Link NCA Final Report

March – July 2015

Agro-pastoral and Mixed Farming Livelihood Zones,
West Pokot County, Kenya

Link Nutrition Causal Analysis Report, West Pokot County, *Kenya*. *March-July, 2015*

Link Nutrition Causal Analysis Report

West Pokot County
[Agro-pastoral and Mixed farming Livelihood zones],
Kenya.

Report compiled by: CCRST[1], Gwenaelle luc, Kevin Mutegi and Nahashon Kipruto

Funded by:

USAID FROM THE AMERICAN PEOPLE

[1] County Council of Research Science and Technology

Acknowledgments

Action Against Hunger (ACF) ACF-USA and county government of West Pokot County wishes to express gratitude and appreciation to all parties involved in the entire link NCA process.

- We acknowledge the generous support, time and energy of the communities; county and national level stakeholders who participated in various stages of link NCA.
- The technical and logistical support provided by Action Against Hunger (ACF) Kenya Mission staff and Link NCA technical unit.
- Technical support and participation of Ministries of Health, Water, Agriculture (crops), Livestock, Education, Market and Trade, National Drought Management Authority (NDMA) and partners (ACF, FAO, KRCS, UNICEF and WFP) among others.
- USAID for financial support
- The SUN CSA movement with representation from the county and partners including UNICEF and KRCS

The report presents all activities of the Link NCA undertaken in Agro-pastoral and Mixed farming livelihood zones of West Pokot County, Kenya.

Table of Contents

List of Abbreviations

ACF-USA	Action Against Hunger (ACF) USA
AG	Agro-Pastoral
ANC	Antenatal Care
ARI	Acute Respiratory Infections
ASDSP	Agricultural Sector Development Strategy Programme
BCC	Behaviour Change Communication
BFCI	Baby Friendly Community Initiative
CCRST	County Council of Research Science and Technology
CHAST	Child Hygiene and Sanitation
CI	Confidence Interval
CLTS	Community Led Total Sanitation
EE	Environmental Enteropathy
ENA	Emergency Nutrition Assessment
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GII	Gender Inequality Index
HAZ	Height-for-Age-Z scores
HDDS	Household Dietary Diversity
HFIAS	Household Food Insecurity Access Scale Score
HINI	High Impact Nutrition Interventions
HIV	Human Immunodeficiency Virus
HoH	Household
IDDS	Individual Dietary Diversity Score
IFA	Iron-Folate
IUGR	Intra-uterine growth retardation
IYCF	Infant and Young Child Feeding
KAP	Knowledge, Attitude and Practice
KARLO	Kenya Agriculture and Livestock Research Organization
KDHS	Kenya demographic health survey
KII	Key Informant Interview
LBW	Low Birth Weight
MAHFP	Measured Months of Household Food Provisioning
MF	Mixed Farming
MLND	Maize Lethal Necrosis Disease
MOH	Ministry of Health
MOALF	Ministry of Agriculture, Livestock and Fisheries
MOE	Ministry of Education
MOWNR	Ministry of Water and Natural Resource
NCA	Nutrition Causal Analysis
NDMA	National Drought Management Authority
NITWG	National Information Technical Working Group
NGOs	Non-Governmental Organizations
OPV	Oral polio vaccine
PHAST	Participatory Hygiene and Sanitation
RFS	Risk Factor Survey
SMART	Standardized Monitoring Assessment of Relief and Transitions
SUN CSA	Scaling Up Nutrition Civil Society Alliance
TBA	Traditional Birth Attendants
UNICEF	United Nation Children's education fund
WAZ	Weight-for-Age-Z scores
WARMA	Water resources Management Authority
WHO	World Health Organization
WHZ	Weight-for-Height-Z scores

Executive summary

The long-term effects of chronic malnutrition among the vulnerable populations in West Pokot County remain evident with the prevalence of chronic under nutrition (stunting) plateauing at critical levels above World Health Organization (WHO) emergency cut-off of 40%. The latest findings from Kenya Demographic Health Survey (KDHS) results (2014) placed the county with the highest stunting rates in the country (45.9%). It depicted a situation where nearly 1 in every 2 children below five years were exposed to undesirable consequences of stunting which impacted negatively on health, economic and social aspects in the county. Poor linear growth or stunting (low length- or height-for age) in infants and young children is as a result of multiple factors and with previous studies not showing contributory factors linked to stunting in the county. ACF, county government and partners have been supporting programmes in areas of Food security, Nutrition, Water, Sanitation and hygiene. Despite a number of initiatives, chronic vulnerabilities resulting to long-term nutrition problems are still persistent. This is mainly because various players are employing a "silo" approach with little collaboration, synergy and multi-sectoral integration. It's for this reason that West Pokot County government line ministries in collaboration with a number of NGOs, UN agencies, private sector, community and faith based organizations came together to identify key factors to stunting and develop response plans through the Link NCA method. To address stunting, there is therefore need to focus on long-term and holistic approaches that address the basic and under-lying causes of chronic vulnerability and malnutrition. The initiative must bring an array (health, nutrition, education, WASH and FSL, among others) of key stakeholders and expertise under one roof, with the county government of West Pokot taking lead.

The need to urgently address chronic malnutrition though changing the way we intervene led to the initiation of "Alleviating Chronic Malnutrition Initiative" which brings together 7 national and County government ministries (Health, Agriculture, Water, Planning, Education, Trade) with 3 UN agencies (UNICEF, FAO and WFP) and 2 INGOs (ACF and HKI). The Link NCA study process which is part of the larger alleviating chronic malnutrition imitative began in January, 2015, where ACF took the opportunity to identify stakeholders representing various sectors at the county. The process also involved review of previous secondary data and scientific literature available to enable the stakeholders formulate hypothesis on causal link to undernutrition specifically stunting. A multi-stakeholder workshop on validation of hypothesis was held in February, 2015 which was followed closely by Link NCA training of supervisor at the County in March, 2015. Sensitization training at national level was also conducted in March, 2015. Participants in both trainings received Link NCA tools and resources. The field work process began in April, 2015 with engagement of multi-stakeholders in various stages of the Link NCA. Results and findings were shared and validated in July, 2015 at multi-stakeholder forum held in the county. The participants at the forum also participated in developing response plans with regards to NCA study findings.

The summary findings revealed that the major risk factors linked to stunting as highlighted in the table below include high prevalence and recurrent episodes of childhood illnesses namely Acute Respiratory Infections (ARI), clinical malaria, environmental enteropathy and diarrhoea. It was however noted that the prevalence of environmental enteropathy in the county is unknown and needs investigation since its linked unhealthy environment as result of poor access of safe water, poor hygienic practices and high open defecation also cited as major risk factors. Prolonged seasonal (rainfall) failure coupled with myriad of vulnerabilities over time rendered households chronic food insecure. Low sources of incomes during the lean season in addition to cultural taste preferences and as low involvement of men in decision making process did have influence on household expenditure patterns precisely on nutritious food. Inadequate diversified incomes and utilization of assets coupled with high maternal workload presents itself as major risk factors leading to inadequate dietary diversity, frequency and intake among vulnerable

groups i.e. under-five children. The Link NCA finding also revealed important and minor risk factors with various levels of contribution to stunting. It's important to note that stunting peaks did not follow a seasonality complex as with the case of wasting.

Risk factors +++-Major ++-Important +-Minor	Rating from initial workshop	Strength of association with literature	Rating from technical experts	Participatory rating exercise with Communities	Interpretation by NCA analyst
High prevalence of childhood illness: ARI, Clinical malaria, diarrhea and environmental enteropathy	+++	+++	+++	++/ +	Major
Inadequate dietary diversity, intake and meal frequency	+++	+++	+++	+++	Major
High Maternal workload	+++	++/ +	++	+++	Major
Low sources of income/ low sources of diversified income	+++	+++	+++	+++	Major
Inadequate income and assets utilization within the household	+++	++	+++	+++	Major
Poor access to safe water	+++	++	+++	++	Major
Poor hygiene practices	+++	+++	+++	+	Major

Multi-stakeholders at county and national level were later involved in developing recommendations for various risk factors identified. The stakeholders were involved in developing problem, solution and intervention trees. The interventions were later communicated at the forum through advocacy messages and desired change expected from actualization of the response plans. The interventions were also aligned with key actor, expected timeline and resources required. Priority interventions across different sectors are highlighted in the response matrix below:

Major risk factors	**Interventions**	**Stakeholders**	**Resources Required**	**Timeline**
High prevalence of childhood illness: ARI, Clinical malaria, Diarrhoea and EE	• Develop and implement a multi-sectorial social behaviour change strategy. • Increase integrated health outreach programmes to strengthen and scale up community level services-(ICCM, IMCI) and community health units	County government Line ministries led by MoH, partners, community, BCC experts, Media, political leaders and civil society.	Develop and Implement a multi-sectorial SBC strategy Upscale Integrated health outreach programmes from current 20 to 35 sites Advocacy towards recruitment of technical staff	2 years

	(MOH). • Advocate for opening of access roads to health facilities. • Advocate for recruitment of technical staff.			
	• Strengthen supply chain management. • Provision of IFA supplements and awareness creation. • Scale up Vitamin A supplementation. • Strengthen disease/nutrition surveillance	Partners, MOH, private sector and community. MOH, partners and community. MOH, partners and community). MOH, partners, NDMA).	Training and monitoring of supply chain management IFAS sensitization Scale up Vitamin A supplementation Strengthen disease/ nutrition surveillance	2 years
	• Advocate for utilization of indigenous foods and development of recipes.	MOA, MOH and partners	Advocate for utilization of indigenous foods and development of recipes	2 years
Inadequate dietary diversity and meal frequency	• Create awareness on food fortification. • Implement BFCI Cooking demonstrations. • Advocate for utilization of indigenous foods and development of recipes. • Provide dairy goats. • Scale up home fortification. • Introduction and promotion of diversified food crops/ Livestock • Procurement of agricultural machineries	MOA,MOH,MOE Private sector NDMA Community members Local Media Politicians	Diversified types of food crops: green grams, soya beans, indigenous vegetables, Cassava, Sweet potatoes (Traditional High Value Crops) Procurement of agricultural machinery	2-5 years
Low sources of incomes/ low sources of diversified incomes	• Introduce integrated pest and disease control for livestock and crops and use of disease resilient seeds/crops/livestock breeds e.g. farm hygiene, destruction of alternate hosts for pest and diseases • Promote new farming techniques such as irrigation technologies (drip/ sprinkle), double digging • Develop an integrated coordination mechanism at the county to steer	MOALF,KARLO,FAO CSG-NDMA, MOALF,MOH and ASDSP MOA, KARLO MOALF MoALF and Partners MoALF and	Resistant/ tolerant crop varieties Pest and disease control Funds for procurement of seeds/ farm inputs: fertilizers Funds for coordination Funds to supply seedlings Implement 14 irrigation schemes Water harvesting for crop production Capacity building Promotion of new farming technology	2-5 Years

	Multi-sectorial approach. • Introduce and promote bulk drought tolerant crops/ livestock varieties. • Subsidize cost of seeds for pasture and bulking. • Advocate for utilization fish and development of fish ponds. • Establishment of pasture production • Procurement of grass seeds and Pasture production machineries • Introduction and promotion of livestock breeding centres • Introduction and Promotion of diversified livestock (Galla goats, poultry and camel)	partners MoALF and partners MoALF and partners	Coordination support Introduction of new crops and livestock varieties Development and advocating for fish farming Establishment of pasture and fodder	
Poor access to safe Water Poor hygiene's practices	• Provision of water treatment chemicals and filters at household level. • Conduct CLTS, PHAST and CHAST. • Advocate for a central water storage. • Connectivity and expansion of pipe water to HH to main sources e.g. River Muruny. • Provision for tanks for roof/rain water harvesting at communal level	Institution and HHs, MoW, MoH, MoERC, NDMA, Partners: WARMA, Yangat, WVI, ACF	Procurement of water treatment chemicals and filters Scale up of CLTS, PHAST and CHAST 4 Conference package for Advocacy workshops Funds for procuring water tanks	2 Years
Inadequate incomes and assets utilization intra-household High Maternal workload	• Linking women to enterprise funds and loans. • Training on financial literacy and alternative IGAs institution. • Advocate for improved education infrastructure. • Advocate for shared gender roles and responsibilities. • Advocate for adult literacy education classes.	Ministry of trade, cooperatives, gender, development partners, MOA, MOALF, NDMA. MOE, Action Aid, World Vision) Ministry of gender and Social Services, MoE , Partners	Train and supply agro forestry tree seedlings Funding educate on roof and rock catchment and purchase tanks Funds for capacity building women groups to manufacture energy saving stoves/jikos locally Advocacy initiatives	2 Years

1. Background information

1.1 Study Area and Population

West Pokot County is located in the North Rift of Kenya and covers an area of 9,169 km^2. The county is further sub-divided into four Sub-counties (West, North, South and Central) with an estimated population of 574,786 people as per the 2013 population projections from the 2009 population and housing census[2]. The county is generally categorized as arid and semi-arid and has 3 main livelihood zones: pastoral, agro pastoral and mixed farming in proportions of 33%, 37%, and 33% respectively. This study was conducted in agro-pastoral and mixed farming livelihoods zones as seen highlighted in figure 1. The county experiences 2 rainy seasons; the long rains in the months of March to June and short rains between mid-October to mid-November. The rest of the seasonal calendar is characterized by short and long dry seasons. The county is inhabited mainly by Pokot communities who cut across the various livelihood zones of West Pokot County. The county has an average household size of 6 members per household with percentage of under-five (0-59 months) with regards to total population at 19.2%. The current population growth estimate for the county is currently at 3.1%.

