ Support IGAs and social enterprises closer to home for primary caregivers; 	<ul style="list-style-type: none"> ➤ <u>Low incomes and limited livelihoods</u> ➤ <u>Maternal employment and seasonal migration</u> 	Caregiver and child
<ul style="list-style-type: none"> ▪ Establish VSLA to reduce loans taken from Banks; 	<ul style="list-style-type: none"> ➤ <u>Low incomes and limited livelihoods</u> ➤ <u>Poor resilience</u> 	Household
<ul style="list-style-type: none"> ▪ Community rice banks 	<ul style="list-style-type: none"> ➤ <u>Poor resilience</u> 	Community
<ul style="list-style-type: none"> ▪ Vocational skills training; 	<ul style="list-style-type: none"> ➤ <u>Low incomes and limited livelihoods</u> 	Community
<ul style="list-style-type: none"> ▪ Farmer training for men and women – resilient farming techniques, diversify crops, irrigation 	<ul style="list-style-type: none"> ➤ <u>Poor resilience</u> ➤ <u>Agricultural dependence and poor crop diversity</u> ➤ <u>Low income and limited livelihoods</u> ➤ <u>Food security</u> 	Household
<ul style="list-style-type: none"> ▪ Support for farmers to sell their agricultural products at higher prices (?Collaboration) 	<ul style="list-style-type: none"> ➤ <u>Poor market links and poor infrastructure</u> 	Community
<ul style="list-style-type: none"> ▪ Support VHSGs to establish Mother Support Groups, to focus on SBCC for care practices, breastfeeding support, psychosocial support, IYCF and prevention of illness 	<ul style="list-style-type: none"> ➤ <u>Care practices</u> ➤ <u>Poor quality diets of children under 5-years</u> ➤ <u>Poor nutritional status of women of child bearing age</u> ➤ <u>Gender issues and maternal wellbeing</u> ➤ Poor knowledge attainment 	Caregiver and child
<ul style="list-style-type: none"> ▪ Handwashing stations made from locally available resources (e.g. tippy-taps) 	<ul style="list-style-type: none"> ➤ <u>Hygiene practices</u> 	Household
<ul style="list-style-type: none"> ▪ Promotion of soap use for bathing to increase soap contact points 	<ul style="list-style-type: none"> ➤ <u>Hygiene practices</u> 	Caregiver and child
<ul style="list-style-type: none"> ▪ Support community to create maintenance groups for water sources 	<ul style="list-style-type: none"> ➤ <u>Inconsistent access to clean water</u> 	Community
<ul style="list-style-type: none"> ▪ SBCC for safe water collection, transport, and storage 	<ul style="list-style-type: none"> ➤ <u>Inconsistent access to clean water</u> ➤ Poor knowledge attainment 	Household
<ul style="list-style-type: none"> ▪ Micro gardens, including water 	<ul style="list-style-type: none"> ➤ <u>Food insecurity</u> 	Household

efficient methods, use of waste water for plants, and solutions for keeping animals out;		
<ul style="list-style-type: none"> ▪ Construction of fish farms (Cash-for-work?) 	➤ Food insecurity	Community
<ul style="list-style-type: none"> ▪ Demonstrations of using family foods to produce appropriate complementary meal for child 	➤ Poor quality diets of children under 5 years	Caregiver and child
<ul style="list-style-type: none"> ▪ SBCC around feeding practices: use of feeding bowl for children to encourage adequate amounts of food (see NOURISH feeding bowl); positive responses when child refuses to eat; not giving snack foods frequently; child not distracted by other things when eating; 	<ul style="list-style-type: none"> ➤ Poor quality diets of children under 5 years ➤ Care practices ➤ Poor knowledge attainment 	Caregiver and child
<ul style="list-style-type: none"> ▪ SBCC around consistent treatment of ALL water. ▪ Taking treated water to the field/forest? Disposable water containers? 	➤ Inconsistent access to clean water	Household
<ul style="list-style-type: none"> ▪ Preservation of foods for times of food shortage 	➤ Food insecurity	Household
<ul style="list-style-type: none"> ▪ Promote PNC as not just when there is a problem 	➤ Exposure to skilled health advice	Caregiver and child
<ul style="list-style-type: none"> ▪ Continue to support HCs capacity in skilled breastfeeding support and train TBAs in skilled BF support: to include prolonged breastfeeding sessions (>10mins), emptying each breast. And breastfeeding cues from child, not to pacify. It is important to sustain the current improved breastfeeding practices 	<ul style="list-style-type: none"> ➤ Exposure to skilled health advice ➤ Inadequate breastfeeding practices 	Caregiver and child
<ul style="list-style-type: none"> ▪ Awareness raising for pregnant women taking precautions against mosquito bites in the forest and fields 	<ul style="list-style-type: none"> ➤ Poor nutritional status of women of child bearing age ➤ Poor knowledge attainment 	Caregiver and child
<ul style="list-style-type: none"> ▪ Continued efforts to: sleep under mosquito nets, work with TBAs to promote and facilitate Health Centre deliveries (MKRK, ADRA); have a first child after 18-years and use of contraceptives 	<ul style="list-style-type: none"> ➤ Mosquito-borne disease ➤ Delivery with unskilled professional ➤ Early child bearing 	Caregiver and child
<ul style="list-style-type: none"> ▪ Raise awareness of link between diet when pregnant and stunting. 	➤ Poor nutritional status of women of child bearing age	Caregiver and child

Now thought to be genetics, with no solution with messages on importance of eating more when pregnant ➤ Poor knowledge attainment

2. Next steps

In follow up to the results of the NCA, it is recommended that maternal health is investigated further. It has not been clarified what is causing such a high number of caregivers to be at risk of depression, but given the impact on care practices of young children and the mother's own nutritional status this is an important risk factor to understand more about. It is recommended that there is a focused study, possibly in collaboration with the Provincial Department of Women's Affairs or TPO, a local NGO working in mental health, to assess the main risk factors for risk of depression. Maternal Health does not come under Action Against Hunger's expertise, and as such would need to be worked on with a collaborating partner.

During the months of April and May, a Participatory Community Action Planning (PCAP) will be conducted by the Resilience and Nutrition Programme Managers with two Community Facilitators, trained by the Resilience Advisor for Action Against Hunger International.

The Participatory Community Action Planning (PCAP) will include:

- Preliminary action plan prepared
- Composition and training of the team
- Analysis of the Link NCA and Resilience Analysis Reports
- Select communities and representatives
- Planning of field activities
- Pilot test of the methodology
- Risk factors: self-identification and validation by communities
- Risk factors: village level contextualisation
- Risk Factors: vulnerability and capacity
- Visioning
- Community Action Planning and leaning needs
- Learning visits
- Review and finalisation of Community Action Plans

Final Conclusions

The Link NCA results provide a number of actionable risk factors for undernutrition in Choam Ksant. A complex situation exists, with minimal resources to enable behaviour change despite good knowledge in some communities. With minimal commune funding and scattered coverage of local NGOs, there is a need for collaboration and coordination of activities for maximum coverage and impact.

Two risk factors were highlighted as major: open defecation and unhygienic environments, and the closely related child illnesses (diarrhoea, environmental enteropathy and worms, as well as fever and ARI). Given these results, the recommendation is a Nutrition programme with a strong WASH-component or collaboration with a WASH partner. Recently a Nutrition-WASH sub-working Group has been established at National level with key actors in both sectors. This shows there is already National momentum for the integration of Nutrition and WASH programming. UNICEF have recently completed a Theory of Change for Nutrition and WASH which will be informative to the programme design. NOURISH is a current large scale Nutrition-WASH programme being implemented in other areas of Cambodia, any lessons learnt through their progress so far would be useful to strengthen the implementation plans for Action Against Hunger.

The Nutrition component should focus on IYCF and maternal diets, with promotion of age-appropriate feeding for children, including the amount of food given, and increased food intake during pregnant. The WASH component should focus on reducing open defecation, safe disposal of faeces, cleaning up environments, and improved handwashing practices at critical times.

Additionally, a number of risk factors were rated as important under food security and livelihoods (FSL). These were low incomes and limited livelihoods, poor market access and infrastructure, poor resilience and household food insecurity. As such it is also recommended that the programme contain a FSL component to improve the capacity and ability of households to generate sustainable and reliable incomes to improve household wealth, which impacts on a number of risk factors, as well as providing alternative coping mechanisms that taking loans or selling assets, and reduces issues with food access at the household and subsequently improved child and household nutritional status.

Actionable recommendations are made for programme strategy and specific activities to input to the following response analysis and programme design.

Annex

Annex A. NCA Timeline

Activities	Week beginning																		
	7 th Dec	14 th Dec	21 st Dec	28 th Dec	4 th Jan	11 th Jan	18 th Jan	25 th Jan	1 st Feb	8 th Feb	15 th Feb	22 nd Feb	29 th Feb	7 th Mar	14 th Mar	21 st Mar	28 th Mar	4 th Apr	
Reviewing of the Preparatory phase																			
Compile and analyse secondary data																			
Defining objectives, study population and appropriate methodology																			
Review the budget, time-frame and human resources needed																			
Redefine roles and responsibilities																			
Identify causal hypothesis																			
Secondary data review; Key Informants interviews																			
Analyse existing data																			
Technical expert workshop																			
Qualitative enquiry																			
Development and pre testing of field survey instruments																			
Sampling																			
NCA team training and pilot test																			
Data collection																			
Analysing evidence																			
Quantitative survey																			
Development of household survey instruments																			
Pre-Test of the household survey instruments																			
Sampling																			
Develop database and entry mask																			
NCA team training and pilot test																			
Data collection																			
Data base cleaning																			
Descriptive analysis																			
Rating risk factors																			
Weighting the different sources of information																			
Rating Risk Factors with communities																			
Internal validation of analysis																			
Final technical workshop																			
Communicating results																			
Report of technical expert meeting and final stakeholder workshops																			
NCA report																			
Executive summary and article																			
Communicate results to the communities																			
Human resources, logistic, administrative work																			
Final selection of NCA team																			
Organisation of technical expert workshop																			
Organisation of NCA team training (qualitative survey)																			
Organisation of NCA team training (quantitative survey)																			
Organisation of quantitative field survey																			
Organisation of qualitative field enquiry																			
Organisation of final stakeholder workshop																			

Annex B: Seasonal Calendars

Kouk Sralao

	1	2	3	4	5	6	7	8	9	10	11	12
Seasons and weather												
Rainy season					X	X	X					
Long droughts						X	X					
Short droughts						X		X	X			
Floods								XX	XX	X	X	
Farming												
Rice planting						X	X	X	X			
Rice harvest										X	X	X
Cassava planting	X	X	X									
Cassava harvest	X										X	X
Vegetable planting	X									X	X	X
Vegetable harvest		X	X	X								
Crop disease							X	XX	XX			
Disease												
Diarrhoea	X X	X	X	X	X	X	XXX	XXX	X	X	X	X
Dengue												
Malaria												
ARI				XXX							XXX	
Animal Disease	X X X	X	X	XX	XX	X	X	X	X	X	X	X
WASH												
Drinking unclean water						XX	XX	XX	XX			
Handwashing							XXX	XXX				
Workload												
Busy time for women	X				X	XX	XXX	XXX				
Busy time for men	X	X	X	X	XX	XX	XX	X	X	XXX	XXX	XXX
Children with grandma or older sibling in the day					XX	XX	XX			XX	XX	XX
Births	X X	XX									X	X
Food availability and access												
Availability of wild foods	X	X	X	X								
Availability of fish								X	X			
Purchasing food from the market	X	X	X	X	X	X	X	X	X	X	X	X
Using own rice stocks	X	X	X	X	X						X	X
Food shortage						X	X	X	X	X		
Increased rice prices								X	X	X		

Increased food prices (other)	X	X	X	XX	XX	XX	X	X	X	X		
Home gardens poor HHs					X	X	X	X	X			
Home gardens middle HHs	X	X	X	X								
Income												
Sale of rice crops	X											X
Sale of other crops	X	X	X									
Causal labour	X	X	X	X	X							X
Borrowing money					X							
Repaying debts	X											X