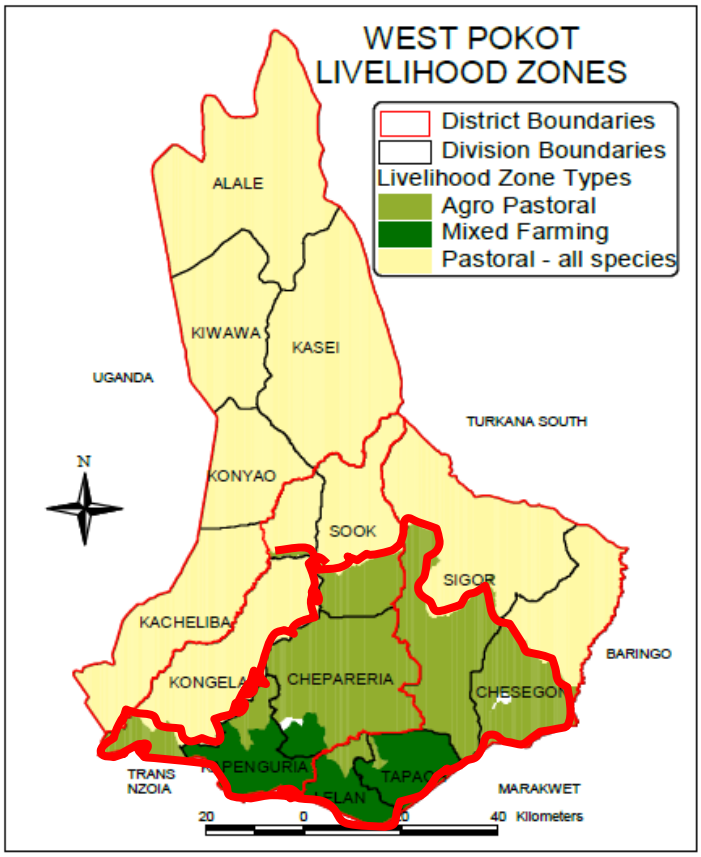


Figure 1: West Pokot County Map illustrating Main Livelihood Zones

2.0 Why conduct a Link NCA?

2.1 Context information

The long-term effects of chronic malnutrition among the vulnerable populations in West Pokot County remain evident with the prevalence of chronic under nutrition (stunting) plateauing at critical levels above World Health Organization emergency cut-off of 40%. The prevalence of chronic malnutrition/stunting in West Pokot County increased from 37.5% in 2011 to 43.3% in 2012 and 50.1% in 2013 before slightly dropping to 43.7% in 2014[3] though the drop was not statistically significant as seen in figure 2. It is evident that the stunting rates are plateauing at a critical level above the WHO critical stunting prevalence cut off of 40%. Poor linear growth or stunting (low length- or height-for age) in young children is as a result of multiple circumstances and determinants including; antenatal, intra-uterine and postnatal malnutrition. Stunting in early life is associated with adverse functional consequences, including poor cognition and educational performance, low adult wages, lost productivity. The latest Kenya Demographic Health Survey (KDHS) results (2014) placed the county with the highest stunting rates in the country (45.9%).

[2] Kenya National Bureau of Statistics, 2009
[3] Integrated nutrition surveys conducted by ACF, NDMA and MoH in 2011, 2012, 2013 and 2014

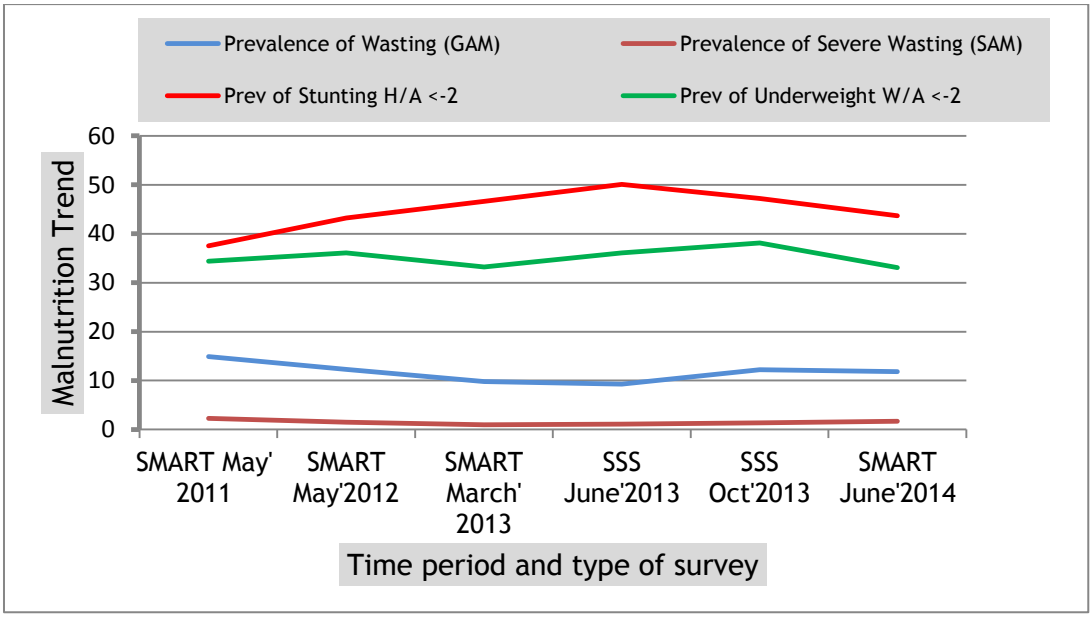


Figure 2: Malnutrition indicator trends in West Pokot County

The Figure 2 above illustrates malnutrition trends in the county over time. The results are used as a proxy but not for comparability. The trends of malnutrition show a slight decline in chronic malnutrition rates but with no significant difference when compared to previous seasons. Approximately 1 in every 2 children below five years are exposed to undesirable consequences of stunting which have impacted negatively on health, economic and social aspects in the county. Poor linear growth or stunting (low length- or height-for age) in infants and young children is as a result of multiple factors and determinants which were not explored clearly in previous assessments. Stunting in early life is associated with adverse functional consequences, including poor cognition and educational performance, low adult wages, loss of productivity and when accompanied by excessive weight gain later in childhood there is an increased risk of nutrition-related chronic diseases among others. All the above stated consequences are highly undesirable and costly to West Pokot County. The capacity of the populations to manage endemic stresses and vulnerabilities has been hampered by frequent droughts, inadequate availability and access to safe water, endemic livestock diseases, diminishing livestock and crop production, overreliance on rain fed agriculture, dependence on fluctuating markets, degraded natural resources, poor production and value chain systems among other issues. The situation is compounded by low coverage and access to health, nutrition, Water, Sanitation and Hygiene (WASH) and food security and livelihoods interventions and services by the population. The situation has greatly affected communities their resilience to shocks has no choice but to adopt negative coping strategies. The endemic drivers outlined above have deepened and are accelerating food and nutrition insecurity in the county. The challenges have led to persistent household food insecurity, poor care practices and increased morbidity in the population, which in turn has resulted to poor nutrition and health status. West Pokot County government has been collaborating with a number of Non-Government Organizations (NGOs), United Nation (UN) agencies, private sector, community and faith based organizations on various emergency and development programs/projects. Areas of interest in programming include: health, nutrition, WASH, Food Security and Livelihoods (FSL). Despite a number of initiatives, chronic vulnerabilities resulting to long-term nutrition problems are still persistent. This is mainly because various players are employing a “silo” approach with little collaboration, synergy and integration. The situation is mainly

aggravated by the short duration of the grants and skewed donor interest more focus on acute malnutrition as compared to chronic malnutrition. In addition to that, majority of the players are striving to address immediate causes of poor nutrition outcomes providing little room for integrated nutrition sensitive interventions addressing the underlying and basic causes of malnutrition. To address stunting, there is therefore need to focus on long term and holistic approaches that address that aim to address the basic causes of chronic vulnerability and malnutrition and enhance nutrition resilience in the community. The initiative which brought together all county government line ministries led by ministry of Health (MoH) and other key stakeholders to use Link Nutrition Causal Analysis (NCA) method with the aim of identifying and understanding the risk factors to stunting for mixed farming and agro-pastoral livelihood zones in the county. It important to note that pastoral livelihood zones were left out of the study due to distinct differences in the risk factors as identified from multi-sector secondary data review workshop held in March, 2015. A separate Link NCA for pastoral livelihood zones was proposed.

2.2 Main Study Objective

The main objective of the NCA is to identify the possible causes of child under nutrition, in particular stunting among children age 0-59 months, in Agro-Pastoral and Mixed farming livelihoods zones of West Pokot County.

2.3 Specific Study Objectives

The NCA study specific objectives include:

1. To estimate the prevalence and severity of stunting in the study population
2. To estimate the prevalence of known risk factors for under-nutrition, especially stunting among the population and key "nutrition vulnerable groups"
3. To identify main causes of stunting in order to inform the technical strategy and programs for the prevention of the same at a local level
4. To determine which causal pathways of malnourishment are likely to explain most under nutrition, especially stunting, cases in the target area
5. To develop an "emic" definition and understanding of good nutrition, malnutrition and believed causes of under nutrition within the target population
6. To understand the local seasonal and historical pathways to stunting
7. To support technical advocacy on causes of stunting so as to support technical strategy.

3.0 Link NCA Methodology

3.1 Overview of the Link NCA Approach

A Link NCA is a structured, participatory, holistic, multi-sectorial study, based on the UNICEF causal framework, to build a case for nutrition causality in a local context.

- Structured – the steps of the methodology are precisely defined and have all been tested in the field.

- Participatory – the study is giving a real opportunity to national technical experts as well as caregivers in the community to express their opinion on the causes of under nutrition, and to discuss, review and finally validate the conclusions of the study.

- Holistic – under nutrition is here studied globally to avoid a sectorial approach, and to highlight the inter-relations between risk factors.

- Multi-sectorial - a nutrition causal analysis (NCA) investigates and presents a "multi-sectorial" overview of the contributing factors affecting nutritional status within a given community.

- Building a case for nutrition causality – the core exercise of an NCA is to identify and rate causal hypotheses by order of importance.

- Specific to a local context - causes of under-nutrition are often different from one location to another. The purpose of the methodology is to go beyond generic interventions by identifying context specific causes in order to propose adequate solutions. From an epidemiological point of view, a certain factor can be mentioned as a cause of under-nutrition in a specific context only after well-designed epidemiological studies have demonstrated a clear, specific causal association. As these studies are long and costly, the Link NCA methodology proposes a more pragmatic approach to causality. The Link NCA gathers a wealth of information from different sources to build a case for causality: the aim of the Link NCA is to identify risk factors that are *very likely* to be causal in a specific context. The Link NCA methodology provides guidance on which information to collect and how to analyse the data collected.

3.1.1 Overview of the limits of the methodology

The methodology used is indeed a causal analysis although causality is not demonstrated from an epidemiological point of view. A low confidence note for certain results would signify that the information gathered is not convincing enough and advocates for additional research to be conducted. The Link NCA presented is valid for the population studied: Population from agro-pastoral and mixed farming livelihood of the West Pokot County in Kenya. All the results should be considered at this geographic level and not beyond without additional analyses.

3.1.2 Overview of the strength of the methodology

The methodology chosen is believed to be more cost efficient than an epidemiological research and much more cost-efficient than cross sectional surveys aiming at following an epidemiological protocol but fails to do so. Indeed, experience shows that often, such studies have methodological weaknesses, fail to reach a conclusion, or may produce misleading results. The aim of the study is to test the majority of causal pathways that may occur in the population studied even those that are difficult to quantify. The study uses a holistic approach, looking at inter-relation between causal pathways. Results are built on a participatory process that includes technical experts and local communities. This participatory approach helps to build a consensus among stakeholders on priority actions.

3.1.3 Special attention to underlying vs. basic causes

The Link NCA methodology is designed for a specific context with specific attention to underlying and basic causes.

3.2 Study Design

The Link NCA methodology involved five key steps:

1. Preparatory Phase: The preparatory phase was to ensure timely recruitment process; objectives are clearly illustrated and the choice of Link NCA methodology and key stakeholders to engage. The activities for the NCA study were conducted from January to February, 2015.

2. Development of causal hypotheses: a literature review, data review and stakeholders interviews were undertaken to generate an overall understanding of the local context of under nutrition and design a set of local causal hypothesis of under nutrition. These hypotheses were validated to be field tested by technical experts during a workshop held on the 18TH and 19th February, 2015.

3. Data Collection: Both quantitative and qualitative data were collected to provide more evidence on levels of under nutrition, key risk factors and community perceptions, practices, resources and constraints. The entire data collection process began from April, to June, 2015 with various stakeholders and communities engaged in the activities.

4. Identification of highest priority causes of under nutrition: Based on the evidence gathered during the data collection, the causal hypotheses were then rated according to their importance with particular attention to seasonal differences and vulnerable groups. The results were then validated with the local community and multi-stakeholder forums before being presented at a final validating workshop in July 2015, where technical and Link NCA experts reached a consensus on the risk factors identified and priorities for action.

5. Communicating results and planning for a response: The Link NCA results have been presented to operational stakeholders and to the communities that participated in the study. The Link NCA team liaised with operational teams to create a plan for transforming Link NCA results into better programming for nutrition security interventions. This was done during the multi-stakeholder dissemination and engagement workshop accomplished in July, 2015.

3.3 Sample

3.3.1 Sample Size and Eligibility

The method selected was random cluster sampling. A sample size has been calculated for a list of key indicators present on the Link NCA indicators guide. This list was a sufficient basis to calculate the sample to be surveyed.

Table 1 - Indicators to be measured and population targeted for each indicators

Type of indicator	Indicator	Targeted population
Measurement of risk factors	HDDS	Household
	HFIAS	Household
	MAHFP	Household
	Early initiation of breastfeeding	0-23 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≤13	Caregiver
	Caregiver-child interactions scale	Caregiver
	ARI past 14 days	0-59 months
	Diarrhea 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

Calculation of household sample size was derived from deduced from estimated percentages of the following age groups namely: 0-6 months (1.92%), 0-23 months, (7.68%) 6-8 months (0.96%), 6-23 months (5.76%), 6-59 months (17.28%), 12-15 months (1.27%), 12-23 months (3.84%) with respect to proportion of under-five 0-59 months of 19.2% as highlighted in table 2.