Tmat Peuy

	1	2	3	4	5	6	7	8	9	10	11	12
Seasons and weather												
Rainy season					XX	XX	XXX	XX	XX	XX		
Dry Season	X	X	X	X							X	X
Long droughts						XX	XXX					
Short droughts								X	X			
Floods								X	X	X		
Farming												
Rice planting							X	XXX	X			
Rice harvest										X	XXX	X
Cassava planting				X	X							
Cassava harvest	X	XXX										
Vegetable planting	X				X							XX
Vegetable harvest	XX	X										
Crop disease									X	XX		
Disease												
Diarrhoea				X	X	XX	X					
Dengue						X	XX	X	X			
Malaria					X	X	XX	X	X	XX	X	
Fever				XX	XX							
ARI				XX	XX						X	X
Animal Disease				XX	XX	X	X	X				
WASH												
Drinking unclean water	XXX	XX	XX	XXX								
Handwashing					X	X	XX	XX	X	X	X	X
Workload												
Busy time for women					XX	XX	XXX	XXX	XX	X	XXX	XXX
Busy time for men					XX	XX	XXX	XXX	XX	X	XXX	XXX
Children with grandma or older sibling in the day	X	X					XX	XX	XX			
Births	XX	XX	X	X								

Migration	X	X	X	X	X							
Food availability and access												
Availability of wild foods		XX	XX	X	X	X	X	XX	XX			
Availability of fish	XX	X					X	X	X	X	XXX	XXX
Purchasing food from the moto market		X	X	X	X	X	XX	XX	X			
Using own rice stocks	X	X	X	X	X	X				X	X	X
Food shortage				XX	X	X						
Increased rice prices							X	XX	XX			
Increased food prices (other)							X	XX				
Income												
Sale of Rice	XX										X	XX
Sale of Cassava	X	XX	X									
Sale of forest items	X	XX										
Causal labour	XX	XX						X	XX	X	X	XX
Borrowing money				X	XX							
Repaying debts	XX										X	X
Migration	X	X	X									

Sok Senchey

	1	2	3	4	5	6	7	8	9	10	11	12
Seasons and weather												
Rain					X	XX	XX	XXX	XXX	XX		
Droughts							XXX					
Farming												
Rice planting					XXX	XXX	XXX	XXX				
Rice harvest										X	XXX	
Cassava planting					XXX	X	X					
Cassava harvest	X	XXX										
Other crops					X							
Crop disease							X	X				
Disease												
Diarrhoea			XX	X								XX
Respiratory disease			XX	XX	XX						XX	XX
Dengue							XXX	XXX	X			
Malaria						XXX	XXX	XXX	X			
Animal Disease	XXX	XXX								XX	XX	XX
WASH												
Drinking unclean water	XXX	XXX	XX	XX	XX	XX						X
Workload												
Children with grandma or older sibling in the day	XXX	XXX	XX	X	X	X	X	X			XXX	XXX
Food availability and access												

Collecting wild foods						X	X	X	X			
Fishing						X	X	XX	XX	XX	X	X
Purchasing food from the market	X	X	XX	XXX	XX				X	XX	X	X
Using own rice stocks	X	X	X								X	X
Food shortage									X	X		
Increased food prices									X	X		
Income												
Sale of rice crops												XXX
Sale of Cassava	XX	XXX	XX									
Causal labour												
Borrowing money	X	X	X	X	X	X	X	X	X	X	X	X
Repaying debts	X	X	X	X	X	X	X	X	X	X	X	X

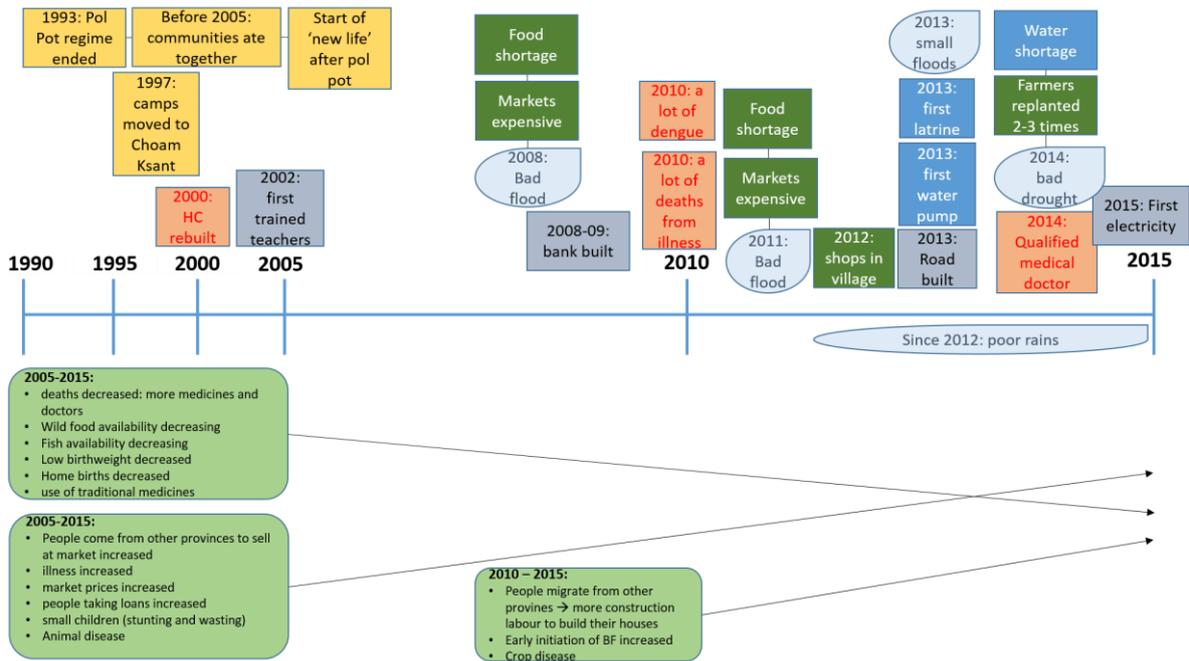
Svay

	1	2	3	4	5	6	7	8	9	10	11	12
Seasons and weather												
Rain					X	XX	X	XXX	XXX	X		
Droughts	XX	XX	XXX	X			X				X	X
Floods								XX	XX	XX		
Farming												
Rice planting					X	X	X	X				
Rice harvest										X	X	X
Cassava planting				X	X	X						
Cassava harvest	X	X	X									
Homegarden planting									X	X	X	X
Crop disease	XX	XX						X	X			
Sleeping in the field				X	X	XX	XX	X		X	X	X
Disease												
Diarrhoea			XX	XX	X				X	X		
Respiratory disease	X										X	X
Fever	XX	XX			XX	X						
Dengue					XX	XXX	X	X	X			
Malaria						XXX	XX	XX	X			
Animal Disease	X	XX X	XXX	XX	X				XXX	XXX	XX	X
WASH												
Drinking unclean water					X	XXX	XXX	XXX	XXX	X		
Washing hands with soap	X	XX	XX	XXX					X	X	X	X
Care practices												
Children with grandma or older sibling in the day	XX	XX X		X	X	X	XXX	XXX		XX	XXX	XXX
Food availability and access												
Purchasing food from the market	X	X	X	X	X	XX	XXX	XXX	XX	X	XXX	XX

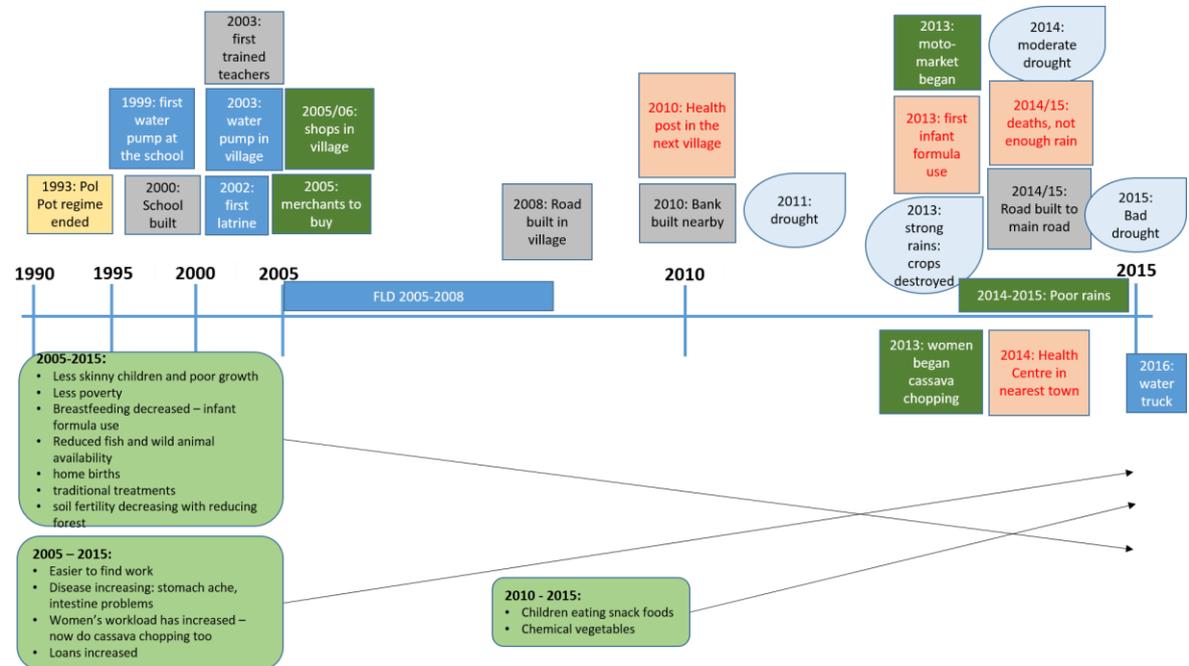
Collecting wild foods	X	X	X		X	XX	XX	XXX		X	X	
Fishing	X	X	X			XX	XX	X	XXX	XXX	XX	X
Food shortage					X	X	X	XX	XXX	XXX		
Increased food prices				XXX	XXX					XXX	XXX	XX
Income												
Sale of rice crops	X	X									X	X
Sale of Cassava	X	X										X
Causal labour	XX X	XX X	XX	X	X		XX	X	X	X	X	X
Borrowing money	XX	XX	X						XX	XXX	X	X
Repaying debts	XX X											XX
Sale of livestock	X	XX X	XXX	X	X	XX	X	X	XXX	XXX	XX	X
Other IGAs	XX	XX	X	X	X	X	X					