Table 2 – Calculation of household sample to be surveyed

Example of Indicators	Population targeted	D[1]	d[2]	p[3]	No of measured needed[4]	No of measures /HoH visited[5]	HoH sample size [6]
Food Consumption Score	Household	2.0	0.10	0.685	180	1.0	180
Perceived social capital	Caregiver	2.0	0.10	0.5	209	1.0	209
Low birth weight	0-59 months	2.0	0.10	0.5	209	1.152	181
Early initiation of breastfeeding	0-23 months	2.0	0.10	0.895	79	0.4608	171
Exclusive breastfeeding	0-5 months	2.0	0.10	0.379	197	0.1152	1710

Continued breastfeeding at 1 year	12-15 months	2.0	0.10	0.825	121	0.0760	1591
OPV3 coverage	12-23 months	2.0	0.10	0.651	190	0.2304	825
IDDS	6-23 months	2.0	0.10	0.513	209	0.3456	605
Stunting	6-59 months	1,5	0.05	0.437	617	1.0368	**640**
Wasting	6-59 months	1.5	0.05	0.118	261	1.0368	252
Introduction of solid, semi-solid or soft foods	6-8 months	2.0	0.10	0.708	173	0.0576	3,003

[1]Design effect
[2]Desired precision
[3]Estimated prevalence: When no previous data as per livelihood zoning were available the prevalence were set at 50%
[4]Calculated from ENA Software
[5]The number of measured per household
[6]The household sample sizes have been defined by dividing the number of measured needed divided by the number of measures than could be taken per household visited.

The prevalence of stunting (6-59 months) was derived from the integrated SMART survey conducted in 2014 in the West Pokot County. The prevalence[4] of the following indicators: Food consumption score (Household), early initiation of breastfeeding (0-23 months), exclusive breastfeeding (0-5 months), continued breastfeeding at one year (12-15 months), OPV3 coverage (12-23 months) minimum dietary diversity (IDDS) (6-23 months), and introduction of solid, semi-solid or soft food (6-8 months) from the SMART survey report and ACF KAP survey Report[1]. Without specific data, a conservative estimated prevalence of 50% (most demanding in terms of sample size) had been used for the following indicators: perceived social capital and Low Birth Weight.

3.3.2 Number of household to be surveyed

As the evidence from secondary data does not strongly suggest that the problem or causes differ significantly between Mixed farming and agro-pastoral livelihoods, we choose to include the two livelihoods (Mixed farming and agro pastoral) without intentionally stratifying the sample. In the table 2, only the blue rows were considered. The sample sizes calculated on the red rows are too big to be surveyed within the human resources, budget and time availability to the present Link NCA. The highest sample size within the blue rows is considered, i.e. 640 Households. A margin of 5% was taken into account for both non-respondent households and data entry errors. The risk factors survey was planned to cover a total of 672 Households.

3.3.3 Selection of number of clusters to be surveyed

To calculate the number of interviews conducted per day, the following elements were considered: each interview would last for approximately 1 hour and each team would effectively work 5hours per day. Taking in consideration logistics or others issues, the hypothesis gave the estimate of 5 interviews/day/team has been considered. By considering 4 teams in each cluster and 1 day of investigation/cluster, the combination

shown in the following table had been obtained. This option considers 8 teams of 2 surveyors. 4 teams would visit one cluster each day and 20 Household would be surveyed in each cluster. 34 clusters would be considered to survey 680 HoH. The initial objective was to assess 672 HoH. This sampling option gives a higher sample than the initial one. With this option, 8 HoH will be in extra. The survey will takes place in 17 days. Among these clusters, 4 have been randomly selected for the qualitative survey.

3.3.4 List of villages and random selection of clusters for the Risk factor survey (RFS)

An exhaustive list of villages from the Agro-Pastoral and Mixed farming livelihoods of the West Pokot County was established using by using official data. The list of villages was entered in ENA software that randomly selected clusters accordingly to the Proportion Population Size (PPS). Reserve clusters (RC) were randomly selected by ENA. All the RC will be visited in case of 10% of the selected clusters are not reachable. The list of cluster sampled for the quantitative survey is presented in the annex of this report. Once the selection of clusters done, it appeared that all the villages were reachable and at the end of the survey, none of the replacement clusters used.

3.3.5 Random selection of Household within each cluster for the Risk Factor Survey

Depending on the configuration of the villages, the selection of households was done following a two-stage cluster sampling methodology. For both of the ways, the first stage is the cluster selection using ENA and according to the PPS. The villages with a population exceeding 1400 persons, a geographical segmentation was done inside the village and one segment randomly selected. Each segment contained approximately the same number of household. A number was prior attributed to each household in the village, and then households to be surveyed were randomly selected using a random number table.

3.3.6 Sampling methodology for the qualitative inquiry

In order to choose communities where to conduct the qualitative enquiry, the Link NCA study utilized hybrid approach called “random purposive sampling ». This approach is useful when the category of individuals meeting the purposive sampling criteria is large. Among the list of selected clusters, 2 clusters from the list of agro-pastoral villages and 2 clusters from mixed farming villages will be randomly selected for the qualitative survey. The random selection was made using a “random selection” formula in Excel.

Table 4: List of the four selected villages for the Qualitative enquiry

County	Sub County	Sub location	Geographical unit	Population size	Live hood zone
West Pokot	West Pokot	KAIBOS	MAYAKIT	834	Mixed Farming
West Pokot	South Pokot	KIPKOMO	TUKUMWOK	412	Agro-pastoral
West Pokot	South Pokot	SINA	KTAIMA	364	Mixed farming
West Pokot	Central Pokot	SOSTIN	CHEMUSAR	309	Agro-pastoral

At the community level, respondents were selected using only a purposive sampling approach – intentionally choosing which people to interview based on what type of useful information they are likely to provide. However, the following five types of participants

were selected: 1) community leaders, 2) key informants, 3) mothers and fathers of children under the age of 5, 4) a sample of women whose selection is based on the nutritional status of their child and 5) Grandmothers and grandfathers of children under the age of 5.

3.4 Data Collection Methods

To assess the causes of under nutrition in agro-pastoral and mixed farming livelihoods zones in the West Pokot County, the Link NCA methodology applied a mixed-methods study design. A quantitative component was designed to objectively assess under nutrition prevalence of children under five and the prevalence of known risk factors, while the qualitative component aimed to uncover the community's own conceptualization of malnutrition, the degree to which they perceive it as a problem, and what are observed to be the causes. Thus, the qualitative and quantitative components are intended to generate complementary data.

3.4.1 Quantitative Household Survey

Methodology

Data collection took place between the 13th and the 29th April 2015 after 6 days of training. On average each field team completed 5 questionnaires per day. 720 households were surveyed within 36 clusters. The quantitative survey of this Link NCA includes a nutrition survey of child anthropometry and a Risk Factor Survey.

Field Team Composition, Recruitment and Training

Surveyors and supervisors were trained during six days. Data entry operators and translators attended the training too. Two days were dedicated to the RFS and three day to the anthropometry. The candidates who took most accurate measurements were selected as supervisors. Only those candidates received extensive training on anthropometric assessments and the supervisors had a responsibility to detect and refer severe and moderate acute malnutrition children during the survey. Sixteen enumerators and eight supervisors were involved in the entire risk factor and anthropometric survey.

Data Collection

A quantitative RFS questionnaire was designed to collect information on key risk factors related to the following domains: Food Security and Livelihoods (FSL), WASH, Health, IYCF practices and Mental Health. The questionnaire was translated into local languages (Swahili and Pokot) and back translated into English. The household questionnaire was pretested. Following pre-testing, it was adapted and finalized. The RFS questionnaire was divided into 3 sections, each section being addressed at different levels: the caretaker, the child under five and observations.

The RFS questionnaire was built as follows:
-Household questionnaire: this section had been addressed to the primary caregivers as they are in charge of meal preparation and water collection.
-Child questionnaire 0-23 and 0-59 months: this section had been addressed to the primary caregivers for each child under 59 months present in the household.
-Observation questionnaire

3.4.2 Qualitative Survey

Methodology based on the Link NCA guidelines

Qualitative survey took place from the 7th of June to the 20th of June, 2015. Focus Group Discussion (FGD) and in-depth interviews were organized in 4 clusters. The purpose of qualitative enquiry requires about 6 days spent by villages/ clusters. We choose to implant day 1 to 5 consecutively and Day 6 has been be implemented at a later date to present preliminary analyses of data collected for that particular village as well as preliminary findings for the qualitative enquiry as a whole. The six core objectives of the community-level qualitative enquiry are presented below:

OBJECTIVE 1: Develop a local definition and understanding of malnutrition

One important starting point of the qualitative assessments in the villages is to develop an understanding of how individuals describe or conceive of good nutrition and under-nutrition, the ways in which under-nutrition manifests itself in the community, their beliefs about its causes and consequences, and what is 'normally' done to prevent and treat it.

OBJECTIVE 2: Characterize food security, health, and care in the community

The purpose of this step is to understand the food security, health, and care situation in the community (i.e., typical knowledge, attitudes, practices, assets, access issues, strategies and trade-offs).

OBJECTIVE 3: Explore respondent perceptions of the causes and consequences of poor food security, health, and care in relation to malnutrition

The purpose of this step is to document 1) whether or how respondents feel that food insecurity, health insecurity or poor caring practices lead to malnutrition outcomes, 2) what respondents believe to be the main constraints (if any) to achieving optimal food security, health, and care for their children, and 3) the interrelationships among these constraints.

OBJECTIVE 4: Understand the practices of caregivers of positive deviant children (i.e., well-nourished and healthy children of parents who seemingly face the same challenges and barriers as parents of malnourished children)

The community-based qualitative work provides an important opportunity to uncover positive deviant practices in the community; that is, the behaviours of caregivers whose children who have good health and nutrition despite the fact that they seemingly face similar constraints as caregivers of wasted or stunted children.

OBJECTIVE 5: Identify seasonal and historical trends in malnutrition and risk factors

The purpose of this objective is to explore seasonal and historical trends in food security, health, and care situation as well as in the causes and consequences. The process of developing the seasonal calendar and historical timeline will be incorporated into the focus group discussions, in order to more efficiently elicit the desired information.

OBJECTIVE 6: Understand how the community prioritizes these factors

The purpose of this next step is to engage community members in prioritizing factors according to a) which causes are believed to be problematic (i.e., both prevalent and severe), and b) which causes are likely to be modifiable given community knowledge and resources. Focus group discussions (FGD) and in-depth interviews have been the methods employed to collect rich contextual data on community perceptions, practices and constraints with regards to child under nutrition. FGD and individual interview guidelines have been pre-tested, with a particular emphasis placed on the phrasing of questions in the local languages.

The Qualitative guidelines were developed covering 10 key sessions:

1. Overview, general information and guidelines for interview and FGD with local leaders and Key informants. - Day 1
2. Nutrition- Day 2
3. Care Practices- Day 2
4. Health- Day 3
5. Food security and livelihoods- Day 3
6. Water, Sanitation and Hygiene- Day 4
7. Gender, Education- Day 4
8. Seasonal and historical calendar – Day 5
9. Positives deviant case study- Day 5
10. Community rating exercise and Community action Plan- Day 6

Field Team Composition, Recruitment and Training

The Link NCA Analyst lead the qualitative data collection with the assistance of two translators (one female and one male), who previously received an induction to qualitative research methods and tools, as highlighted in figure 3. In addition, a Community Facilitator and in each village, a 'Community Mobilizer' had been recruited to facilitate the enquiry and help mobilize the community.

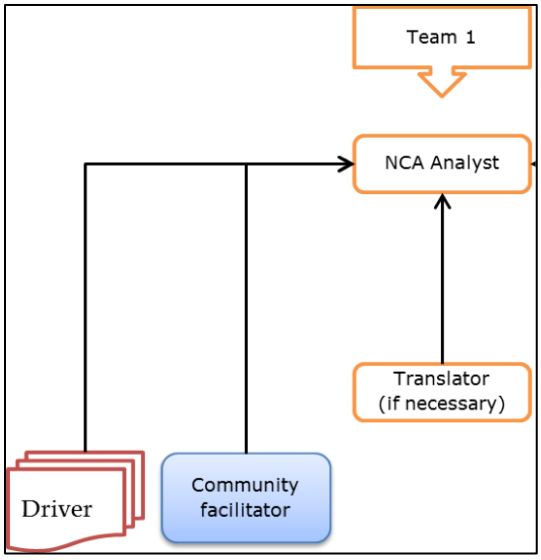


Figure 3: Qualitative team composition

Training:

A two days training for the translators and community facilitator was conducted. The following describes the three main objectives of the training session:
- To familiarize the team with the objectives of the Link NCA and the methods used to meet them
- To ensure that the principles of research ethics are understood
- To practice effective translation, facilitation, and note taking
The training also included a practice session/ pilot test before starting data collection.

Data Collection

The Qualitative data collection took place from the 7th of June to the 20th of June, 2015

Community rating exercise:
The purpose of this next step was to engage community members in prioritizing factors according to a) which causes are believed to be problematic (i.e., both prevalent and severe), and b) which causes are likely to be modifiable given community knowledge and

resources. A rating exercise was held to rate factors discussed in focus groups according to how big a constraint they are for the wellbeing of participants' children. The rating/piling exercise begins by splitting all the participants up into groups of men and women. The main causes of under-nutrition identified in the FGDs of the last several days was read out loud one by one by the Link NCA Analyst, and then participants will choose one picture who represented the best for them the risk factor identified. Once the risk factors are listed, participants working in small groups will be asked to select 5 factors that they consider to be the most problematic in their community. Tokens such as small stones will be used during the rating exercise.

Figure 4: community rating exercise

Community action plan

The second exercise is aimed to support the community to think and submit their own endogen solutions according to their knowledge and resources to the factors they identified as a Major risk. Also this will give an opportunity to the communities to express their needs. According to the result of the community rating exercise, The NCA team asked the participants how they would address the risk factors they rated as most major.