Annex C: Historical Calendars

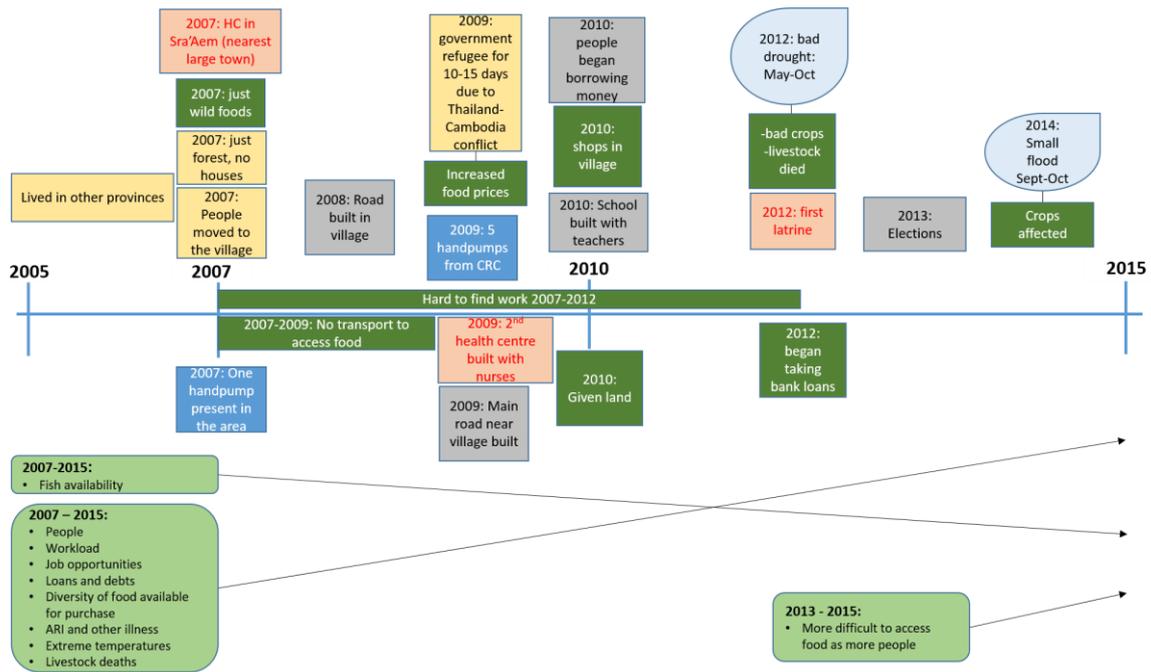
Kouk Sralao



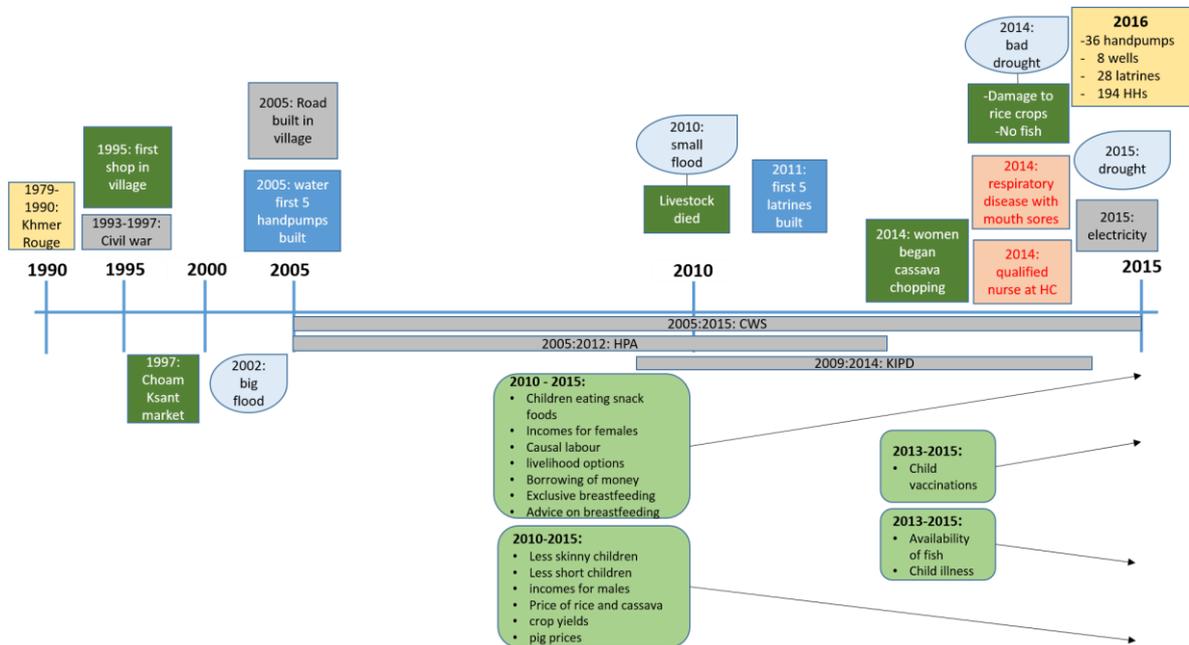
Tmat Peuy



Sok Senchey



Svay



Annex D. List of village per commune in Choam Ksant district, with type of village, population numbers and assigned cluster.

Commune name	Village name	Type	Population		Cluster (No.)
			HHs	persons	
Choam Ksant - 1	Choam Ksant	Traditional	902	3736	1,2
	Kouk Sraloa	Traditional	124	493	3
	Boskor*	Traditional	100	450	4
	Ansas	Military	241	829	5
	Chher Teal Kong	Traditional	407	1515	6
Tuek Kraham - 2	O's Ksan	Traditional	231	1067	7
	Sen Rong Reoung 1	Military	439	1678	8
	O Chunh*	Traditional	150	675	9
	Chat Taing	Traditional	146	663	RC
Rumdao Srae - 3	Kouk	Traditional	215	1038	10
	Svay	Traditional	632	3119	11
	Srae	Traditional	224	952	12
	Rolum Thma	Traditional	228	1106	13
Pring Thum - 4	Tmat Paey	Traditional	305	1255	14
Yeang – 5	Kaong Yaong & Chugn Chang*	Traditional	256	1061	15
	Chem Srae	Traditional	230	1062	16
	Antil	Traditional	702	2904	17, 18
	Komprak*	Traditional	231	942	19
Kantuot - 6	Char	Traditional	219	866	20
	Trapeng Sangker Khang Lech	Military	87	699	21
	Sok Senchey	Military	108	434	22
	Sra Aem Khang Thbong	Traditional	282	1260	RC
Sra'Aem - 7	Thocheat Dechor Hun Sen	Military	2319	6877	23, 24, RC
	Sen Chey	Military	875	2167	25, 26
	Chambok Sen Chey	Military	269	1010	27
	Sra'aem Khang Cherng	Military	554	2154	28, 29
Morokot - 8	Sen Dekchash	Military	280	1159	30
	Sen Rong Reoung 3	Military	294	1048	RC

*sub-village (new village with the same village chief as another close by)

Annex E. Village selected for qualitative survey

Week	Commune	Village Name	Type
1	Choam Ksant	Kouk Sraloa	Traditional
2	Pring Thum	Tmat Paeky	Traditional
3	Kantout	Sok Senchey	Military
4	Rumdao Srae	Svay	Traditional

Annex F: Risk Factor questionnaire

HOUSEHOLD QUESTIONNAIRE

I. Identification

To be filled before the interview, before entering in the household

Date of the survey (day/month/year):	
Number of the commune (1 to 8):	
Name of village:	
Number of the cluster (1 to 30):	
Pair ID number (1 to 8):	
Household ID (No. 1 to 28):	
Starting time of the interview (hh:mm):	

Proceed only with Consent

Is there a child aged from 0 to 59 months present in the household?

No = 0 (If there is no child 0-59 months, move to the next household)

Yes = 1

II. Household demographics

How many people are there in your Household?

Is the head of household present?

No = 0

Yes = 1

Is the mother or the current primary caregiver of the 0-59month child present?

No = 0 (Reschedule)

Yes = 1

III. Food Security and Livelihoods

I would first like to ask some questions about the food eaten in your household

Household Dietary Diversity Score (HDDS)		
I would like to ask you about the types of foods that you or anyone else in your household ate yesterday during the day and at night. Who prepared the food yesterday? <i>Probe about snacks between meals, any special foods given to children or pregnant women, any added foods such as sugar in tea, oil in cooking. If a mixed dish, what were the ingredients? Once the recall is finished, probe for food groups which were not mentioned. Mark "No" when it is certain that no foods in that group were eaten.</i>		
	Yes = 1	No = 0

Cereals: any food such as rice, porridge, bread, instant noodle, Khmer rice noodles		
White potatoes, white yams, elephant foot yam, cassava, taro, or any other foods made from roots		
Vitamin-A rich vegetables: pumpkin, carrots, or sweet potatoes that are orange inside + other locally available vitamin-A rich vegetables (e.g. sweet pepper)		
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 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)		
Vitamin-A rich fruits: ripe papaya (fresh or		
dried), ripe mangoes (fresh or dried), musk melon		
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 pineapple, longan, longkong, guava, green mango, green papaya, coconut meat liver, kidney, heart or other organ meats or blood- based foods like blood pudding		
Flesh meats: beef, pork, goat, poultry or any wild animal like deer, rabbit, pig, birds, or snail, snake, frog		
eggs from chicken, ducks, goose or any other eggs		
fresh or dried fish or shellfish, fermented fish, snails		
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		
Insects: insect larvae, red ants, grasshopper, crickets		
Milk and milk products: milk, yogurt drink or other milk products (like powdered milk, AD milk, Red cow milk) Any foods made with oil, fat or butter		
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) spices (black pepper, salt, chili, ginger), herbs (lemongrass, lime leaf, krasong, lime, tamarind leaves),		

condiments (soy sauce, fish sauce, hot sauce), pra-hok, coffee, tea, tender coconut water, alcoholic beverages such as: canned beer, rice wine, palm wine		
---	--	--

	Food Consumption Score (FCS)
	Now I would like to ask you about how many time that you or anyone else in your household ate during the last 7 days: <i>Code the consumption from 0 to 7 according to the answer. Any consumption frequency greater than 7 should be coded as 7.</i> <i>Example:</i> <i>“Fruits was eaten 3 times in the last 7 days”, code 3.</i> <i>“Milk was drunk 12 times in the last 7 days”, code 7.</i>
FCS1	Cereals: any food such as rice, porridge, bread, instant noodle, Khmer rice noodles
FCS2	White potatoes, white yams, elephant foot yam, cassava, taro, or any other foods made from roots
FCS3	Vitamin-A rich vegetables: pumpkin, carrots, or sweet potatoes that are orange inside + other locally available vitamin-A rich vegetables (e.g. sweet pepper)
FCS4	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
FCS5	other vegetables (e.g. to mato, onion, eggplant, chinese cabbage, green pepper, green beans, boiled whole corn, bottle gourd, bitter gourd, sponge gourd, water lily, lettuce)
FCS6	Vitamin-A rich fruits: ripe papaya (fresh or dried), ripe mangoes (fresh or dried), musk melon
FCS7	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
FCS8	liver, kidney, heart or other organ meats or blood-based foods like blood pudding
FCS9	Flesh meats: beef, pork, goat, poultry or any wild animal like deer, rabbit, pig, birds, or snail, snake, frog
FCS10	eggs from chicken, ducks, goose or any other eggs

Months of Adequate Household Food Provisioning (MAHFP)		
Now I would like to ask you about your household’s food supply during different months of the year. When responding to these questions, please think back over the last 12 months, from now to the same time last year.		
In the past 12 months, were there months in which you did not have enough food to meet your family’s needs?	No = 0	(If the answer is no, mark no for all months)
	Yes =1	
If yes, which were the months in the past 12 months during which you did not have enough food to meet your family’s needs? <i>DO NOT READ THE LIST OF MONTHS ALOUD.</i> <i>Use a seasonal calendar if needed to help respondent remember the different months.</i> <i>Probe to make sure the respondent has thought about the entire past 12 months.</i> <i>This includes any kind of food from any source, such as own production, purchase or exchange, food aid or borrowing.</i>		

<i>Mark which months are quoted, put no for the rest:</i>		
	No = 0	Yes = 1
February 2016		
January 2016		
December 2015		
November 2015		
October 2015		
September 2015		
August 2015		
December 2015		
June 2015		
May 2015		
April 2015		
March 2015		

Market Access

Is there a market in the village?

No = 0

Yes = 1

How long does it takes to go to your usual market?

Less than 30 minutes = 0

Between 30 minutes and 2 hours = 1

About half a day = 2

More than half a day = 3

Household Wealth

Assets of household

AS1	Now, I would like to ask you if your household has any of the following, and how many?	
		Number
AS2	Cows	
AS3	Chickens	
AS4	Land for cash crops (acres)	
AS5	Moto	
AS6	Car/Van/Truck	
AS7	Hand Tractor	
AS8	Tractor	

	Condition of Household
	<i>Ask or observe the following in the household:</i>
HQ1	What material is the roof?
	<i>long grass = 1</i>
	<i>palm leaf = 2</i>

	<i>metal sheet = 3</i>
	<i>clay = 4</i>
	<i>metal and clay =5 other = 88</i>
HQ2	What material is the floor inside the household?
	<i>no floor/ earth/ mud = 1</i>
	<i>bamboo = 2</i>
	<i>wooden planks = 3</i>
	<i>concrete = 4</i>
	<i>tiles = 5</i>
	<i>Other = 88</i>
HQ3	What fuel is used for cooking?
	Firewood = 1
	<i>charcoal = 2</i>
	<i>gas = 3</i>
	<i>other = 88</i>
HQ4	Has the house been provided by the government to a military family?
	<i>No = 0</i>
	<i>Yes = 1</i>

	Source of income
INC1	What is the main source of income of your household throughout the year?
	<i>sale of agricultural products (crops/ livestock) = 1</i>
	<i>sale of firewood/charcoal or non-food forest products = 2</i>
	<i>Sale of wild foods = 3</i>
	<i>casual labour = 4</i>
	<i>petty trade small business = 5</i>
	<i>employment/salary = 6</i>
	<i>loan = 7</i>
	<i>cash remittance = 8</i>
	<i>none = 0</i>
	<i>Other = 88</i>
	Number of sources of income
INC2	How many different sources of income does your household currently have?
	<i>None = 0</i>
	<i>source = 1</i>
	<i>sources = 2</i>
	<i>3 sources = 3</i>
	<i>More than 3 = 4</i>

Household resilience

Recent shocks to the household

Have your crops been affected in a negative way by the droughts in the last 2 years?