Stakeholder Consultations

Involvement of stakeholders (NGO, technical agencies, academic institution, community members, and frontline workers) is a key aspect of the Link NCA methodology. Stakeholders supported the survey at every key step. To contribute to the development of causal hypotheses, key stakeholders were interviewed in the preliminary stages of the survey. In addition, two technical experts' workshops were organized. The initial workshop aimed to validate causal hypotheses to be field-tested and final workshop to rate causal hypotheses based on evidence gathered by the Link NCA study and to validate results by providing a confidence note for each result.

Final stakeholder workshop

The results of the rating exercise were presented and validated by several stakeholders during the final technical expert workshop held on the 8th, 9th and 10th July 2015. Technical experts were invited to inform the level of confidence they had in the result

through a consensus building on each of the specified findings. The confidence note provides an evaluation of how reliable technical experts think the rating is, based on the strength of the information gathered for each result. Also, during the second and the third day, stakeholders from different sectors went further to develop response plans to alleviate stunting in the county. In addition to prioritizing key interventions, the response outlined desired changes, advocacy objectives, stakeholders who will implement the interventions and specific timelines.

3.5 Data management and analysis

3.5.1 Quantitative data management and analysis

A data entry system was developed in Excel 2011. Two trained data entry operators entered data from completed household questionnaires every day into the database. Each questionnaire and databases were crosschecked. Quantitative data analysis was conducted using Epi Info v.3.5.3. ENA for SMART survey 2011 version April 21st 2015 was used for analysis of anthropometric indicators.

3.5.2 Qualitative data management and analysis

The process of qualitative data analysis was on going and iterative. Every evening, transcripts were written down and a weekly summary of key themes developed. Lastly, the data were analysed using content analysis methods.

3.5.3 Rating causal hypotheses

Based on the results of the Link NCA, the Link NCA expert then rated the causal hypotheses by order of importance and through triangulation of:

- The prevalence of risk factor from secondary data;
- The prevalence of risk factor from the quantitative survey;
- The strength of association between the risk factor and under-nutrition;
- The participatory rating exercise with communities.

Causal hypotheses were rated based on the following classification:

Table 1: Classification of causal hypothesis

Category	Criteria
Major risk factor	No contradictory information AND strength of association from literature review is classified as [++] or [+++] AND majority of [++] or [+++] for all other sources of information
Important risk factor	A minor amount of contradictory information exists AND strength of association from literature review is classified as [++] or [+++] AND majority of [++] or [+++] for all other sources of information
Minor risk factor	A moderate level of contradictory information is permitted AND strength of association from literature review is classified as [+] or [++] AND majority of [+] for all other sources of information
Rejected risk factor	No contradictory information AND Majority of [-] or [+] for all sources of information
Untested risk factor	Contradictory information AND / OR Information gathered not complete or not available

3.6 Ethical considerations taken during the survey

Ethical approval was approved by both CCRST[5] and NITWG[6] in adherence to government of Kenya protocols. Additionally, informed voluntary consent was obtained from all Link NCA participants. Children who were found as severely malnourished were referred for medical attention and appropriate treatment as per the protocol defined at section 3.4.1of the presented Link NCA survey report.

3.7 Limitations

The causal approach chosen in this Link NCA methodology has been justified earlier. Inherent to this choice are three categories of limitations to consider for the interpretation and use of the Link NCA results.

The results of the Link NCA are elaborated from different sources of information. Each source of information has potential bias and limits that are developed in the first section.

Quantitative data are representative of MF and AP LHZ as a whole. The methodology used is indeed a causal analysis although causality is not demonstrated from an epidemiological point-of-view. A low confidence note for certain results would mean that the information gathered is not convincing enough and advocate for complementary research to be conducted. The NCA presented is valid only for the population studied in Agro-pastoral and mixed farming livelihoods zone in the West Pokot County, Kenya. All the results should be considered at this geographic level and not beyond without complementary analysis. Since ACF is an NGO active in nutrition' activities in the intervention area, a possible bias in the results may be considered. Participants from the communities may have perceived some benefit from taking part of the survey. This potential threat to the research was mitigated as far as possible by providing detailed information to study participants on the objectives of the Link NCA, and that the participation would be independent to any NGO or Government support. Furthermore, this potential bias was mitigated in the analysis stage.

Limits of each source of information used in a Link NCA

Some technical experts have more influence than others whether because of their official position, their past experiences or their political influence. The voting system and the working groups through consensus building during the workshop were among techniques used to limit this bias. The qualitative inquiry could have been subject to a selection bias when selecting villages, when selecting participants or when distributing participants in different sub-groups. Also, a cross sectional survey provides a snapshot of the situation. It is important to consider the results presented according to the year of the study as well as to the season of the study (refer to seasonality section). As mentioned earlier, the cross sectional survey of the Link NCA is not intended to identify causal associations between risk factors and under-nutrition. However, for certain very specific objectives, the association may be explored from the database. For these particular cases, the following limits must be clearly identified: a significant association identified in a cross sectional survey between a risk factor and under-nutrition cannot be a proof of causality alone. The data compiled from different sources of information are interpreted in a final causal exercise (phase IV). The limits of this interpretation are not the sum of the limits for each source of information mentioned above. On the contrary, compiling these sources of information reduces their limits, as they are complementary.

During phase IV, the first step was to identify if certain risk factors are prevalent to the point of being considered a public health problem. For example, there is clear evidence showing the causal association between low birth weights and stunting. But there is no threshold commonly accepted: i.e., from which level of prevalence should we consider low birth weight as an important contributor of stunting? Is a prevalence of 10% low birth

[5] County Council of Research, Science and Technology
[6] National Information Technical Working Group

weight acceptable? There are a number of risk factors for which no threshold is commonly accepted, and when a threshold exists, it is rarely based on scientific evidence but rather on pragmatic experience. The list of indicators with thresholds is detailed in the "indicator guide for a NCA. The second step of phase IV was to refer to existing scientific literature to interpret a causal association. While there are clear evidence for a causal association between certain risk factors and under-nutrition (diarrhea, breastfeeding…), evidence is missing for other risk factors whether because of lack of quality studies (food security…), or because of difficulties of measurement (women workload; maternal well-being…). Scientific studies have also too often neglected to measure acute under-nutrition in their protocol leading to a lack of evidence regarding this particular form of under-nutrition. Certain causal associations can easily be generalized (when a number of studies showed a consistent causal link in various contexts); it is not the case for other risk factors. The NCA done is valid for the population studied: Agro-pastoral and mixed farming livelihoods area in the West Pokot County, Kenya. All the results should be considered at this geographic level and not beyond. However, certain causes identified should be extrapolated with caution.

4. Link NCA findings

4.1 Context information and results from the NCA by sector

4.1.1 Under-nutrition

4.1.1.1 Anthropometric results

The reference values used are WHO growth standards 2006.The indices are expressed in Z-scores, according to WHO 2006 reference standards

Weight for height (WHZ) index: The percentage of acute malnutrition was estimated from weight-for-height (WFH) index values combined with presence of oedema (and/or oedema). The weight for height index compares the weight of the child measured to the median weight of a reference population for that particular height.

Height for age (HAZ) index: Chronic malnutrition is characterized by a deficit in height for age, which results in stunted growth. The prevalence of chronic malnutrition was estimated from the height for age index. This index compares the height of a child to the average height of a reference population for that particular age.

Weight for age (WAZ) index: The prevalence of underweight was estimated from the weight for age index. The index weight for age compares the weight of a child to the median weight of a reference population for that particular age.

Anthropometric data was collected from a total of 666 children. The ratio for boys and girl was 1.00, which is within the estimated range of 0.8-1. This shows that the boys and girls were equally represented in the sample as shown in table below.

Distribution of age and sex of sample

Table 1: Prevalence of acute malnutrition based on weight for height z-scores age and by sex

	Boys		Girls		Total		Ratio
AGE (mo.)	**No.**	**%**	**No.**	**%**	**No.**	**%**	**Boy: girl**
6-17	74	49.7	75	50.3	149	22.4	1.0
18-29	72	45.3	87	54.7	159	23.9	0.8
30-41	75	53.6	65	46.4	140	21.0	1.2

42-53	73	49.0	76	51.0	149	22.4	1.0
54-59	40	58.0	29	42.0	69	10.4	1.4
Total	334	50.2	332	49.8	666	100.0	1.0

World Health Organization 2006 growth Standards were used to compute and interpret the survey results. The survey result unveiled a global acute malnutrition (GAM) prevalence of 12.8% (10.2-15.8 95%) classified as at serious levels. The prevalence of moderate malnutrition (MAM) was 11.4 %(8.8-14.6 95%) while the prevalence of severe acute malnutrition (SAM) stood at 1.4% (0.7- 2.7 95% CI). Boys were more severely malnourished than girls and could be attributed to gender roles, which will be explained by assessing health behaviour, hygiene and care practices.

Table 2: prevalence of acute malnutrition by weight for height z-scores and/or oedema and by sex

	All N = 666	**Boys** n = 334	**Girls** n = 332
Prevalence of global malnutrition **(<-2 z-score and/or oedema)**	(85) 12.8 % (10.2 - 15.8 95% C.I.)	(54) 16.2 % (12.0 - 21.4 95% C.I.)	(31) 9.3 % (6.7 - 12.8 95% C.I.)
Prevalence of moderate malnutrition **(<-2 z-score and >=-3 z-score, no oedema)**	(76) 11.4 % (8.8 - 14.6 95% C.I.)	(46) 13.8 % (9.7 - 19.2 95% C.I.)	(30) 9.0 % (6.4 - 12.6 95% C.I.)
Prevalence of severe malnutrition **(<-3 z-score and/or oedema)**	(9) 1.4 % (0.7 - 2.7 95% C.I.)	(8) 2.4 % (1.1 - 5.0 95% C.I.)	(1) 0.3 % (0.0 - 2.3 95% C.I.)

Table 3: prevalence of acute malnutrition by age, based on weight for height z-scores and/or oedema

		Severe wasting **(<-3 z-score)**		**Moderate wasting** **(>= -3 and <-2 z-score)**		**Normal** **(> = -2 z score)**		**Oedema**	
Age (mo.)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	149	4	2.7	13	8.7	132	88.6	0	0.0
18-29	159	1	0.6	19	11.9	139	87.4	0	0.0
30-41	140	3	2.1	20	14.3	117	83.6	0	0.0
42-53	149	1	0.7	16	10.7	132	88.6	0	0.0

54-59	69	0	0.0	8	11.6	61	88.4	0	0.0
Total	666	9	1.4	76	11.4	581	87.2	0	0.0

Table 4: Distribution of acute malnutrition and oedema based on weight for height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor No=0(0.0 %)	Kwashiorkor No=0(0.0 %)
Oedema absent	Marasmic No. 9(1.4 %)	Not severely malnourished No. 657(98.6 %)

Prevalence of acute malnutrition based on MUAC

Mid upper arm circumference (MUAC) is a good predictor for identifying malnourished children at a high risk of death. Table 5 below illustrates GAM by MUAC at 4.1% (2.9-5.6 95% CI), and SAM at 0.6% (0.2-1.6 95% CI) with no significant difference between sexes.

Table 5: prevalence of acute malnutrition based on MUAC cut-offs (and/or oedema) and by sex

	All n = 666	**Boys** n = 334	**Girls** n = 332
Prevalence of global malnutrition **(< 125 mm and/or oedema)**	(27) 4.1 % (2.9 - 5.6 95% C.I.)	(9) 2.7 % (1.5 - 4.8 95% C.I.)	(18) 5.4 % (3.4 - 8.5 95% C.I.)
Prevalence of moderate malnutrition **(< 125 mm and >= 115 mm, no oedema)**	(23) 3.5 % (2.3 - 5.2 95% C.I.)	(8) 2.4 % (1.3 - 4.5 95% C.I.)	(15) 4.5 % (2.6 - 7.7 95% C.I.)
Prevalence of severe malnutrition **(< 115 mm and/or oedema)**	(4) 0.6 % (0.2 - 1.6 95% C.I.)	(1) 0.3 % (0.0 - 2.2 95% C.I.)	(3) 0.9 % (0.3 - 2.8 95% C.I.)

Table 6: prevalence of acute malnutrition by age, based on MUAC cut offs and/or oedema

		Severe wasting **(< 115 mm)**		**Moderate wasting** **(>= 115 mm and < 125 mm)**		**Normal** **(> = 125 mm)**		**Oedema**	
Age	**Total no.**	**No**	**%**	**No.**	**%**	**No.**	**%**	**No**	**%**

(mo.)		.						.	
6-17	149	3	2.0	16	10.7	130	87.2	0	0.0
18-29	159	0	0.0	6	3.8	153	96.2	0	0.0
30-41	140	0	0.0	1	0.7	139	99.3	0	0.0
42-53	149	0	0.0	0	0.0	149	100.0	0	0.0
54-59	69	1	1.4	0	0.0	68	98.6	0	0.0
Total	666	4	0.6	23	3.5	639	95.9	0	0.0

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

Underweight is a composite index of height-for-age and weight-for height, which means it, accounts for both acute and chronic malnutrition. Low weight-for-age is as a result of insufficient weight gain relative to age. The survey finding indicated that 39.3% (35.3-43.4 95% CI) of children in the county are underweight).This is high compared with the national underweight averages of 11% (KDHS[7] 2014/2015).There was no significant difference in underweight between sexes as shown in table 10.

Table 7: prevalence of underweight based on weight-for-age z-scores by sex

	All n = 664	**Boys** n = 333	**Girls** n = 331
Prevalence of underweight (<-2 z-score)	(261) 39.3 % (35.3 - 43.4 95% C.I.)	(137) 41.1 % (35.3 - 47.3 95% C.I.)	(124) 37.5 % (31.7 - 43.6 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(198) 29.8 % (26.2 - 33.7 95% C.I.)	(97) 29.1 % (23.8 - 35.2 95% C.I.)	(101) 30.5 % (25.7 - 35.8 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(63) 9.5 % (7.3 - 12.2 95% C.I.)	(40) 12.0 % (9.1 - 15.6 95% C.I.)	(23) 6.9 % (4.6 - 10.3 95% C.I.)