No = 0

Yes = 1

Not relevant = 99

Have your crops been affected in a negative way by floods in the last 2 years?

No = 0
Yes = 1
Not relevant = 99

Have you experienced a reduction in availability of fish and aquatic species from fisheries, lakes and ponds in the last 2 years?

No = 0
Yes = 1
Not relevant = 99

Have you experienced a reduction in availability of foods and animals from the forest in the last 2 years?

No = 0
Yes = 1
Not relevant = 99

Have you experienced a reduction in availability of non-food items from the forest in the last 2 years?

No = 0
Yes = 1
Not relevant = 99

Access to Credit, Savings or Loans

Do you have access to credit, savings or loans?

No = 0
Yes = 1

IV Water Access, Sanitation and Hygiene (WASH)

I would now like to ask some questions about the water access, sanitation and hygiene practices in the household

Household water management

Household water source

What is the main source of drinking water for members of your household at this time of year?

You will need to do an observation of the water source in the observation questionnaire.

- 1 = Groundwater: open well, well/borehole with hand-pump, well/borehole with motorized pump system
- 2 = Protected spring
- 3 = Roof rainwater
- 4 = Water trucking
- 5 = Piped supply
- 6 = Sealed bottled water
- 7 = Surface water such as river, stream, lake, pond

Household water source

For answers 1 - 5, assign letter of water source from water source map:

Water source to be observed during the Observation questionnaire at the end of the household survey

And what is your main source of water in the rainy season?

This water source does not need to be observed

- 1 = Groundwater: open well, well/borehole with hand-pump, well/borehole with motorized pump system
- 2 = Protected spring
- 3 = Roof rainwater
- 4 = Water trucking
- 5 = Piped supply
- 6 = Sealed bottled water
- 7 = Surface water such as river, stream, lake, pond

Method of treating water for drinking

What do you usually do to make the water safer to drink? Probe: "Anything else?" (*record all items mentioned*)

- Boil = 1
- Add bleach/ chlorine = 2
- Strain it through a cloth = 3
- Use water filter (ceramic, sand, composite, etc.) = 4
- Solar disinfection = 5
- Let it stand and settle = 6
- Nothing = 7
- Other = 88
- Don't know =99

Quantity of water per capita per day

What containers do you use to carry water from the water source? *Ask to see the pot if possible.*

What is the capacity of the pot in litres?	
How many containers do you collect every day?	
In a normal day:	
How many litres do you and other household members use for drinking?	
How many litres do you and other household members use for food preparation?	
How many litres do you and other household members use for bathing/showering?	
How many litres do you and other household members use for hygiene and sanitation?	
How many litres do you and other household members use for other purposes?	

Household sanitation

"Now I would like to ask some questions about the household's access to sanitation facilities"

Is there a toilet or latrine in the household?

No = 0

Yes = 1

Household latrine

Do you use this toilet or latrine?

No = 0

Yes = 1

Who in this household uses this latrine/ toilet?

Grandparents = 1

Other Adults = 2

Children over 5 years = 3

Children under 5

years = 4 don't know

= 99

Please can I see the latrine?

Mark the type of latrine from the list

Flush toilet = 1

Piped sewer system = 2

Septic tank = 3

Flush/pour flush to pit latrine = 4

Ventilated Improved Pit Latrine = 5

Pit latrine with slab = 6

Composting toilet = 7

Flush/pour flush to elsewhere = 8

Pit latrine without slab = 9

Bucket = 10

Hanging toilet or hanging

latrine = 11

No facilities. Forest, field or

bush = 0

If answer is 1-7 then complete the following observations:	No = 0	Yes = 1
Are the feces well-isolated from the environment? (Leak, crack) *		
Is the outlet safe? (leading to open sewer, river, sea or mangrove) *		
Presence of any anal cleaning item/material (paper, water...)		
Is there a hand washing station inside the latrine or within 10 paces of the latrine?		
Is there a cleansing agent at this hand washing station inside/near the latrine? (YES includes soap, detergent and ash, whereas NO includes mud, sand, none and other)		

No household latrine

Where do you usually relieve yourself?

Flush toilet = 1

Piped sewer system = 2

Septic tank = 3

Flush/pour flush to pit latrine = 4
 Ventilated Improved Pit Latrine = 5
 Pit latrine with slab = 6
 Composting toilet = 7
 Flush/pour flush to elsewhere = 8
 Pit latrine without slab = 9
 Bucket = 10
 Hanging toilet or hanging latrine = 11
 No facilities. Forest, field or bush = 0

If answer 1 to 7, ask where the latrine is and make a note of the location. After the questions are complete you will need to go to the latrine to do an observation as part of the observation survey

Household Hygiene Practices

Now I would like to ask some questions about hygiene practices

Do you have any soap in your household?

No = 0

Yes = 1

Did you use soap today or yesterday?

No = 0

Yes = 1

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!
 (Ask to be specific, encourage "what else" until nothing further is mentioned and check all that applies)

	Quoted = 1	Not quoted = 0
After defecation		
After cleaning babies' bottom		
Before food preparation		
Before eating		
Before feeding children (including breastfeeding)		
Other		

V. CAREGIVER QUESTIONNAIRE

Questions for the mother of the child under 5-years

Did you eat more/less/same amount as usual during your most recent pregnancy and period of breastfeeding?

more = 1

the same = 2

less = 3

Questions for the caregiver of the child under 5-years

Ask these questions directly to the mother or the secondary caregiver

Age of first birth

How old were you when you gave birth for the first time? (age in years)

Recent Pregnancy

Now I would like to ask you some questions about your most recent pregnancy.

Ask these questions directly to the mother or the secondary caregiver

Where did you go for your last delivery?

Hospital = 1

Health center = 2

Home = 3

Private facility = 4

Other = 88

Who assisted with the delivery of your last child?

Probe for the type of person assisting and mark all answers given.

Ask "Anyone else?"

	Not quoted = 0	Quoted = 1
Health professional. This includes: doctor, nurse, midwife = 1		
Other health person. This includes traditional birth attendant, community health staff = 2		
Friend/relative = 3		
No one = 4		
Other = 88		

Ante-natal care (ANC)

Did you see someone for Antenatal care) for your last pregnancy?

No = 0

Yes = 1

If yes, "Whom did you see?" Probe for the type of person seen and mark all answers given. "Anyone else?"

	Not quoted = 0	Quoted = 1
Health professional. This includes: doctor, nurse, midwife = 1		
Other health person. This includes traditional birth attendant, community health staff = 2		
No one = 3		
Other = 88		

How many times did you see someone for Antenatal care? ____

Did you take some time to rest after your most recent delivery?

No = 0

Yes = 1

If yes, how many days? ____

Education

What is your highest level of schooling?

None = 0

Some primary = 1

Completed primary = 2

Some secondary = 3

Completed Secondary = 4

More than secondary = 5

Migration within the last 12 months

Have you migrated in the last 12 months? (*use a events calendar to clarify the last 12 months*)

No = 0

Yes = 1

When you left the village for work, did you take your child with you?

No = 0

Yes = 1

Who was the main carer for your young children while you were away?

Grandmother = 1

Grandfather = 2

Father = 3

Sibling younger than 12 years = 4

Sibling 12 years or older = 5

Other family member = 6

Other = 88

Do you feel supported?

No at all = 0

Not very = 1

Somewhat = 2

Extremely = 3

WH05

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks.

Notice that higher numbers mean better well-being.

	<i>At no time = 1</i>	<i>Some of the time = 2</i>	<i>Less than half of the time = 3</i>	<i>Most of the time = 4</i>	<i>All of the time = 5</i>
I have felt cheerful and in good spirits					
I have felt calm and relaxed					
I have felt active and					

vigorous					
I woke up feeling fresh and rested					
My daily life has been filled with things that interest me					

VI CHILD QUESTIONNAIRE

Date of birth of child (yyyy-mm-dd): ____/____/____

If day of month unknown, put 15th

Prioritisation for sources for obtaining age of children: 1) ANC card, birth certificate, Child health card.

2) Family Book 3) Event Calendar.

Age of child in months: ____

Calculate immediately in months, if the birth date is known.

Otherwise use the event calendar to define the age.

What is the sex of the child?

male = 0

female = 1

How many children are there in the household aged under 6 months old? ____

How many children are there in the household aged under 6-23 months old? ____

How many children are there in the household aged under 24-59 months old? ____

A. Children from 0 - 23 months

I would firstly like to ask some questions about your child aged 0-23 months

Begin with the youngest child

Child ID given at the beginning of the questionnaire: _

Youngest child = 1

Breastfeeding practices

Has (NAME of child) ever been breastfed at any time during their life?

No = 0

Yes = 1

Breastfed children

Did you breastfed this child yesterday?

No = 0

Yes = 1

How long after birth did you first put (name) to the breast?

Immediately = 0

Within 1 hour = 1

Between 1-23 hours = 2

Equal or more than 1 day = 3

Don't remember = 99

Do you feed your baby any types of liquids with a bottle?

No = 0

Yes = 1

Bottle feeding

Which liquids do you normally feed your baby in a bottle?

water =1

breastmilk =2

infant formula = 3

other milk = 4

Juice = 5

tea = 6

watery porridge = 7

Other = 88

Do you use soap to wash the baby bottle?

No = 0

Yes = 1

Complementary feeding practices

Liquids consumed yesterday

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.....

Read each item aloud and record response

Mark all that apply

	No = 0	Yes = 1	Don't know = 99
Plain water?			
Infant formula such as France Bebe, Dumex, Fabimilk?			
Milk such as tinned, powdered, or tetrapack milk?			
Juice or juice drinks?			
Clear broth like soup?			
Watery porridge?			
Any other liquids such as sweetened, flavored water or tea or infusion?			
Any other liquids?			

Infant Dietary Diversity Score (IDDS)

Please think about when {name} ate yesterday from the time he/she woke up yesterday morning, till the time he/she woke up today, at home or outside.

When they woke up yesterday. Did {name} eat anything when they woke up?

IF YES: Tell me everything {name} ate at that time.

What did {name} do after that? Did they eat something at that time?

IF YES: What did {name} eat at that time?

Anything else?

Continue till the person answers “nothing else”. Repeat the question up until this morning when they woke up.

If the participants answer a mix dishes, ask: “what were the ingredient of this dish?” Tick all the food category related to the mix dishes.

Each time one is telling what the child ate, tick “yes” in the food category

	No = 0	Yes = 1
Rice, bread, noodles, corn flour, or other foods made from grains/cereals		
Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside		
White potatoes, white yams, elephant foot yam, cassava, taro, or any other foods made from roots		
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		
Ripe mangoes, ripe papayas		
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		
Liver, kidney, heart, or other organ meats		
Any meat, such as beef, pork/wild pig, deer, chicken, mice, rats, rabbits, ducks, any kind of frog		
Eggs from any kind of bird		
Fresh or dried fish, shellfish, smoke fish, fermented fish, sour fermented fish, fish paste, seafood or crab, snails		
Any foods made from beans, red beans, black beans, mungbean, bean sprouts, any kinds of peas, nuts, or seeds, like lotus seeds		
Yogurt or other milk products, like RED COW milk or AD sour milk		
Any oil, fats, or butter, or foods made with any of these		
Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits, soda, bubble tea, condensed milk, sugar cane, palm sugar, any kinds of crisps and chips, sweet milk/lactasoy		
Condiments for flavor, such as chilies, pepper, ginger, spices, herbs, or fish powder, fish sauce, soy sauce, sugar added powder, fish sauce, soy sauce, sugar added in lit-tle amounts, salt, seasoning, lemongrass, tamarind leaves, kaffir lime leaves,		

krasang added only for sour taste		
Insects (flying termites, grasshoppers, crickets, fragrant water insects, black water insects, wood worn, mole cricket, tarantula)		

Meal frequency

How many times did (name) eat solid, semi-solid or soft foods other than liquids yesterday during the day or night?

This includes any snacks

Responsive feeding

Does anyone help (name) to eat?

No = 0

Yes = 1

What do you do when (name) refuses to eat?

Categorize answer into the positive, negative or no reaction

Nothing = 0

Other good practice (coax, play with him, change food) = 1

Force (negative attitude) = 2

Child sanitation practices

The last time (name) passed stool, where did he/she defecate?

Used a potty = 0

Used washable diaper = 1

Used disposable diaper = 2

Went in his/her clothes = 3

Went in house compound = 4

Went outside the premises (i.e. in woods) = 5

Used own latrine = 6

Used a public latrine = 7

Other = 88

If answer is 1-5 or 88:

The last time (name) passed a stool. Where were his/her faeces disposed of?

Dropped into toilet facility/latrine = 0

Buried = 1

Solid waste/trash = 2

In yard = 3

Outside premises = 4

Public latrine = 5

Into sink or tub = 6

Thrown into waterway/river = 7 In the well = 8 thrown elsewhere = 9

Other = 88

B. Health of children under 5 years

Now I would now like to ask some questions about the health of all children under 5 years in the household, starting with the youngest

Complete for all children under 5 years, starting with the youngest

Child ID given at the beginning of the questionnaire: ___

Youngest child = 1

Has (name) had an illness with a cough (trouble breathing or breathe faster than usual with short, quick breaths) in the past two weeks?

No = 0

Yes = 1

Has (name) had diarrhoea (more than 3 loose or watery stools in a 24-hour period) in the last two weeks? No = 0

No = 0

Yes = 1

What did you do last time they had diarrhoea? Where did you first seek advice or treatment?

Did nothing/ wait = 0

Self-medication shop/ kiosk = 1

Local Herbs = 2

Community health worker = 3

Traditional healers = 4

Public clinic = 5

Private clinic or pharmacy = 6

Nothing = 0

Other = 88

Has (name) had a fever in the past 14 days?

No = 0

Yes = 1

What did you do last time they had fever? Where did you first seek advice or treatment?

Did nothing/ wait = 0

Self-medication shop/ kiosk = 1

Local Herbs = 2

Community health worker = 3

Traditional healers = 4

Public clinic = 5

Private clinic or pharmacy = 6

Nothing = 0

Other = 88

Does (name) have an immunization card?

No = 0

Yes = 1

Check the immunization card. Has (name) received DTP3 immunization?

No = 0

Yes = 1

Has (name) received any deworming medication in the past 12 months?

No = 0

Yes = 1

May I see where the selected child sleeps? Does the sleeping place of (name) have a mosquito net?

No = 0

Yes = 1

What are your main barriers from going to the health centre when someone is sick? *Select all that apply*

No challenge = 0

Money/cost = 1

Time = 2

Transportation means = 3

Geographical distance = 4

Decision power = 5

The service is not good enough = 6

Other = 88

C. Anthropometry measurements

I would now like to take some measurements of all children aged 6-59 months old

Begin with the easiest child

Child ID given at the beginning of the questionnaire: __

Youngest child = 1

What is the sex of the child?

male = 0

female = 1

Weight in kilograms, record to the nearest 0.1 kilograms (100 grams): ____ kg

Height/Length in centimetres, record to the nearest 0.1 cm: ____ cm

Does the child have Oedema?

No = 0

Yes = 1

MUAC in centimetres, record to the nearest 0.1cm: ____ cm

Refer all SAM children MUAC <11.5cm, or a WHZ <-3.0, or with Oedema to the nearest health centre site.

Are you referring the child to the health centre?

If yes, contact your team supervisor to refer the child

No = 0

Yes = 1

MUAC measurement for females aged 15-49 years

How many females are there in the household aged 15-49 years? __

Please measure the MUAC of all females in the household who are aged 15-49 years using the adult's MUAC tape

How old is the female in years? __

Is the female currently pregnant?

No = 0

Yes = 1

MUAC in centimetres, record to the nearest 0.1cm: _____

VII. OBSERVATIONS QUESTIONNAIRE

To be filled at the end of the questionnaire

Child observations

Caregiver-child interaction observation:

	Yes	No
Caregiver tends to keep the child within visual range and looks at the child quite often	0	1
Caregiver talks to the child during the course of the visit	0	1
Caregiver interacts with child to promote development and learning	0	1
Caregiver smiles at the child, laughs with the child, caresses, kisses or hugs the child	0	1
Caregiver spanked or hit the child during the visit, or shouted or yelled at him/her	1	0

Regarding (name), how clean are they?

Clean = 0

= 1

Very dirty = 2

Household observations

Water management Observation

	Yes	No
Is the container used to carry water left uncovered during transportation?	1	0
Is the container used to carry water dirty?	1	0
Is the water storage left open/uncovered?	1	0
Is there a water cleaning system visible (filter, boiling container, chlorine tablets...)?	0	1
While serving water to drink, is there a risk of water contamination? (do the fingers touch the water? Or is the scooping container used dirty?)	1	0

Water Source observation

1. Groundwater sanitary inspection form	No	Yes
Is there a latrine or any source of pollution within 30 m of the well?	0	1
Does the fence around the well allow animals in? <u>If there is no fence, answer is yes</u>	0	1
Is the drainage channel less than 2 m long, broken or dirty?	0	1
Is there stagnant water close to the well?	0	1
Is the apron less than 1 m wide all around the well?	0	1
Are there any cracks in the well apron and headwall?	0	1
Is the cover of the well unsanitary and closed?	0	1
Is the well poorly sealed for 3 m below ground level?	0	1
Is the water point dirty?	0	1
Is the lift system in a bad condition / are ropes and buckets dirty? <u>If it is a borehole, then no</u>	0	1

2. Protected spring sanitary inspection form	No	Yes
Is there a latrine or any source of contamination within 30m uphill of the spring?	0	1
Does the fence around the spring allow animals in?	0	1

Is the drainage channel blocking the flow and allowing stagnant water?	0	1
Is the spring open to surface water contamination?	0	1
Is the spring box cracked?	0	1
Is the inspection cover cracked or unsanitary?	0	1
Is the cut-off ditch above the spring blocked or non-existent?	0	1
Is the water point dirty?	0	1
Is there standing water at the collection point?	0	1
Is the gutter disposed upstream of the site is missing or improperly maintained?	0	1

3. Roof rainwater harvesting sanitary inspection form	No	Yes
Is the roof area dirty?	0	1
Are the gutters that collect water dirty?	0	1
Is there absence of a filter box at the tank inlet or is it not working well?	0	1
Is there any other point of entry to the tank that is not properly covered?	0	1
Are there cracks in the wall of the tank?	0	1
Is the inside of the tank dirty or not periodically cleaned and disinfected?	0	1
Are the taps leaking?	0	1
Is the concrete apron near the tank absent or broken or dirty?	0	1
Is the drainage in bad condition and the water inadequately drained?	0	1
Is there any source of contamination around the tank or water collection area?	0	1

4. Water trucking sanitary inspection form	No	Yes
Is the water point where the truck collects the water unsanitary?	0	1
Is there no, or inadequate, chlorination of the water during the trucking process?	0	1
Is the pipe used to fill and empty the water in the truck unsanitary or dirty?	0	1
Is the tanker ever used for transporting other liquids besides drinking water?	0	1
In the filler hole of the truck unsanitary or is the lid missing?	0	1
Are any parts of the system (water tank of the truck, storage tank in the community, distribution point) not periodically cleaned and disinfected?	0	1
Is the storage tank / distribution point unsanitary and dirty?	0	1
Is there no chlorination of the water at the storage tank / distribution point?	0	1
Is the storage tank at the distribution point badly covered?	0	1
Is there stagnant water around the water tank / distribution point?	0	1

5. Piped supply sanitary inspection form	No	Yes
Is the source badly protected, or not protected?	0	1
Is there any point of leakage between the source and the reservoir?	0	1
If break-pressure tanks, are they covers unsanitary? (If no break-pressure tanks, answer is no)	0	1
Is the storage tank cracked or leaking and the inspection cover or the air vent unsanitary?	0	1
Is the storage tank dirty or not regularly cleaned?	0	1
Are there any leaks in the distribution lines of the system?	0	1
Are the areas around the taps unfenced or allowing access to animals?	0	1
Is there inadequate drainage and standing water around the taps?	0	1
Are the surroundings of the taps dirty and with possible contamination source (excreta, refuse, etc.)?	0	1
Is the water not chlorinated?	0	1

Sanitation facilities observation

Individual sanitation Observation	Yes	No
Are the faeces well isolated from the environment? (Leak, crack) *	1	0
Is the outlet safe? (Leading to open sewer, river, sea water...) *	1	0
Presence of any anal cleaning item/material (paper, water...)	1	0
Is there a hand washing station inside the latrine or within 10 paces of the latrine?	1	0
Is there a cleansing agent at this hand washing station inside/near the latrine? <u>Yes includes soap, detergent and ash, whereas no include mud, sand and other</u>	1	0
Presence of flies or other insects entering or exiting the pit	1	0
Presence of excreta on the ground or around the pit or seat	1	0

Annex G: Qualitative discussion guides

KEY PEOPLE	
CHARACTERISING MALNUTRITION	
Perception of malnutrition	1. Have you heard of "malnutrition" or "undernutrition"? What does this mean for you?
	2. Is malnutrition thought of as a disease? A contagious disease? How do people tell the difference between malnutrition and other illness?
	3. How do you tell a child that is growing and developing normally from one that is not? Have you seen any children not growing normally? Can you describe what they looked like?
	4. <u>If understand malnutrition</u> , do know different form of under nutrition? <u>If yes</u> , what are they? Is malnutrition a problem in your village? <u>If yes</u> , do the community recognize it as a problem?
	5. What is believed to cause malnutrition? Do you think some behaviors or practices can cause malnutrition?
	6. Are all the children/mothers malnourished? <u>If no</u> , how do some manage to be healthy?
	7. Who can be affected by malnutrition? Do you think that mothers can be affected by malnutrition? <u>If no</u> , why not? <u>If yes</u> , which kind of mothers? Age? What might be the effect on a pregnant woman?
Families	8. At what age do people get married? And at what age would a woman have her first baby? How many children do most families have? Is it better to have more or fewer children? Why?
	9. Who is mainly making decision within the household? Do women make decisions for themselves on their own? Do women have access to the same resources as men? (water, food, money)
	10. In some families fights can happen for different reasons. Do you think there is a lot of family fight in the village? According to you what can be the reasons? (<i>Probe money and family income management, household work, alcoholism, etc</i>) How would you describe this fight? Is it violent? What is the reaction of other people if the fight gets violent? Is it happening often?
FOOD SECURITY AND LIVELIHOODS (FSL)	
FSL	1. What is your definition of food security? Why might people not have enough to eat?
	2. What are the livelihoods in your village? Does everyone work? Who doesn't?

	3.	Is it easy to go to the market? What can you buy from the market? Are people coming from outside the village to sell food? <u>If yes</u> , what kind of food?
	4.	Is there any other shop in the village? What does it sell? Is it more expensive than the market? Can everyone afford to buy food from the shop?
	5.	How do people get their food? Fish? What? Where? Accessible to everyone? Hunt? What? Where? Accessible to everyone? Land/ vegetable gardens, do people have enough for their family? Forest? What? Accessible to everyone? Trade food? What? At the market? Who do they trade with?
	6.	Do people have livestock? <u>If yes</u> , which animals? Poultry? Who doesn't? What are animals used for? What's consumed and what's sold? Where do people keep livestock? Poultry?
	7.	Do families migrate? Who? Why? When? Is the entire household migrating? Do you know where they live? <u>If yes</u> , can they find food easily?
	8.	Who usually prepares the food for the family? Who is buying the food? Who is deciding what to cook?
	9.	Do families eat together or is there any kind of order? <u>If yes</u> , who eats first? And last? Do you think there is any difference between how much food is given to boys compared to girls?
	10.	What kind of food are young children eating? Does anyone give advice on children's diets? Are children eating the same food all year?
Shocks	11.	Has your village experienced any floods, droughts, or strong winds in the last few years? How does the community cope during this time? What is the effect of this?
	12.	Did you notice a change on the climate in the past years? What has changed? What effect has this had on the village?
	13.	Are there any DRR programmes in your village? Who are these organized by?
WASH AND HEALTH		
WASH	1.	What are the main problems to do with water in your village? Do you have access to water all the time? Where do people usually collect water from? And how is it stored at the household?
	2.	How far are the water sources (rainy/ dry season)? Who is responsible for their management? Do communities use different sources for livestock and domestic water?
	3.	Can you drink directly the water collected? <u>If no</u> , do you need to treat it? How do people treat their drinking water?
	4.	What are the main issues regarding sanitation in your villages? If people need to go to the toilet, is it easy for them? Where do they go? And small children? Why do people not have latrines?