Table 8: prevalence of underweight by age, based on weight-for-age z-scores

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

[7] Kenya Demographic Health Survey

Age (mo.)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	147	10	6.8	41	27.9	96	65.3	0	0.0
18-29	159	17	10.7	48	30.2	94	59.1	0	0.0
30-41	140	17	12.1	43	30.7	80	57.1	0	0.0
42-53	149	14	9.4	51	34.2	84	56.4	0	0.0
54-59	69	5	7.2	15	21.7	49	71.0	0	0.0
Total	664	63	9.5	198	29.8	403	60.7	0	0.0

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

Stunting as reflected by low height-for-age results from prolonged period of inadequate food intake, poor dietary quality, poor young child feeding practices and combination of factors. It's a proxy indicator of chronic malnutrition. Update from KDHS 2014/2015 on stunting rates in Kenya: West Pokot County has highest stunting prevalence in Kenya at 45.9%. KDHS is national demographic health survey conducted after five years. The rates are above national prevalence of 26%. The NCA anthropometric survey indicated prevalence of stunting rate at 46.6 **% (41.7- 51.5 95% CI)**. An analysis of stunting by gender revealed that boys were more malnourished than girls (p-value =0.005).Segregation of stunting by age group shows slight reduction of stunting rates in children 18-29 months.

Table 9: prevalence of stunting based on height for age z-scores and by sex.

	All n = 657	**Boys** n = 329	**Girls** n = 328
Prevalence of stunting (<-2 z-score)	(306) 46.6 % (41.7 - 51.5 95% C.I.)	(164) 49.8 % (43.5 - 56.2 95% C.I.)	(142) 43.3 % (37.1 - 49.7 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(211) 32.1 % (28.0 - 36.5 95% C.I.)	(111) 33.7 % (27.6 - 40.5 95% C.I.)	(100) 30.5 % (25.6 - 35.9 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(95) 14.5 % (11.8 - 17.6 95% C.I.)	(53) 16.1 % (12.9 - 20.0 95% C.I.)	(42) 12.8 % (8.9 - 18.1 95% C.I.)

Table 10: prevalence of stunting by age based on height for age z-scores

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

6-17	147	16	10.9	40	27.2	91	61.9
18-29	159	23	14.5	66	41.5	70	44.0
30-41	133	31	23.3	42	31.6	60	45.1
42-53	149	20	13.4	46	30.9	83	55.7
54-59	69	5	7.2	17	24.6	47	68.1
Total	657	95	14.5	211	32.1	351	53.4

Table 11: prevalence of overweight based on weight for height cut offs and by sex (no oedema)

	All n = 666	Boys n = 334	Girls n = 332
Prevalence of overweight (WHZ > 2)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)
Prevalence of severe overweight (WHZ > 3)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)

Table 12: Mean z-scores, design effect and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	666	-1.01±0.92	1.14	0	0
Weight-for-Age	664	-1.73±0.96	1.11	0	2
Height-for-Age	657	-1.82±1.09	1.52	0	9

4.1.1.2 Nutrition Vulnerable Groups

The following groups were identified as nutrition vulnerable groups: under five, children from single parents and in particular single mother, pregnant and lactating mothers and HIV/AIDS infected people.

4.1.2 Overview of Villages from qualitative enquiry

	Village 1	Village 2	Village 3	Village 4
Name	TUKOMWOK	KTAIMA	CHEMUSAR	MAYAKIT
Population	412	364	309	834
sub-location	KIPKOMO	SINA	SOSTIN	KAIBOS

sub-county	South Pokot	South Pokot	Central Pokot	West Pokot
Livelihood Zone	Agro-pastoral	mixed farming	Agro-pastoral	Mixed-farming
Distance to nearest Health facility	2km- 20 minutes by walk, some are using motorbikes: 10 minutes	4-5 km- 40- 45 minutes by walk	7km- 2 hours by walk	2 Km- 20 minutes by walk
Distance to the nearest Market	2 km- 20 minutes	4-5 km 45 minutes	Ortum 5 hours by walk (small shop 2 hours by walk)	7km- 30 minutes by vehicles
Ethnic group	Pokot	Pokot	Pokot	Cherangany
Language spoken	Pokot and Swahili	Pokot	Pokot	Cherangany and Swahili
Source of water for drinking	Borehole during dry season, rivers and unprotected sources for piped water	Unprotected spring, unprotected piped water	Mainly rivers and few HoH are using piped water	Unprotected spring, rivers and unprotected piped water
Sources of water for livestock	Rivers	Springs	Springs	Rivers and springs
Communication	Through elders, chiefs and mobiles phones	Through elders, chiefs and mobiles phones	Through elders, chiefs and mobiles phones	Through elders, chiefs, radio station and mobiles phones
nearest primary school	20 minutes by walk	2 km- 30 minutes	1 hours by walk	20 minutes by walk
nearest secondary school	20 minutes by walk	1 hour by walk	4 hours by walk	20 minutes by walk
nearest tertiary school				4 km- 30 minutes by motorbikes
Farming assets	Maize, Beans, green leaves and cabbages and bananas and papayas	Maize, Beans, sugar cane, bananas, tomatoes, potatoes, cabbages, green leaves, tomatoes, Onions	Maize, Beans, Millet, Sorghum, green leaves, few tomatoes on rainy season	Maize, Millet, bananas, potatoes, coffee avocadoes, cabbages, green leaves, tea leaves

Livestock, poultry and products	Cows, goats, sheep, chicken, Milk, eggs	Cows, goats, sheep, chicken, Milk, eggs, wool	Cows, goats, sheep, chicken, Milk, eggs	Cows, goats, sheep, chicken, Milk, eggs
Migration	No	No	No	No
Main activities for Men	fencing the farm and business in town, go to Chapareria, sell livestock and crops in Chapareria	fencing the farm, bit of farm work, go to the centre in Sina, sell livestock and crops in Sina	Look after animals, farm work, collect heavy firewood, 2 times a week go to the centre in Sostin, sell livestock and crops in Ortum	Gets feeds for the cattle, fence the farm, go to the centre in SIYOI
Main activities for Women	HoH duties (fetching water, look after firewood, prepare breakfast lunch and dinner, wash utensils, wash children, clean the compound) Milking the cattle, work in the field, take care of children	HoH duties (fetching water, look after firewood, prepare breakfast lunch and dinner, wash utensils, wash children, clean the compound) Milking the cattle, work in the field, take care of children look after the cattle	HoH duties (fetching water, look after firewood, prepare breakfast lunch and dinner, wash utensils, wash children, clean the compound) Milking the cattle, work in the field, take care of children Mining	HoH duties (fetching water, look after firewood, prepare breakfast lunch and dinner, wash utensils, wash children, clean the compound) Milking the cattle, work in the field, look after the cattle
Access and use of latrines	Good latrines coverage, good use except when they are working in the field	Few have latrines	Only 2 Hoh have latrines	Good latrines coverage, good use except when they are working in the field
Place for delivery	They prefer to give birth at home with the TBA but if it takes long or complication they go to the Health centre	Give birth at home with the help of TBA	Give birth at home with the help of TBA	They prefer to give birth at home with the TBA but if it takes long or complication they go to the Health centre

4.1.3 Local Definition and Understanding of Good Nutrition and Malnutrition

The community recognizes lack of balanced as the main cause of child undernutrition. They also were able to recognize some manifestation of acute malnutrition like kwashiorkor and marasmus and its causes as lack of balanced diet and diseases like diarrhoea but could not identify chronic malnutrition as a form of malnutrition but rather caused by genetic composition which is hereditary.

4.1.4 Nutrition

Households in Agro-pastoral and Mixed farming zones predominantly consume maize meal paste called "ugali" and vegetables for lunch and dinner with some few alterations with a mix of beans and maize "githeri". Tea with little milk and ugali left offers are taken for breakfast. Children mostly take the same meals as other household members. Households consume less fruits as most of them are grown for sale i.e. Papayas, Mangoes in parts of agro-pastoral zones as Ortum and Chepareria. Households mostly in Agro-pastoral livelihood zones prefer giving tea to children instead of milk due to the little production of milk by the few traditional cows. In Mixed farming livelihood zone milk is sold at the households who do not have enough milk for each family member. The mothers in most households take lunch with children while their husbands take lunch at the trading Centre as they chart with their fellow men "collecting information". The changes in household food consumption were good with plenty of traditional foods available. Foods were not sold for money so milk; sorghum/millet meals were mostly consumed. This was as a result of low demand for money then unlike now where all food, crops and livestock products are sold. In terms of child nutritional status to due availability of food there were few cases of malnutrition compared to today.

4.1.5 Food Security and Livelihoods

The population in the Agro-pastoral and mixed farming livelihoods zones depends on sale of farm products (Maize, beans, vegetables, onions), livestock and livestock products i.e. milk, eggs. This is primarily sold to get money to supplement household food, starting with livestock who reproduce fastest/easiest, from chicken, goats, then cattle respectively. Large animals i.e. cattle are sold to pay for children school fees or other key expenditures like hospital bills. Farm products like maize are sold during the months of November till January and for some households till March. The household rebuy the maize from traders at higher prices from April till the next harvest occurring in October/November. Milk availability for households in Agro-pastoral livelihood zones increases with increase in pasture-during the rainy season from April. Other sources of income for household in Agro-pastoral livelihoods include casual labour mostly during planting, weeding periods from March to June/July and during harvesting periods: August to November for beans and maize. In the mixed farming livelihood zones households have a variety of income sources with sale of milk being a key source of income which is sold at the nearest milk cooling plants. In Mixed farming livelihood zones they have more sheep thus some households sell wool. Other parts of mixed farming zones grow potatoes instead of maize due to relatively high altitudes. Livelihood across the two livelihoods has changed overtime due to a number of reasons: Increased population has exerted pressure on land thus less food production. The distance to markets has also reduced, thus goods reach markets and traders come from far to purchase the produce. A smaller proportion of population is formally employed in the government departments. Some of the notable challenges to sustainable source of incomes are erratic rains affecting farm produce, farm products price fluctuation due to market gluts, small parcels of land which often leads to boundary conflicts among other challenges.

4.1.6 Water, sanitation and hygiene (WASH)

Access to safe water and sanitation facilities is directly linked to the overall health of individuals and communities. Improved WASH context has the potential to prevent 8 percent of deaths and 10 percent of the disease burden in developing countries[8]. Poor WASH context is linked to childhood undernutrition, cognitive delays and stunting[9]. The results from the Link NCA risk factor survey indicate 37.6% of households using safe water sources and 83.1% doing nothing to improve drinking water. The major sources of household water are natural rivers and boreholes. Access to toilet is also low at 50.8% with majority being traditional pit latrines (West Pokot SMART 2014). The survey established the most common method of solid waste disposal at households is to throw on the open field (70.86%) and also pouring liquid waste outside the house (98.3%). Only 23.43% burn their household waste which is relatively safer compared to the rest of the methods. There is a high risk of oral-faecal contamination due to high rate of open defecation and poor sanitation access and utilisation. The results from qualitative study showed poor management of child and livestock waste due to the community's believe that they are safe. The poor child hygiene practices are due to: lack of caregiver awareness on hygiene practices, maternal workload leading to mothers leaving their children in the care of other older children.

4.1.7 Care Practices

The four optimal Infant and Young Child Feeding (IYCF) practices are: initiation of breastfeeding within one hour of birth, exclusive breastfeeding till six months of life, continued breastfeeding for a minimum of two years and introduction of complementary feeding at 6 months in adequate, safe and age appropriate quality and quantity manner. Some of the common child care practices practiced in the Agro-pastoral and Mixed Farming livelihood zones are a high utilization of herbs after delivery and before 6 month and early introduction of solid and semi solid food (light porridge and milk mixed with untreated water is commonly given at 3 or 4 months, mostly because of high maternal workload worsened by lack of male cooperation). Women stop breastfeeding when they discover their new pregnancy (they complain about poor birth spacing). In some instances girl school students who get pregnant leave their children with their grandparents and go back to school. Women have knowledge on exclusive breastfeeding, that they learn from other women, but do not put them into practice. This is attributed to high influence from traditional birth attendance and mother in laws. Other poor childcare practices revealed during the Link NCA process are the use of inappropriate feeding utensils (*mugo*) for children exposing them to high risk of faecal-oral contamination and leaving care of children to other siblings and grandmothers due to mother's workload. Caring for children are among of the main responsibilities of the women who have to ensure they are brought up well. This therefore contributes to the vulnerability of women as they have to go out to look for money. Moreover, cares provided to children are reduced whereas there are essential to ensure children wellbeing. In such cases, level of vulnerability of children is increased in a critical stage of their development. There were also noted poor maternal care practices during pregnancy which impact on the nutritional status of the foetus/unborn child. This includes poor iron folate supplementation (traditional habits: eating soil) and no reduction of maternal workload for pregnant and lactating mothers leading to poor access to health services during pregnancies.

[8] Üstün, A., Bos, R., Gore, F. & Bartram, J. "Safer Water, Better Health: Costs, Benefits and Sustainability to Intervention

[9] Childhood pneumonia and diarrhoea series

4.1.8 Gender

The Link NCA findings identified skewed gender roles among men and women. This is due to societal expectations of what a woman and man should do, leading to a higher responsibility for women. From the time a woman wakes up in the morning daily activities are so many that they are taking her to late in the night, leaving less time for childcare. Their roles include both household and field responsibilities. Their male counterparts, on the other hand, have few responsibilities with mostly outdoor activities such as field work (taking care of livestock) or sometimes in the farm work (either ploughing, planting, weeding and harvesting). Boys duties are more of outdoor taking care of young cows-calves- and helping their mothers fetching water while the girls help their mother in all households duties including taking care of their siblings.

4.1.9 Basic causes

Unreliable rainfall

Most households depend on one or two rain fed crops and vegetable are not growing due to poor access to irrigation. This leads to a situation in which households are overly dependent on one or two crops and vulnerable to weather patterns and crop diseases. Furthermore, livestock are also dependent on rainfall for their access to pasture.