		If OD, what is the effect of this behaviour on the community? Who is responsible for the construction/ management of latrines?
	5.	What do people use to wash their hands? When do people wash their hands? Does anyone give advice on this?
	6.	Where do you put your garbage/waste? What happens to it? And liquid waste?
Health	7.	How do you recognise a healthy child?
	8.	If a child is sick, what does the family do first? Where do they go? Who takes care of the sick child? What does the family do if the sick child doesn't get better?
	9.	Do some children get sick because of bad spirits? If yes, what do you do?
	10.	Are some traditional treatments available at the village? What kind? Who gives advice to use this kind of treatments?
	11.	Is immunization done at the health center? Is it a good or a bad thing?
	12.	Is there a difference between frequency of disease for girls compared to boys? Why girls/boys get more sick?

NUTRITION

MOTHER		
1.		Have you heard of "undernutrition"? What does this mean to you? (<i>identify specific terms and expressions and their meanings</i>) If yes, do you know different types of undernutrition? If yes, can you tell me about them?
2.		How do you tell that a child that is growing and developing normally? And how do you tell when they are not? Are all the children you know growing equally? Girls and boys?
3.		How do you know when a child has undernutrition? What do they look like? Are there any other signs? How do you tell the difference between a child that has undernutrition and one that does not? Do some children with undernutrition look different to other child with undernutrition? If having problems to identify use TOOL: Picture of SAM, Kwash, stunting and healthy
4.		What are some reasons why an infant may not grow or develop normally? (<i>Probe for references to malnutrition</i>) What can cause undernutrition? Do you think that some behaviours or practices can cause undernutrition
5.		Do you think that undernutrition/not growing normally has any effects on a child? Do you think this is a long term effect? Where do you learn this information?
6.		Can adults have undernutrition? If a pregnant woman had undernutrition, what do you think could be the effects on them and their child?
7.		Is undernutrition a type of illness or disease?

8.	What would you do if your child had undernutrition? If medicines or foods were not helping, what would you do?
9.	Is undernutrition a problem in your community? Do you see undernutrition as a disease?
10.	What can you do to stop an infant from having undernutrition?
11.	In some communities, you will find children or mothers with undernutrition and others who are healthy. What do you think the healthy people do differently?

Fathers:

Q1, 3, 4, 5, 6

Health Workers:

Variation of Q1, 3, 4, 7, 8 plus:

“Is undernutrition recognized as a problem in the community?”

HEALTH

MOTHER	
1.	How do you know when a child is not well? What are some of the challenges in keeping your child healthy? Do you have anyone supporting you? Anyone to ask for advice?
2.	How do you know when a child is healthy? What are some positive practices that are in your community that help a child and mother to be healthy?
3.	What are the most common child illnesses in the village? Is it different for a boy and a girl?
4.	For each disease mentioned, what is the cause? How do you prevent this illness? How would you usually treat the illness? Where did you get this advice? Is there a time of year when your child is more likely to get this illness (<i>Seasonal calendar</i>)? If not the HC, what do you do if the child isn't getting better?
5.	Are you familiar with parasitic worms? Who can suffer from these? How do they get the worms? How can you prevent them? How do you treat them? Do you think anyone should not take this medication?
6.	If your child gets sick a lot, do you think there are any long term effects? What are these? Where did you hear this information?
7.	Is there illness (or diseases) that are better treated by traditional healers or herbal medicines? If yes, why? What are the symptoms? And causes? Are the herbs available all year? If the child is not getting better with this treatment, what would you do? Are there any illnesses caused by bad spirits?

8.	What is your opinion of immunisations? Would you take your child to get immunisations? Why/why not? Do you get information about immunisations for your children? Where from?
9.	If not already asked in discussion about dengue or malaria, Do you have mosquito bed-nets at home? <u>If yes</u> , do you use them? For everyone? Is anyone prioritized? <u>If no</u> , why don't you have one in your household? Do you use any other methods to protect against mosquitos? How do you know if your child has malaria? And dengue? And what do you do?

Grandmothers:

Q1-4, 7 plus

“In the past, were these illnesses treated differently? If yes, how so? Why did it change?”

Health workers:

Variation of Q2, 5, 7, 8 plus:

“If a child is sick, what does the family do first? Where do they go? Who takes care of the sick child? What does the family do if the sick child doesn't get better?”

“Is there a difference between frequency of disease for girls compared to boys? Why do girls/boys get more frequently?”

MATERNAL HEALTH

HEALTH WORKERS	
1.	How many babies are born at low weight? Has this changed over time?
2.	What are the most common illnesses for young children? Does this change throughout the year? Has it changed over time?
3.	And for adults? Has this changed over time?
4.	What is the most common reason for seeking advice/ treatment?
5.	Do you always have the needed treatment in supply at the health center? What do you do if you don't have the treatment? (HC only)
6.	How many pregnant mothers attend PNC? And ANC after delivery? What services do you deliver at PNC? And ANC?
7.	Do pregnancies/deliveries occur at certain times of the year?
8.	What happens at ante-natal checks? What happens during a prenatal check? (HIV test? Iron-folate supplementation >90 days? Counselling?)

9.	Is HIV/ AIDS a problem in this community? What are the methods for prevention? What are the risky behaviours?
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IYCF

MOTHERS	
1.	Remember when your baby was just born? What was the first thing they were fed? When exactly? Why this? If not given breastmilk within the first hour, what did you give them? For how long? Why? Who gave you this advice? (<i>Probe honey and water/ pre-lactal feeding</i>)
2.	Did you have any problems breastfeeding your child? Did you ask anyone for advice? Who? Were they able to help?
3.	TOOL: photos of foods (veg, meat, fruit, condensed milk, other milks, water, breastmilk etc) What foods did your child have when they were younger than 6 months? Anything which is not shown here? If items that aren't breastmilk - did anyone give you advice on this?
4.	When did you give them different food from breastmilk for the first time? What? Why did you give food at this age? Why did you give this food? Did anyone give you advice? How often each day did you give them food other than breastmilk at first?
5.	At what age did you change the quantity of the food that your child is eating? How did you change this – did you give different foods, more of the same, more rice or something else?
6.	Have you used a bottle to feed your baby? <u>If yes</u> , what did you feed them? Why? <u>If infant formula</u> , why did you decide to use infant formula? Where did you first get this from?
7.	What age did you/will you stop breastfeeding your child? For those of you who have stopped breastfeeding, why did you stop breastfeeding? Was this earlier than you had planned? (<i>probe working, problems with breastfeeding, preference</i>)
8.	Who normally prepares the food for the child? Do they cook a special meal for your baby? Why/Why not? What type of meal?
9.	Who feeds the child? <u>If the mother</u> , if your child doesn't want to eat the food, what do you do? Do you give something else? What? At what age is a child able to eat without an adult?
10.	TOOL: photos of common foods for children <ul style="list-style-type: none"> • Which of these foods do you give to your child? • Which of these foods would you like to give to your child, but they are too expensive • Which of these foods are bad for your child?

11.	What would you say is a good diet for young children? Why? Where do you get this advice? What is the perception of a 'diverse diet'? Have you heard of food groups? Can you tell me some?
12.	Are you facing any constraints in giving your child a healthy diet?

Grandmothers:

Q1, 4, 6, 8, 9, 11, 12

Health Workers:

Variation of Q1, 11, plus:

“Who is mainly taking care of the children? Do fathers take care of young children? Grandmothers? Older siblings?”

“What kind of help/ support does a mother get when she gives birth?”

“Do you think mothers have a lot of work? Why do some mothers work but others don't? How soon after giving birth do mothers return to work?”

WATER ACCESS

MOTHERS	
1.	What are your sources of water in this community? Does this change with the season? (<i>Seasonal calendar</i>) Do you experience any difficulties accessing water?
2.	Do you use the same source of water for drinking/animals/agriculture/hygiene?
3.	Does everyone have the same access to water in quality and quantity? <u>If no</u> , why not?
4.	Who is responsible for water management? Are there any problems with water management? Are women involved in water management groups?
5.	Who is responsible for collecting water for your household? How many times a day does the household collect water? And how much water would you collect at a time? What do you use to transport it back to the household?
6.	How much time per day do you need to collect water? Does it change with the season/ source of water? Is there a queue and if so, how long do you wait? <u>If the mother</u> , where are your young children, while you collect water?
7.	How do you store water at your household? Is different water stored in different ways? (<i>Open jar, close jar, open bucket, close bucket, open container, close container, other (specify)</i>)

	How do you access the water from the storage container in the home?
8.	Would you say the water you collect is safe? How do you know? What makes water unsafe? Do you treat your water before drinking? Do you treat your water all year? <u>Any answer,</u> what happens if you drink unsafe water?
9.	Do animals roam near the water source? Do people go to the toilet near to the water source? Do you think there is any problem with this?

Grandmothers and fathers:

Q8

SANITATION AND HYGIENE

MOTHERS	
Sanitation	1. Where do you go to the toilet? (<i>probe defecation and urination</i>) Is this the same for men and women? And for adults and children? <u>If not for children,</u> What do you do with young children's faeces? And urine? Why? At what age do children start to use the same sanitation facilities as adults? Is this the same all year round? (<i>Seasonal calendar</i>)
	2. Why do you go to the toilet here? <u>If not a latrine,</u> why do you not use a latrine? Do you think it is better to have latrines? Why?
	3. Do you take water with you? What do you do after you relieved yourself? (<i>cleaning with water? Other? Hand washing?</i>)
	4. Some of you own animals, do your animals go inside the house? Do they go to the toilet inside the house? What do you do with their feces?
	5. What do you do with your household waste? And liquid waste?
Hygiene	6. What would you define as good hygiene practices for a child? And bad practices?
	7. What happens if you do not practice good hygiene?
	8. What difficulties do you have in keeping good hygiene practices?
	9. Who prepares the food in the household? How many times a day do they cook? At what time of the day do you eat food? How and where do you store the cooked food?

Grandmothers:

Q1, 3, 5-7

Fathers:

Q1, plus

“Do you wash your hands on a normal day? What would you wash them with?”

MATERNAL CARE AND WOMEN’S ROLES

MOTHERS	
Maternal care practices	1. How do you know when a pregnant woman is not well? How can you tell if she is not healthy/malnourished?
	2. Are there special foods pregnant women should eat or avoid? Does the quantity of food eaten change during pregnancy? And how about when you are breastfeeding? Why?
	3. Where did you deliver your babies? Why did you decide to deliver your baby here? Were you given any advice? Did anyone influence your decision?
	4. Are there any traditional practices women do during pregnancy, delivery or after delivery? Have these changed over time?
	5. During pregnancy, how often do you get a medical consultation? Why is it important? What are the reasons women don't go for medical consultation when they are pregnant?
	6. Who decides when to have a child? What age should a girl get pregnant for the first time? Why? Where do you get this advice?
	7. TOOL: activity and responsibility calendar (draw with chalk?) How are responsibilities and activities shared in the household on a typical day for:
	Young children (under 10 years) From what age are they given responsibilities? Seasonal?
	Older children (10+ years) Childcare? Do they go to school? Seasonal? Food for younger children? Water collection?
	Grandparents Childcare? How much? Seasonal? Cooking?
Women How much time do you get to spend with your children? Free time? Cooking?	
Men Support for childcare? Any household tasks? What hours do they work – just one job?	
8. How would you describe the workload of women in your community? When you were pregnant, did you have the same workload?	

	9.	If you had some free time where you didn't have any work to do, what would you choose to do? (<i>rest, take more care of children, etc</i>)
	10.	Who is making most decisions in your household? Do you feel free to take your own decisions? <u>If yes</u> , do you feel supported? By who? <u>If no</u> , why not?
	11.	Sometimes there are arguments between and husband and wife. How much is this happening in your community? What do people usually argue about? How do you feel about this?

Fathers:

“What role do you play in the care of your children? (*probe provision of what types of foods?*)”

“How would you describe the workload of women/men (at home/on the field)? Do you think you have too much work to do? What about your wife?”

FOOD ACCESS AND AVAILABILITY

MOTHERS		
Food sources	1.	How do you normally get food? Through own production, purchase, fishing, gathering/wild food, hunting etc? (<i>Probe for all food type: meat, fish, vegetable, pulses, roots and tubers, wild foods</i>) All the year? (<i>seasonal calendar</i>) Has this changed with time? (<i>historical calendar</i>) Do you sell any of these products?
	2.	During a normal year, is access to food affected by the season? <u>If yes</u> , how and why? When are there usually shortages of food? (<i>seasonal calendar</i>) Has this changed over time?
	3.	Is meat accessible for you? How about fish? Has this changed with time? What are the barriers to accessing meat and fish? How many times a week would you usually have fish? And meat?
	4.	Do you store or preserve any food after harvest ? <u>If yes</u> , how so ? How long does this last ? <u>If no</u> , why not? Do you know how to? Do you try and preserve any other foods for a long time? What foods? How? What challenges do you face in trying to preserve foods?
Food markets	5.	Do you have markets in your village? <u>If yes</u> , are markets functioning well all year round? (<i>probe insufficient rice? increase in prices? food insecurity?</i>) How often do you go to the market each week ? Are there any foods that are sometimes not available? Is there any time where there is not enough food at the market ?
	6.	Do you think it's easy to buy food? <u>If no</u> , why not? (accessibility)

7.	What do you usually buy from the market? Are there price fluctuations? When? Why? (<i>rainfall failure/seasonality of crops/livestock trade</i>) At what time of the year are the market prices at the highest? When it is most difficult to find food? (<i>Seasonal calendar</i>)
8.	Do you sell anything in the market? What do you sell? Are there any difficulties selling these items? Any price fluctuations? When? Explain fluctuation for each item you sell?
9.	Except this market, do you go anywhere else to buy or sell food (livestock or cash crops)? Why/why not? Linkages between markets?
10.	Are there traders from far destinations on the market, buying your products? <u>If yes</u> , which products? Where do traders come from?

LIVELIHOODS AND FARMING

MOTHERS		
Livelihoods	1.	Could you list the main livelihoods in your community? Are there different livelihoods depending on the time of year? (<i>Seasonal calendar</i>)
	2.	Have livelihoods changed over time? Why? (<i>Probe due to ELC and deforestation? Conflict? New villages? More migration</i>) (<i>historical calendar</i>) What's the effect of this on the community?
	3.	Are family members migrating to other areas for work? Who? When? Why? What are the consequences for the household?
Farming and crops	4.	Do you have land for farming? It is big enough for you? Are there any problems accessing land for farming or grazing animals? Is there any land conflict currently?
	5.	Do you have any problems with the land you have? Do your crops grow easily? <u>If no</u> , why not? Soil fertility? Crop diseases? Productivity? Have any of these factors changed over time? (<i>historical calendar</i>) When in the year do diseases occur? (<i>seasonal calendar</i>)
	6.	Have you experience any crop diseases? When was this? What were the symptoms? What did you do to protect or fix your crop? Where can you get advice on this?
	7.	What do you grow? Have you tried to grow anything else? What happened/ Why not?
	8.	Do you keep the products or do you sell them? What do you eat? What do you sell? When do you sell?
	9.	What months do you work on your land? And when do you harvest? (<i>seasonal calendar</i>) What months do you get more crops? (<i>seasonal calendar</i>)

- 10.** Do you have a garden at your home? If yes, which months do you grow? What do you grow here?
Do you have any problems growing crops in your gardens? Does anyone give advice on homegardens?
If yes, do you consume or sell products from your home garden?

Fathers:

Q4-9, plus

“What are the main problems for farming? What inputs are necessary for good production?

Do you use fertilizer? Pesticides? Seed?

Where do you get them? Are they always available? Why not? What do you do if they are not?”

LIVESTOCK

FATHERS	
1.	Do you have any livestock? If yes, what kind?
2.	Do you produce any products from your livestock e.g. eggs or milk? Do you keep their products or do you sell them (eggs, milk...)? When are you selling them? <i>(access/ utilization of meat and animal product - poultry, eggs, milk)</i>
3.	Do you vaccinate your livestock fully? Why/why not?
4.	Do your livestock get sick? Is it happening often? Seasonal? <i>(seasonal calendar)</i> What do you do when they get sick? Do some of them die from diseases? Often? What diseases? <i>(Characterise livestock disease/ locals responses)</i>
5.	How far are the water point and the pasture for your livestock? <i>(in rainy season/ dry)</i> Do you pay for this water?
6.	What are the main difficulties you have with your livestock? What inputs do you need for good production?
7.	What are the current prices of livestock and livestock product? Any changes in prices over time? How so? Do you know why ?

EXPENDITURE AND RESILIENCE

MOTHERS		
Income and Expenditure	Resilience	1. Are you facing any problems with droughts, floods, or poor rains? When? (<i>historical calendar</i>) During what season does this normally happen? (<i>Seasonal calendar</i>)
		2. What impact does this have on your livelihoods? And on your access to food? And on your access to clean water?
		3. How do you cope with these effects? (<i>Probe for coping mechanisms e.g. loans, credit, eating less, using dirty water, irrigation techniques</i>)
		4. If you don't have enough cash, what do you do if you need extra money? (<i>Who? How much? Length of loan? Has this happened often to you?</i>) If take loans, do you ever have problems with repaying the loan? What happens if you do?
		5. What do you do to cope when the food prices increase?
		6. If there is not enough food in the household, how does this affect your household meals? What do you change? (<i>meat? fish? more wild foods?</i>) If there is not much food in the household, who would be prioritized for different types of foods? (<i>Probe animal source, fish, eggs, veg</i>)
		7. What months do you sell your farming products? How long does this income last normally? (<i>seasonal calendar</i>)
		8. Have you experienced any changes in income in the last few years? Why? What effect does this have? (<i>historical calendar</i>)
		9. TOOL: Stones on pictures for expenditure patterns – see Guide What do you spend your income on in a normal month? See Expenditure Tool Guide. If you had extra income next month, what would you spend this extra income on?

Fathers:

Q1-4, 7-9, plus

“Do farmers receive any support from the governments of NGOs to sell their goods and services at better prices?”

POSITIVE AND NEGATIVE DEVIANT MOTHERS OF CHILDREN UNDER 2 YEARS

1. How old is your baby and how old are you?

2. Did you plan to be pregnant with this child?
When you discovered you were pregnant, how did you feel?
3. Did you consult anyone for advice or support during your pregnancy? Who? How many times?
What kind of advice did they give you? Did anyone else give you advice?
4. Did you take any special medicine during your pregnancy?
Did you change your food intake?
5. When did you stop working before delivery?
6. Where was your baby delivered? Who helped to deliver them? Why did you chose to deliver at this place?
Did the baby see a doctor when they were born?
7. What was the first thing you gave to your baby to eat or drink? When was this? If not BF, why?
8. If BF, whilst you were breastfeeding, did you give your baby anything else? Water? Other milk? Why?
9. When did you introduce semi solid, or solid foods? Why? Did anyone give you advice on this?
10. What kind of food do you give to your child? (*probe meat, fish, insects, veg, fruit, green veg*)
Do you cook specially for them? Why?
What is the consistency of the food you feed your baby? (*ask to see the food if possible*) Why?
11. How does your household cope during the hunger season? Do you feed your children differently during this time? Cheaper foods? Less frequent?
12. What do you think is a healthy diet for a child? What foods are important for a child?
13. Do you do anything to the water you collect before you give it to your child?
14. Do you feed your child?
If no, who feeds them or do they eat alone? If yes, how do you feed your baby?
What do you do if your baby does not want to eat?
15. How do you know if your child is sick? Has your child been sick? What was wrong with them?
What did you do first? And then?
16. A lot of children seem to suffer from diarrhoea. Is it happening often to your child? Do you know why children get diarrhoea? Do you know how to prevent it? What do you do if your child has diarrhea?
Where do you get advice on this from?
17. Do you have any challenges in going to the health center? If yes, how would you overcome these challenges if you needed/wanted to go?

18. After which activities do you wash your hands? Do you have soap in the house?
And when do you wash your baby? Their hands? And their bodies?
19. How do you dispose of the baby's feces? Why?
20. Do you feel you receive support from anyone to help care for your children? How so?
21. What is your daily schedule? Who is taking care of your child when you are busy or not at home? How do you manage to feed them?
22. Do you ever feel too tired to take care of your child? How do you manage at this time? Do you have time to play with your baby?
23. Sometimes in families there are arguments. Do you and your husband argue? What do you usually argue about? Do these arguments ever get violent?
24. What are the main issues you are facing to raise your child? How are you dealing with these issues?

HISTORICAL TRENDS: VILLAGE ELDERS AND VILLAGE CHIEF

Firstly, try to identify a 'normal' or 'average' year in the last 10 years. Secondly, ask when the village began. And identify any significant events in the last 30 years e.g. conflicts, severe natural disasters.

1. In the past 10 years, what as the main development in your village? *Probe: new road, electricity, water sources, HC, qualified doctors, teachers, qualified teachers, shop in the village, local markets*
2. In the past 10 years, where there any times when it was more difficult to find work? Why?
3. In the past 10 years, do you remember if there were any years when people get more sick than usual? When? Why? Was there any years when more people were dying? Why?

Do you think that illness has increased, decreased or stayed the same over the last 10 years? And death?
4. In the past 10 years, did you notice a period when it was more difficult for your community to access food? What was the reason? (*Probe. Crops, wild foods, fish, veg*)

If not clear: maybe because the market price increase suddenly or because there was a flood or drought?
5. Was there a time when prices at the market increased to a level that you could not afford? When? Why?

6. Have there been any floods, droughts or other disasters in the village in the last 10 years? When? How severe? What were the consequences?
7. When was the first latrine built?
8. Have there been any NGO or government programmes in your village in the last 10 years?
9. Do you think that the workload of women has increased, decreased or stayed the same over the last 10 years? And for men?
10. Have there been any political events in the last 10 years?
11. Do you think that the number of people taking loans and borrowing money has increased, decreased or stayed the same over the last 10 years?
12. Do you think the diets of young children have changed over the last 10 years?
What about the number of mothers who are breastfeeding?
13. Do you think that the number of children with undernutrition (may have to explain the physical appearance) has increased, decreased or stayed the same?
Can you remember any particular periods where there were a lot of children like this?

Annex H: Hypotheses to be field tested

A. High risk for mosquito-borne disease in children under 5 years

Mosquito-borne diseases such as malaria and dengue result in fever, vomiting, and lack of appetite. Stress of the immune system uses up micronutrients and energy and can lead to deterioration in nutritional status. Pregnant women with malaria have an increased risk of delivering a LBW baby. The change in climate has also been linked with increased dengue and malaria. PVH is an area with high risk for malaria and dengue, particularly in forested areas and in the rainy season. MSF are conducting malaria prevention projects in PVH, however they have not been implemented in Choam Ksant district. It appears that most households own mosquito nets, but information on who sleeps under the nets is not available.

B. High prevalence of illness in children under 5 years

Acute infections have been shown to cause growth faltering in children under 5 years, with continual bouts of infection during the first 2-years of life reducing linear growth. Undernutrition also increases the risk of becoming ill, causing a dangerous cyclical relationship. In the last 14 days, diarrhoea was reported in 19% of children in PVH and fever in 32.6%. Deworming medication had been received by 62.2% of CU5 in the last 6-months (DHS 2014). High prevalence of illness in Choam Ksant appears to be in most part, due to poor hygiene and sanitation practices and unhygienic environments with open defecation a common practice.

C. Delivery without skilled professionals

Those who deliver without a skilled professional are less likely to have attended PNC, and are less likely to attend ANC where they should receive skilled advice on IYCF and care practices as well as maternal health and nutrition. These factors increase the risk of low birthweight, poor child growth and poor nutritional status. In the last 5 years 48.8% of live births were at home in PVH, with 54.4% delivered by a skilled provider (DHS 2014). There is a suggestion that grandmothers play a role in this decision making (KII) and additionally, health seeking behavior in general is constrained by cost, distance and time. There is also some discussion around whether skilled advice is being given at ANC/PNC and the capacity of the skilled health professionals in Choam Ksant.

D. Early child bearing

Early childbearing is associated with a higher risk of low birthweight and subsequent increased risk of poor growth of the child. Additionally, early childbearing is associated with a lack of knowledge of proper maternal and IYCF practices. Of women aged 15-19 years in PVH, 25.5% had begun childbearing (DHS 2014). Culturally in rural Cambodia women marry young, and there is an expectation to have children soon after.