Poor road infrastructure

West Pokot County has a poor terrain coupled with poor road networks. The chief, pastors, most caregivers and CHWs mentioned poor road infrastructure as a barrier leading to inaccessibility to some facilities, whenever it rains, some areas are cut off from markets and health facilities.

The road network in the County is predominantly made from soil and gravel surface, which makes up 87 percent of the road network. The County has no rail network, ports and airports. Airstrips are completely inactive.

Education

The county has a total of 503 primary schools, 58 secondary schools and 479 ECD centres. There are 11 tertiary institutions, which cater for both primary and secondary graduates. These comprise of 5 polytechnics and 4 middle level colleges and Kapenguria extra Mural Centre, a constituent of the University of Nairobi. Despite this, the County has no higher learning tertiary institutions; this hinders transition rates of students from secondary schools. The school enrolment rates in our study area are quite high as revealed by the risk factor survey.

Housing

The main housing types in the County are grass thatched houses, semi-permanent and permanent houses. The county housing sector is characterized by inadequacy of affordable and decent housing, low investment, and extensive and inappropriate dwelling units.

Electricity Coverage

Energy is very important for economic development due to its impact on productivity. The County has electricity coverage of about 2 per cent. Currently, Kenya Power is in the process of extending the supply lines to connect more centres. In order to address the shortage of power supply, public institutions need to encourage alternative use of renewable energy sources such as solar energy, which is abundant in the County.

Population Growth

In 1999, the county had a total population of 308,048 people while in 2009, the population was 512,690 representing an inter census growth rate of 5.2 per cent per annum. This huge increase of population will exert more pressure on social amenities especially health

services, education and food security. This high population growth rate poses a big challenge. For sustainable development to be realized in the County there is a need to intensify awareness creation on family planning and addressing the cultural barriers that prevent and hinder use of contraceptives. Currently, contraceptive acceptance is only 9 per cent and should be increased to at least 60 per cent to reduce the population growth rate and total fertility rate.

4.2 List of hypothesized risk factors and pathways

4.2.1 At the initial workshop

Based on the results of a secondary data review and literature review of risk factors to under nutrition, 23 causal hypotheses along with causal pathways to under nutrition in agro-pastoral and mixed-farming livelihoods zone in the West Pokot County were developed and presented to technical experts during a preliminary workshop on the 18th and 19th January 2015. These 23 causal hypotheses were then debated and consensually rated according their association with under nutrition in the local context of study. The following table shows the results of the rating exercise and the rate of each hypothesis.

Stakeholders validated all hypotheses as shown in table 13.[10]

Table 13: Causal Hypothesis rating

Causal hypotheses		Preliminary rating according association with under nutrition
A	High prevalence of child illness: ARI, Clinical malaria, diarrhea and environmental enteropathy	High
B	Low supplementation and immunization coverage	High
C	Low access to health services / low access to education	High
D	Poor health seeking behaviour	High
E	Inadequate breastfeeding practices	High
F	Inadequate dietary diversity and meal frequency	High
G	Poor nutritional status of pregnant and lactating women	Medium
H	Low Birth Weight	Medium
I	Lack of women empowerment	Medium
J	High maternal workload	High
K	Low sources of incomes/ low sources of diversified incomes	High

[10] After the preliminary workshop, hypotheses concerning pastoral livelihoods were segregated from hypotheses concerning agro-pastoral and mixed farming livelihoods. The lists of causal hypotheses for studied livelihoods were approved by stakeholders in March 2015, before the beginning of the survey.

L	Poor crop production (quantity, diversity et quality)	Medium/low
M	Losses of crop incomes during storage	Medium
N	Poor livestock productivity	Medium
O	Poor access to market	Medium/low
P	Fluctuation of prices on local market (pricing)	Low
Q	Inadequate intra-household incomes utilization	High
R	Low level of education among caregiver	Medium
S	Insecurity and conflict	Medium
T	Poor access to safe water	High
U	Poor sanitation access, utilization and practices	Medium
V	Poor hygiene practices	Medium
W	High HIV/AIDS prevalence	Medium

4.2.2 Additional hypothesis that derived from the field data collection

An additional causal hypothesis was identified by communities during the qualitative survey: Poor birth spacing

4.3 Results by causal hypotheses

The following section presents the quantitative results of the Link NCA risk factor survey triangulated with relevant qualitative data, by causal hypothesis.

4.3.1 Hypothesis A: High prevalence of childhood illness: ARI, clinical malaria, diarrhea and environmental enteropathy

In addition to lack of food, one of the most important immediate causes of malnutrition and child death is disease. Malnutrition can also increase the risk of infection, while infection can cause malnutrition, leading to a vicious cycle referred to as the infection-malnutrition cycle. Observational studies show that repeated episodes of diarrhea or parasitic infection are associated with increased risk of stunting and subsequent cognitive deficits in childhood and later in life. Possible mechanisms for enteric infections leading to growth faltering include reduced nutrient absorption through lower intestinal contact time during episodes of acute diarrhea, greater nutrient losses from persistent diarrhea (e.g., zinc) or intestinal bleeding (e.g., hookworm infection), reduced appetite, and diversion of energy and nutrients from growth to the immune system to fight the infection. According to Checkley et al. (2008) twenty-five per cent of stunting could be attributed to five or more diarrhea episodes before 24 months of age. In Ethiopia, children having diarrhea in the two weeks prior to data collection were found 2.3 times more likely to be stunted (Teshome et al., 2011). Children who had diarrhea episodes after six months of age experienced growth faltering as well, followed by a period of partial or full catch-up growth (Checkley et al., 2003). The unhealthy environment is usually taken into account through symptoms such as diarrhea. It is important to note that diarrhea is not the only pathway in which unhealthy environment impacts growth. Indeed, diarrhea accounted for 5 to 20% of linear growth deficit in some studies (Poskitt *et al.*, 1999) but fewer diarrhoeas did not improve growth evolution in data from Gambian villages. In addition to

symptomatic infection, a subclinical condition called environmental enteropathy (EE), also known as tropical enteropathy, may also contribute to early life growth faltering. Environmental enteropathy (EE) is a poorly defined state of intestinal inflammation without overt diarrhea that occurs in individuals exposed over time to poor sanitation and hygiene. In the growth and intestinal enteropathy study in Gambia (Campbell *et al.*, 2003), children had diarrhea 7.3% of the time but had L: M (lactulose to mannitol urinary excretion ratio, an indicator of intestinal permeability) values associated with growth suppression 76% of the time, and diarrhea represented one-tenth of the growth suppressive intestinal disease these children endured most of their lives. The causes are most likely related to repeated ingestion of pathogenic bacteria and an altered composition of the intestinal microbiota, which together lead to chronic enteric inflammation. Children with EE are believed to have impaired growth through two mechanisms: (1) reduced nutrient absorption due to decreased surface area in the small (upper) intestine and (2) elevated intestinal permeability, which increases translocation of antigenic molecules that stimulate the immune system and divert energy from growth. The combined effect of these two processes may impair a child's ability to effectively utilize nutrients in the existing diet for growth and development. EE is thought to be highly prevalent in low-income countries and develops early in life: by age 8 months, 95% of a birth cohort in the Gambia showed signs of EE and on average children in the cohort exhibited signs of EE during 75% of their first year of life. Besides diarrhea and EE, other illnesses can contribute to the risk for stunting as well. All illness measures in the study by Bloss et al. (2004) were significantly associated with stunting. These illnesses included diarrhea, upper respiratory infection, measles and other illnesses (malaria, vomiting, skin rashes or severe headaches and stomach aches). Illness in general is likely to contribute to stunting. A study in Ethiopia found higher stunting rates among children who reported presence of illness in the month prior to data collection (Asres & Eidelman, 2011). Fever, cough or diarrhea in the fortnight before data collection increased the risk for stunting in Uganda (Engebretsen et al., 2008). Furthermore, having malaria was found significantly associated with stunting in Tanzania (Mamiro et al., 2005). Malaria has several effects on the nutritional status of the host. First, infection tends to restrict food intake through vomiting and anorexia. Malaria also has immunosuppressive effect, which increases the host's susceptibility to infection by other pathogens, which leads to further nutritional deterioration (McGregor, 1982). There are also clear links to low birth weight and IUGR that have effects on later cognitive development and growth. According to data received from West Pokot Authorities and MoH and ACF SMART survey 2014, the top causes of morbidity in children under five in 2013 were malaria (42% of children had fever with child in the last 2 weeks), intestinal parasites, ARIs/ URTI, diarrhea (17.2% of Children had symptoms of watery diarrhea in the last 2 weeks) and pneumonia (31.8% of children suffered from ARI/ cough in the last 2 weeks). To reduce exposure to intestinal infection, WHO recommends that children 12-59 months be dewormed once in every six months. This is due to the fact that they are exposed to poor hygiene and sanitation practices and consumption of contaminated water. Deworming promotes physical growth and cognitive development while preventing anaemia. ACF Smart Survey 2014 in West Pokot results unveiled a deworming rate children aged 12-59 months at 21.1% which is way below national thresholds of 80%. The prevalence of EE in West Pokot is unknown, but the poor environmental condition related to WASH, and high risks of intestinal infection due to faecal-oral transmission suggest that EE prevalence should be high in our study area. The risk factor survey found high levels of childhood illness in the target population with 46.8 per cent of children under five having experienced symptoms of an ARI in the past two weeks (95% CI= 41.2- 55.4%), and 14.4% children under age five in the survey (95% CI= 11.3- 17.5%) had experienced diarrhea. Diarrhea was most common among boys at 15.6 per cent (95% CI=11.5- 19.7%, n=384). In total, 37.1 per cent of the children under age five in the survey had experienced a fever (a proxy indicator commonly used to measure malaria and other acute infection prevalence) in the two weeks previously (95% CI= 32.5- 41.7%).

Furthermore, 54.3 per cent of children under five in the survey were exposed to malaria, as they do not sleep under a mosquito net (95% CI=45.6- 63.1%), despite the RFS found that 87.5% of Agro-pastoral households and 82.3 % of mixed farming households own mosquitoes net (on average each household owns 3.5 mosquitoes nets). During qualitative enquiry, we learnt that parents and new-born are prioritized sleeping under the mosquitoes net was prioritized for babies.

Table14: Child health status indicator results

Child Health Status Indicator (Children 0-59 months)	N	Mean or proportion	Lower Confidence Interval -95%	Upper Confidence Interval-95%
Proportion of children with ARI symptoms in the past 2 weeks	769	46.8%	41.3%	52.3%
Proportion of children with diarrhea in the past 2 weeks	771	14.4%	11.3%	17.5%
Proportion of children with a fever in the past 2 weeks	768	37.1%	32.5%	41.7%
Proportion of children who do not sleep under a mosquito net	747	53.3%	45.6%	63.1%

Major contributor to this pathway are: poor access to safe drinking water, poor hygiene and sanitation practices which lead to intestinal infections, poor use of mosquito nets to protect child from malaria, but also poor housing conditions and access to warm clothing, poor health seeking behaviours and poor care practices as highlighted in the figure 5.