E. Mother's employment and season migration

High workload of mothers increases the risk of poor breastfeeding and care practices due to the absence and lack of time of the mother, which increase the risk of child undernutrition. In PVH, 70.4% of women aged 15-49 years were currently employed in the DHS 2014, of which 78.4% work in agriculture which means they are outside of the household (DHS 2014). During the dry season, mothers from poor families often migrate for work. This is increasing due to depleting of local resources in the forests historically used to generate income in the dry season. In both cases, children are often left at home, with elder family members or older siblings taking care for them. In the

absence of mothers, adequate infant and young child feeding are not adopted resulting in increased risk for child illness, wasting and stunting.

F. Gender issues and maternal wellness

There is some evidence to suggest that poor maternal well-being can affect the care practices of children, impacting on child growth. In PVH, women are traditionally responsible for household chores as well as being employed, leaving little time to rest or time for themselves. It seems that decisions are often made by discussion between mothers and fathers, but that the male will sometimes be the final decision maker. In PVH, 31.8% of women had experienced violence since the age of 15. The perpetrator of violence was most often the husband/partner or parent. There are reports that poverty causes mothers to cry and complain, and also increase the risk of domestic violence (KIIs). In PVH 47.1% of HHs are in the lowest wealth quintile, and 27.3% in the second wealth quintile (DHS 2014). There is the suggestion that women experiencing domestic violence are more likely to migrate for work (KII), with effects on child feeding and care practices as children are often left at home

G. Lack of exposure to skilled health advice

Poor health seeking behavior leads to prolonged and more serious illness, as well as less access to skilled health advice, increasing the risk of good health and care practices. Given the link between disease and nutrition, this increases the risk of poor child growth and nutritional status. In PVH it seems that mothers will use health centers, but it may not be the first choice with a historical preference to first seek local or traditional treatment methods. It seems this is due to the cost and distance/time associated with attending a health center, as well as poor perceived quality of health care. Not seeking skilled medical attention and advice will result in poor frequent and prolonged illness in children with a subsequent increased risk of undernutrition. Due to poor education, many do not have prior knowledge of health and nutrition, and with poor health seeking behavior and poor coverage of nutrition and health activities in Choam Ksant district communities have poor exposure to skilled advice on health and nutrition, increasing the risk of illness, and deterioration with poor nutritional status. Another issue here is the capacity of the health staff and VHSOs, which are often the first contact point with healthcare for communities. It seems in terms of immunisations, there may be some cultural beliefs around the bad side effects of the immunisations and pain of the injection.

H. Open defecation and unhygienic environments

Lack of access to sanitation facilities is linked to increased risk of disease such as diarrhoea and intestinal parasites. Open defecation and unsafe disposal of feces (human and animal) introduces germs into the environment. Increased illness leads to increased risk of poor child growth in communities, not just at HH level. In PVH, only 10-50% of HHs are reported to have access to latrines in Choam Ksant district (KIIs). Although there are a number of projects to improve latrine access in PVH, this doesn't seem to have reached Choam Ksant district. With a lack of knowledge about sanitation and hygiene with only 50% of child's stools are disposed of safely (IMCF Baseline Survey, 2012), and limited household income this is not likely a priority for families. Additionally, the majority of households own animals or livestock which roam freely during the day. This, along with OD creates an unhygienic environment where children are likely to play. With increasing occurrence of floods, this amplifies the unhygienic environment by spreading the germs and bacteria to a larger area.

I. Inconsistent access to clean water

Contaminated water increases the risk of diarrhoea, intestinal parasites and other water-borne diseases, and subsequent deterioration of child nutritional status and growth. Access to clean water becomes limited in the dry season in PVH, with wells and hand pumps reported drying up due to overuse (KIIs). The main source of water in villages is hand pumps and wells in the dry season, and rain water in the wet season. It is reported that 87% of households have access to a clean water source (IMCF baseline report, 2012). However, it is reported that handpumps and wells become contaminated due to improper use (KIIs). Additionally, it seems there is a lack of safe household storage for water; likely due to lack of knowledge as well as lack of income. Increasing occurrence of weather extremes such as floods and droughts are aggravating this situation.

J. Poor hygiene practices

Poor hygiene practices increases the risk of diarrhoea and intestinal parasites leading to increased risk of poor child growth and nutritional status. In PVH 13% of caregivers reporting washing their hands after defecating (IMCF baseline survey, 2012). There are also reports of children appearing unclean (KII). Although there are health promotion activities in the area, these are not widespread and it may be feasible to suggest that the lack of access to water impacts on households practicing these new behaviours.

K. Inadequate breastfeeding practices

WHO recommends a child is breastfed within the first hour of life and exclusively breastfed for the first 6 months of life for optimal health, with strong evidence for its impact on reduction of illness. Early introduction of complementary foods has been associated with poor child growth. In PVH, early initiation of breastfeeding is at 77% (DHS 2014). However, it seems there is a cultural tradition to feed water and honey to newborns. It also seems many mothers stop exclusively breastfeeding at 4-5 months with the likely implication of increased illness and early introduction of foods with subsequent increased risk of undernutrition and poor child growth.

L. Inadequate care practices

Poor hygiene and sanitation practices during preparation or feeding of complementary foods increases the risk of child illness such as diarrhoea, which increases the risk of wasting and stunting. In Cambodia, it is common for children to eat alone which can result in small children not eating properly. Additionally, less than one third of respondents washed their hands with soap before preparing food leading to unsafe preparation of children's foods (IMCF baseline 2012). This is likely due to a lack of knowledge of good practices as well as cultural practices.

M. Poor quality diets of children under 5 years

Poor quality diets of children leads to inadequate energy and nutrient intake needed for child growth and development. If a child is not receiving the adequate quantity of quality of food this results in increased risk of disease as well as poor child growth. Diarrhoea in particular causes zinc deficiencies, which have been linked to stunted growth in children. In PVH only 27.8% of children aged 6-23 months reach the recommended minimum dietary diversity (DHS 2014) and many are deficient in iron, zinc, vitamin A and thiamine. This is in part thought to be due to low crop diversity, with traditional rich-dominant diets. In Cambodia there is also a genetic mutation which is thought to cause anaemia. It is reported that mothers have poor knowledge on how to prepare nutritious meals for children, even when the food is available (KII), resulting in poor nutritional status and child growth as well as increased risk of childhood illness. There also seems to be an increasing trend of 'snack foods' for children in the villages such as packaged biscuits and crisps.

N. Poor nutritional status of women of child bearing age

The first 1000 days of life from -9months to 23months are a crucial stage for proper child development and growth. Poor nutritional status of women of child bearing age and pregnant women is associated with low birthweight and IUGR due to insufficient fetal nutrition. Low birthweight infants have an increased risk of child malnutrition, poor growth and poor health.

In PVH, 16.4% of women aged 15-49 were defined as thin by BMI<18.5 and 53.7% were anaemic (DHS 2014). In Cambodia there is a genetic mutation which is thought to cause anaemia, but there is also poor diversity of diets. PNC attendance is reportedly low and health seeking behavior is not optimum, therefore knowledge levels of appropriate diets are likely to be low. There is also a traditional practice to eat very simple foods after delivery.

O. Household food insecurity

Household food insecurity means less food at the household, this results in less calorific intake for household members and/or lower quality of diets through coping mechanisms. This increases the risk of poor child growth, and malnutrition in PLW during the food insecure period. In PVH, availability of rice determines HH food insecurity and hunger. Periodic food shortages occur close to the harvest seasons where there is less food available, and less income for those whose primary income is sale of crops to be able to access adequate food. Recently, unpredictable rains have been causing problems for farmers and as such it is anticipated that household food security may increase.

P. Agricultural dependence and poor crop diversity

Farming systems in PVH are dominated by rice rain fed system. Rice is the main staple food for the villagers, and when stocks from own production are over (lean season) farmers are seeking jobs out of their farms to purchase food. This happens at a critical time when rice is growing in the fields and require particular attention. This reduction in workforce results in a reduction of the rice production, which then impacts on the rice stock for the next season. This rain fed system is particularly vulnerable to recent climate change and extreme weather events (droughts and floods). Farmers also borrow food or cash during the lean season, and reimburse from the sale of their rice production, after harvest when prices are low. This leads to a vicious cycle of rural poverty with 47.1% of HHs are in the lowest wealth quintile (DHS 2014). Rural poverty is associated with lower quantity and quality of diets, low education attainment, low healthcare access, and poor hygiene and sanitation facilities, all observed in PVH. This situation is aggravated by the poor crop diversity in Cambodia, with farmers often growing only rice, or rice and Cassava – both of which are affected by poor rains. This reliance on one or two crops as a main source of food and income creates a very vulnerable state for the household.

Q. Poor resilience

With many in PVH sitting just above the poverty line (87.3% in the lowest-middle wealth quintiles) and agricultural-dependence, many household are 'transient poor' with a lack of rural safety nets and a lack of technical skills and resources to cope with any shocks or the increasing effects of weather extremes. With resilience on farming as a source of food and income, this is particularly problematic. Historically, natural resources such as the forest have acted as a safety net to communities, providing a way to diversify incomes and diets, especially during the dry season. Recent deforestation and the effects of climate change on natural resources such as fisheries, is putting these rural safety nets in jeopardy, as well as an increase in migration. Inability to deal with shocks can lead to sudden changes in food access and diet quality and quantity, increasing the risk of

wasting and disease. Continual exposure to fluctuations (e.g. seasonal) are likely to result in poor childhood growth.

R. Poor knowledge attainment

Poor education is associated with risk of poor knowledge attainment of health and nutrition practices, which results in high risk of maternal and child undernutrition and illness. Whereas knowledge in itself will not lead to change in behaviours if there is not access to resources, poor education attainment is often linked to socio-economic factors and less health seeking behavior. Education attainment is poor for females in PVH with only 7.1% having completed primary education. It is suggested that this is, in part, due to children being required to begin work at an early age due to rural household poverty. Around 30% of respondents named unclean hands as a cause of diarrhoea, and around 4% poor sanitation (IMCF baseline survey, 2012). As well as poor education, a lack of coverage by health promotion activities is likely a contributing factor. Poor knowledge attainment of health, nutrition and hygiene increases the risk of poor nutritional status and health.

S. Poor awareness of malnutrition

Health workers have limited capacity in their understanding of the different types of malnutrition, and awareness in communities is also reportedly low with little understanding of the symptoms and effects of malnutrition. Poor awareness of malnutrition will lead to poor prioritization of malnutrition prevention.

T. Low income and limited livelihoods

Low income and limited access and diversity to livelihoods was multi-causal and should be a risk factor on its own. In PVH, households facing constraints of only farming or seasonal labour livelihoods are likely to struggle to generate enough income to escape rural poverty. This means that there is often very little spare income for improved living such as household latrines, water pumps or education. This will be dependent on the communities or individual family's priorities. An exasperating factor here is the social habits of gambling, alcoholism and some reports of prostitution in some communities. Income affects many of the other risk factors for undernutrition e.g. household food insecurity, nutritional status of WCBA and WASH.

U. Limited access to markets and poor infrastructure

PVH is very remote with many isolated villages. It seems there is not much flow of information or services from one village to the next, due in part to the linear geography of villages along one road. Those on the outside (furthest in to the remote areas) will not receive any services or visits from neighbouring villages as people will tend to travel only one way along the road in the direction of the nearest large town. Additionally, some areas still poor road access, with some not accessible by car. This situation expands to a number of villages in the rainy season, when access is difficult to a number of areas. There are not always markets within villages, and if they do they are often small and limited with minor links to other villages and markets. This impacts on diversity of markets and hence diets, as well as limiting the economic productivity of agricultural products. Additionally, poor infrastructure impacts on access to villages in terms of health education and other beneficial programmes. One reason for this is thought to be a lack of investment from the government and limited commune budgets leading to basic services, poor infrastructure and limited development.

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SYSTEMS ANALYSIS



La méthodologie Link NCA a été développée par Action Contre la Faim (ACF) sous la supervision d'un comité scientifique regroupant des experts multisectoriels d'ACF ainsi que d'éminents chercheurs membres de la TUFTS University de Medford-Somerville et de l'Institut de Recherche pour le Développement et du Programme Alimentaire Mondial.

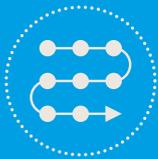
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