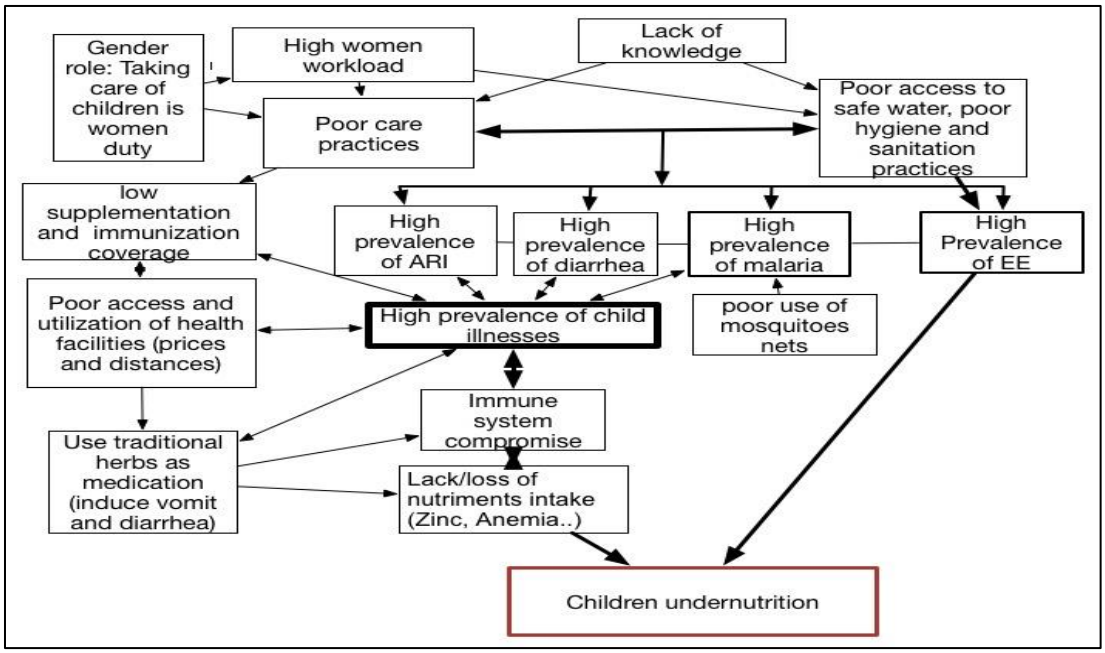


Figure 5: Prevalence of child illnesses pathway to child undernutrition

4.3.2 Hypothesis B: Low supplementation and immunization coverage

Immunization coverage is one of the most cost-effective health investments, with proven strategies that make it accessible to even the most hard-to-reach and vulnerable populations eliminating two to three million deaths each year. It enhances body's immunity to infectious diseases. Studies demonstrate that immunization contributes significantly and positively to reduction in stunting. Having up-to-date vaccinations was protective against stunting for children in Kenya (Bloss et al., 2004). Vaccination status was not related to socioeconomic status. Children with up-to-date vaccinations may come from households with more active health care seeking behaviour. Being adequately immunized was associated with an odds ratio for stunting of 0.68 in Uganda (Engebretsen et al., 2008). Increasing the ratio of vaccinated children to 95 per cent is estimated decreasing stunting rates in Tanzania by 9.6 per cent (Alderman et al., 2005). In Ethiopia contradictory results were found. Stunting was more likely in children who were fully vaccinated (47.1%) compared to children who had at least one vaccination (34.1%) (Yimer, 2000). The authors' explanation for these results is the onset of stunting at a young age in study. Children may have been stunted before they had received the recommended vaccinations. Micronutrient deficiency, specifically vitamin A deficiency, is estimated to cause more than a half million deaths among children aged under five[11]. High impact nutrition interventions (HINI) recommend that a child should be supplemented at-least twice a year (every six months) for children 6-59 months. The dosage offers protection against common childhood infections; averts blindness and substantially reduces mortality. A study from *Elizabeth W. Kimani-Murage et Al.* demonstrates that receiving vitamin A supplement may be beneficial to growth of young children in Kenya. In fact, the odds of stunting were 50% higher among children who had not received vitamin A supplement compared to children who had received the supplement (p=0.038). Vitamin A supplementation to preschool children is known to decrease the risks of mortality and morbidity from some forms of diarrhoea, measles, human immunodeficiency virus (HIV) infection, and malaria[12]. Results from the County SMART Survey 2014 indicate Vitamin A coverage for children 6-11 months supplemented at least once stood at 55%. Vitamin A supplementation for children 12-59 months was 68%, 41% and 12.4% once, at least twice and thrice respectively. Vitamin A supplementation for children 12-59 months once and twice stood at 68% and 41% respectively. Vitamin A supplementation coverage was below national targets of 80%.The findings from risk factor survey revealed 71.9% of children were adequately supplemented (at least once for children 6-11 months and twice for children from 12 to 59 months). However, rates are below the national targets of 80%. Findings from qualitative study shows supplementation and immunization are positively perceived by communities. However it was not rated by the community as a risk factor. Low coverage could be a result of high maternal workload and distance to health facilities which increases the cost burden of accessing the service at the nearest health facility, low caregivers knowledge on optimal immunization and supplementation practices and poor immunization campaign coverage. Findings from the risk factor survey show that immunization rates were quite high, as reflected in OPV3 rates among children aged 12-23 months with immunization cards available. On those children aged 12-23 months who had an immunization card available, 85.7 percent had been immunized for OPV3 (a proxy

[11] Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, *et al.* Maternal and child undernutrition: global and regional exposures and health consequences. Lancet 2008; 371(9608): 243-60. http://dx.doi.org/10.1016/S0140-6736(07)61690-0

[12] Villamor E[1], Fawzi WW, [1]Department of Nutrition, Harvard School of Public Health

indicator for full immunization) (95% CI = 76.4- 95.0%). However, immunization cards were available for 80.4 per cent of all children age 12-23 months (n= 148). Survey results revealed that Vitamin A supplementation coverage was below national targets of 80%. In fact, 71.9% (95 CI = 66.4- 77.4%, n=584) of children were adequately supplemented (children aged 12 to 59 months). However, health card was available only for 11.6% of all children who confirmed having received vitamin A supplementation. Findings from the qualitative inquiry show that communities positively perceive immunization and supplementation. However, high workload of mothers, distance to access to health facilities, poor coverage of vaccination campaigns, which does not always reach distant villages, lack of information on the age at which children must be vaccinated or number of times recommended for supplementation are contributors to this risk factor as shown in the figure 6.

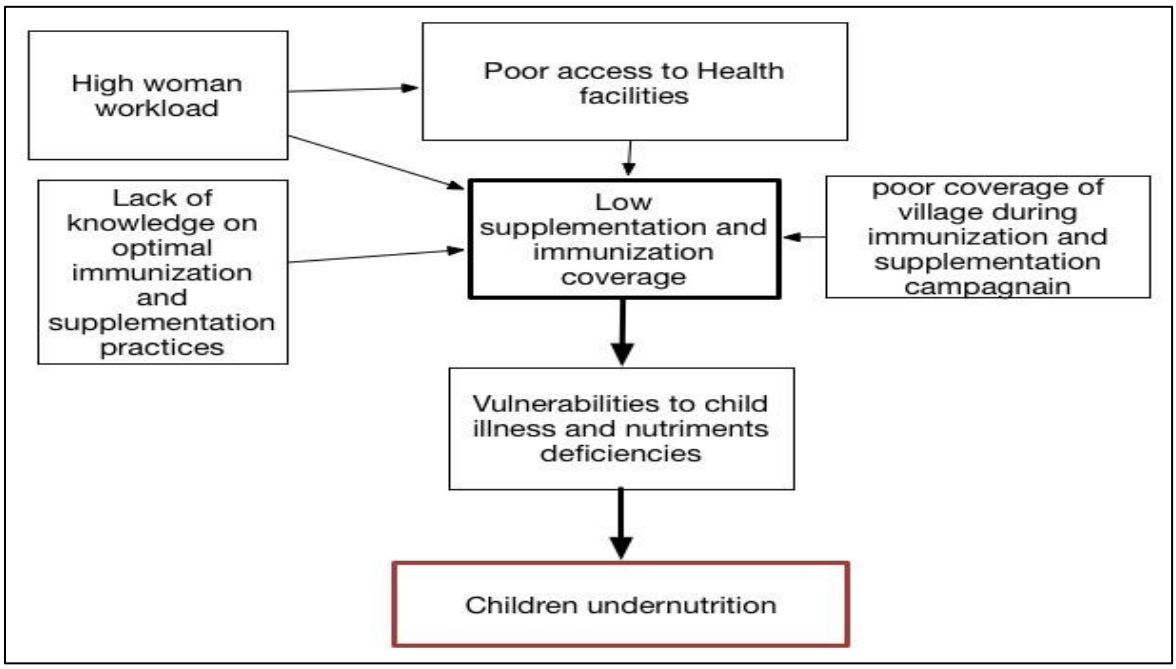


Figure 6: Low immunization and vitamin A coverage pathway to child undernutrition

Table15: Health indicator results

Health indicator		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Immunization coverage	% of children who had an immunization card	770	70.9	65.6	76.2
	OPV3 coverage				
	% of children aged 12-23 months who had an immunization card	148	80.4	72.5	88.4
	% of children aged 12-23 months who received	119	85.7	76.4	95.0

	OPV3 immunization				
Vitamin A supplementation coverage	% of children aged 6-59 months who received a vitamin A supplementation last year	673	81.7	76.9	86.6
	% of children aged 6-59 months who received an adequate number of times vitamin A sup (1 time for children aged 6-11 months and 2 times for children aged 12-59 months)	584	71.9	66.438	77.4
	Sources of verification for Vitamin A supplementation : recall	595	88.4	83.1	93.8
	Sources of verification for Vit A supplementation : card	595	11.6	6.3	16.9

4.3.3 Hypothesis C: Low access to social services / low access to education

Access to Health services

A lack of health care services is highlighted in the UNICEF conceptual framework as one of the main underlying causes of disease, which in turn affects child nutrition. Health services may be community based or facility-based. They can also be preventative or curative; providing education to caregivers about nutrition and treating children before diseases can chronically affect their growth and development. Also access to maternal care services are associated with child stunting. The accessibility of health care facilities influences the risk for stunting. More than an hour travelling distance to a health clinic was found significantly associated with stunting (Chopra, 2003). And a distance of five miles or more to the nearest health care facility was identified to increase stunting rates in Uganda (Biondi et al., 2011). Better accessible health services are expected to reduce stunting. Accessibility of health services could be estimated by the infrastructure: a motor road in every village was estimated to reduce stunting by six per cent. Next to infrastructure, costs are a main determinant for accessibility of health care facilities (Simkhada et al., 2008). Furthermore, cost of accessing health services, i.e. travel costs, are experienced as a barrier especially where distances to healthcare facilities are important. The West Pokot County has 2 Hospital, 2 sub-Sub-County hospital, 7 health centres and 72 dispensaries. Doctor to patient ratio is 1:63,747[13] with an average distance to the nearest health facility of 25 Km, this makes the health services in the County poorly accessible to the population. During the survey, ANC attendance, health seeking behaviours during diarrhea and fever episodes, average time to reach the nearest health facility, location of delivery and barriers to access health care were used to assess the severity of this risk factor.

ANC Attendance and place of delivery

Maternal health service coverage in Kenya remains low, especially in rural areas where 63% of women deliver at home, mainly because health facilities are too far away and/or for lack of transport. According to the results of ACF KAP survey conducted in 2014 in West

[13] (West Pokot County integrated development plan (2013-2017)

Pokot, the main barrier to access ANC was the long distance to reach the health facility. Indeed, publication from May 2014 in Kenya[14] found that households where the nearest facility was offering emergency obstetric care were more likely to deliver at the health facility, but only if the facility was within 2 km of the home. Beyond the 2-km threshold, households were equally as likely to have home and health facility deliveries. There is need for further research on other factors that affect the choice of place of delivery, and its relationship with maternal mortality. The risk factor survey results show that in total, 93.4 percent of mothers saw a health professional for ANC during their last pregnancy (95% CI = 89.8-97.4%). However, less than half of those (34.9 percent) received a minimum of four visits (95% CI = 29.6 – 40.2%, n=404). The vast majority of births continue to be at home, with 56 per cent of mothers reporting to have given birth at home during their last delivery (95% CI = 44.2 – 67.7%). 43.7 percent were assisted by a health professional (n=444), while a traditional birth attendant assisted 51.3 % of mothers. Findings from qualitative enquiry revealed that distance to health centres and high workload of women were the main constraints to attend ANC. Furthermore, women feel more comfortable to give birth at home assisted by a TBA.
"*TBA knows how to massage pregnant women; they can tell us if the delivery will go well, we feel confident"* FGD participant from KTAIMA.

Health seeking behaviours[15]

The findings revealed that children who experienced diarrhea in the past two weeks (n=112), approximate half of children (50 percent, 95% CI= 39.5- 60.4%), sought advice from a health professional in health centre. The children who experienced fever in the past two weeks (n=288), estimated 46.5 percent of children, sought treatment in a public health centre. A slightly difference in health seeking practices appears between boys (44% CI 95% = 33.7- 54.4%) with that of girls (49% CI 95% = 39.5- 58.4%).

Barriers to health facilities

The findings from risk factor survey illustrated that the main barrier to health facilities when a child is sick is the cost of care: indeed, cost of health care, distance to health facilities and lack of transportation means are seen by communities as a major constraint to access health facilities. Limited medical supplies/medicines cost of medicines and accessing medicines at pharmacy (chemist) due to shortages at government health facilities lead to high charges of medicines at the chemists. During the community rating exercise, poor access to health centre was identified as one of the major contributor to child malnutrition.

Distance to health facilities

Studies have revealed that in average more than an hour travelling distance to a health clinic was found significantly associated with stunting (Chopra, 2003). Furthermore, a distance of five miles or more to the nearest health care facility was identified to increase stunting rates in Uganda (Biondi et al., 2011). The risk factor survey revealed that only 21.2% of household (95% IC= 13.1- 29.5%, n=479) are living in less than 30 minutes far from an health centre, and for 34% of household it takes more than an hour to reach the nearest health facility. The findings also revealed that 7.1% of household take more than 3 hours to reach a health facility (95% CI= 1.8- 12.4%, n=479) as highlighted in table 16. Finding from the qualitative enquiry found that in rainy season this risk factor increased due to lake of money and impassable ways to health facilities.

[14] BMC Health Serv Res. 2014 May 10;14:212. doi: 10.1186/1472-6963-14-212.
"Not too far to walk": the influence of distance on place of delivery in a western Kenya health demographic surveillance system.
Mwaliko E1, Downing R, O'Meara W, Chelagat D, Obala A, Downing T, Simiyu C,
[15] Cf. hypothesis D for a more detailed analyse

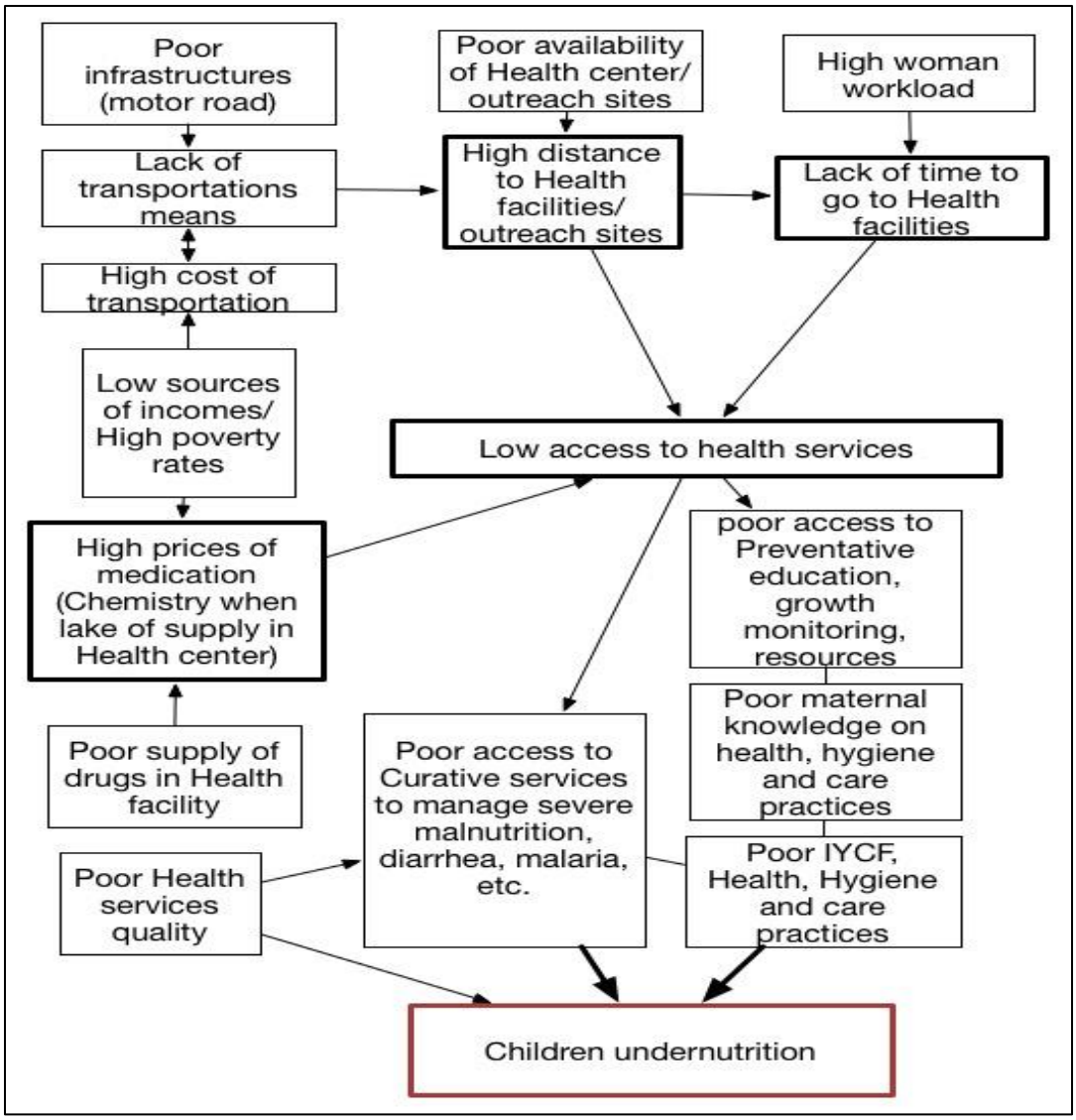


Figure 7: Pathway to low access to health services as linked to undernutrition

Table 14: Risk factor analysis on indicators aligned to low access to health services

Indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
ANC attendance	ANC attendance				
	% of caregivers who did see anyone during last pregnancy	470	92.7	89.2	96.3
	% women who saw a	409	93.6	89.9	97.4

	health professional during last pregnancy				
	Mean no of visit to health worker	404	3.1	2.9	3.3
	% women who saw a TBA during last pregnancy	408	47.3	38.7	56.2
	Mean visit to TBA during last pregnancy	408	3.9	2.4	5.4
	% women who attended ANC at least or more than 4 times during last pregnancy	404	34.9	29.6	40.2
	% women who attended ANC less than 4 times during last pregnancy	404	65.1		
Access to health facilities	Average Time to go to Health Centre				
	% of household who are able to reach the nearest health facility in less than 30 minutes	479	21.3	13.1	29.5
	% of household who are able to reach the nearest health facility in 30 minutes to 1 hour	479	44.7	36.1	53.3
	% of household who are able to reach the nearest health facility in 1 to 3 hours	479	26.9	17.7	36.2
	% of household who are able to reach the nearest health facility in 3 to 5 hours	479	7.1	1.8	12.4
	% of household who are able to reach the nearest health facility in more than 5 hours	479	0	0	0
Location of	Location of delivery				

delivery	% of women who delivered in hospital/ health facility		43.8	32.1	55.5
	% of women who stayed at home/ village for their last delivery		56.0	44.2	67.7

Access to education services

According to secondary data from the West Pokot First County Integrated Development Plan 2013-2017, the school enrolment rate in West Pokot County is 88%.

The risk factor survey shows a high rate of school enrolment, indeed 95.6% (95% CI= 92.2-98.1%, n=437) of respondents claim that their children from 6 to 18 years old are enrolled to school. Furthermore, the distance to school seems not to be an issue with regards to school enrolment. The findings revealed that more than the half of the households was living at less than 30 minutes from a primary school (55.2%, 95% CI: 47- 63.3%, n=385), and 94% at less than an hour from a primary school. The findings also revealed that 67.3% of the households were living at less than an hour from a secondary school, but most of the students are enrolled in secondary school. Findings from qualitative enquiry confirm that school enrolment for children and teen-agers are highly value by communities. Early pregnancy which was the main reason, 10 to 20 years ago, to drop out school, no longer contribute to abandon of school, the mother of the girl taking care of the child while the student is at school. These practices lead to poor breastfeeding practice of baby from student mothers. Girls are equally enrolled at school than boys; in fact they are even prioritized as the bride price is closely linked to its level of education. Therefore, parents of an educated girl will get twice more animals and some cash than parents of a girl who did not go to secondary school. Communities did not identify the lake of access to education as a risk factor to children under nutrition; on the contrary they identify spending the money for school fees as one of the main cause of poverty (sale of animals and crops to pay for school fees) which reduced household resources that prevent access to a sufficient and diversified diet. Also high school enrolment rates have contributed to increased maternal workload over time. Indeed teenagers are enrolled in boarding schools which reduce help for household duties to including herding and farming. Based on the school enrolment rates and the link between school fees and low incomes sources this hypothesis was rejected.

Table 15: Risk factor analysis on access to education services

Indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Average distance to school	% of Hoh who reach the nearest primary school in less than 30 minutes	484	55.2	47.1	63.3
	% of Hoh who reach the nearest primary school in between 30 minutes and 1 hour	484	38.8	32.1	45.6
	% of Hoh who reach the	484	5.2	2.1	8.3

	nearest primary school in between 1 and 2 hours				
	% of Hoh who reach the nearest primary school in between 2 and 4 hours	484	0.8	-0.2	1.8
	Average distance to secondary school				
	% of Hoh who reach the nearest secondary school in less than 30 minutes	484	27.5	17.2	37.7
	% of Hoh who reach the nearest secondary school in between 30 minutes and 1 hour	484	39.9	31.6	48.1
	% of Hoh who reach the nearest secondary school in between 1 and 2 hours	484	22.1	14.198	30.0
	% of Hoh who reach the nearest secondary school in between 2 and 4 hours	484	7.7	2.9	12.4
	% of Hoh who reach the nearest secondary school in more than 4 hours	484	2.9	-0.6	6.4
School enrolment	% of HoH where All children 6-18 are enrolled to school	437	95.7	92.2	98.1

4.3.4 Hypothesis D: Poor health seeking behaviour

Acute respiratory infection (ARI), malaria, and dehydration caused by severe diarrhoea are major causes of child morbidity and mortality in Kenya. When a child has symptoms of these illnesses, prompt medical attention is critical. To obtain information on behaviour surrounding these common childhood illnesses, mothers were asked if any of their children under age five had experienced the following symptoms in the two weeks preceding the survey: fever (symptom of malaria), or diarrhea. Mothers who indicated their child had experienced such symptoms were then asked if treatment or advice was sought from a health facility or provider. The risk factor survey findings revealed that 50% of the respondents sought assistance at the health facility when their children have diarrhea. (95% CI= 39.5-60.4 %, n=112) with no significant difference according to the sex of the child. But the qualitative enquiry revealed that first seeking behaviour during diarrhea was to give to the child mix sugar, water and salt and then seek advice to the traditional healer. Then, in absence of improvement, the child would be taken to the health facility. Indeed diarrhea is believed to be caused by several factors. The main factors believed to cause diarrhea are the growth of false teeth (symptoms are treated by traditional healer giving traditional herbs to the child), unsafe water and children who ate soil.

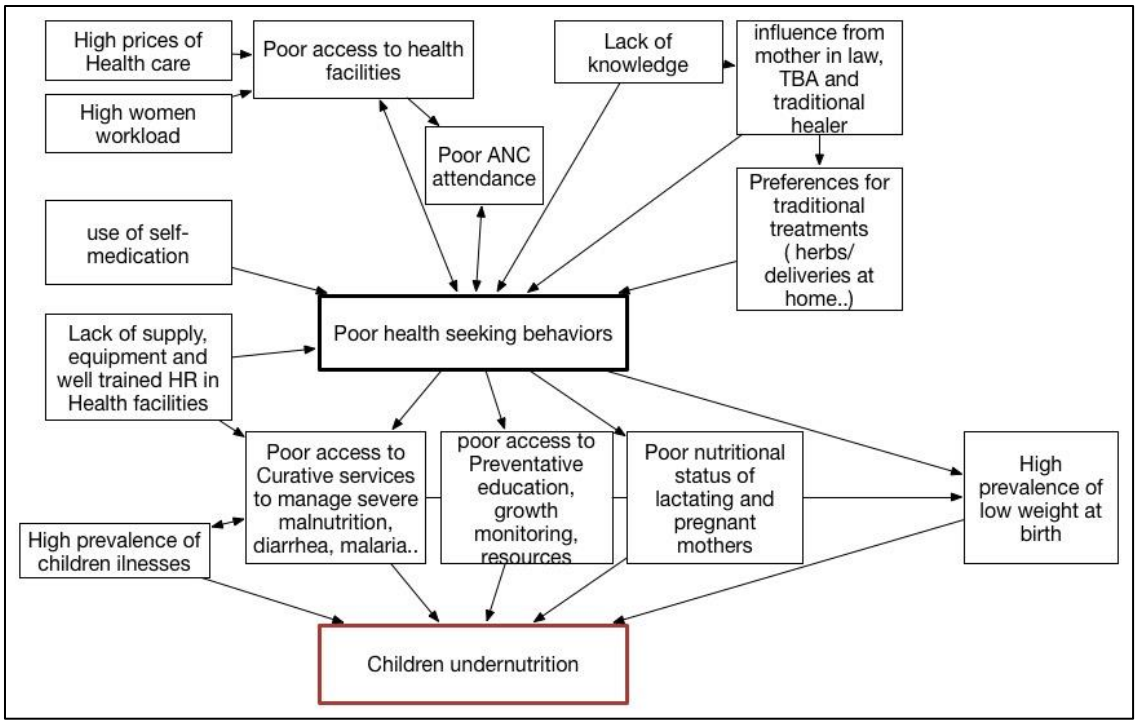


Figure 8: Pathway to poor health seeking behaviour as linked to undernutrition

The quantitative survey found that only 46.5% of children who reported episodes of fever during two weeks before the assessment were taken to health centre for treatment. Figure 9 shows the health seeking practices during the last episode of fever.

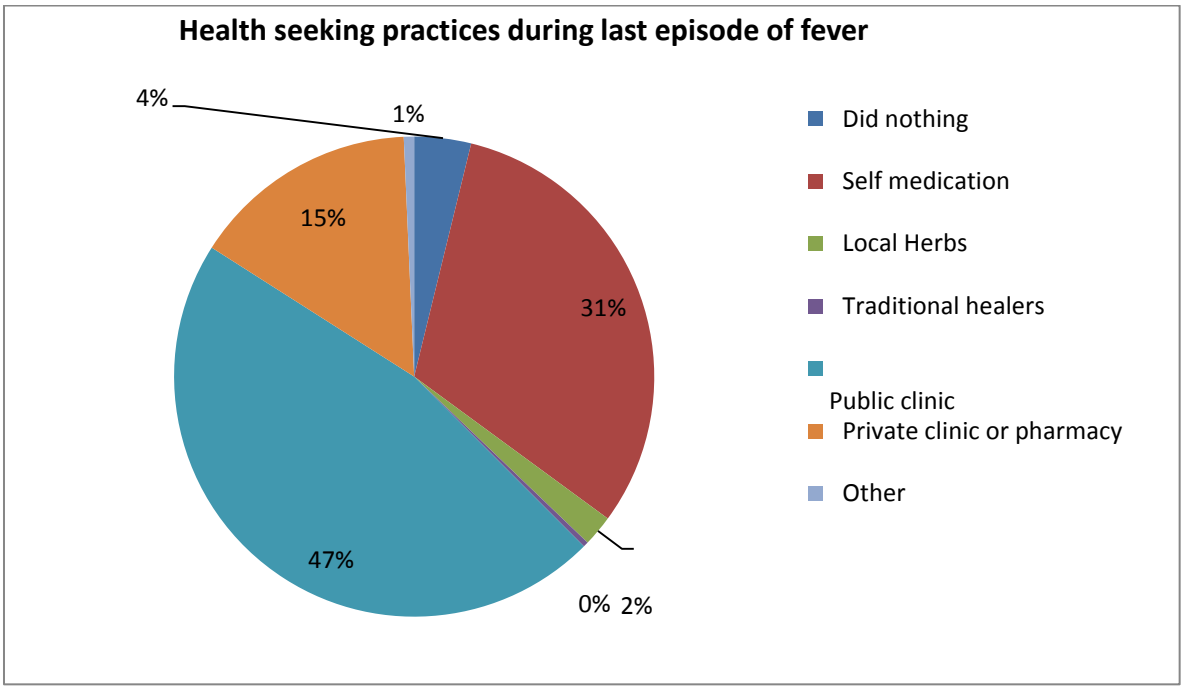


Figure 9: Health seeking practices during the last episode of fever

Qualitative and quantitative survey findings indicate a difference in health seeking practices according to the sex of the child. In fact, 44% of boys (95% CI= 33.7-54.4%, n=143) were taken to the health centre during the last episode of fever, while 49% of girls (95% CI= 39.5- 58.4%, n=145) were taken to health facilities. Girls are considered more

fragile and less resistant to fever than boys by the communities; they are more rapidly taken to health centre than boys. Moreover, ANC attendance and location of delivery can be used as proxy to assess health-seeking behaviour. The risk factor survey found that 93.6% of women did see a health professional during their last pregnancy (95% IC= 89.8-97.4%, n=409), on an average of 3.1 times (95% CI= 2.9- 3.3 times). The gratuity of ANC could explain the high rates of frequentation, but only 34.9% did attend ANC at least 4 times during their last pregnancy as recommended. During qualitative enquiry when we inquired from the mothers on the main barriers to attend ANC at least 4 times, they identified high women workload and long distance to health facilities. Findings revealed that 43.8% of the mothers delivered at the health centre (95% CI= 32.1- 55.5%). Findings from the qualitative inquiry show that recognition of child malnutrition is still an issue, and health-seeking behaviour when children are moderately malnourished is weak. As mentioned in the previous section, determinant of health seeking practices are multiples, during the community rating exercise, communities identify costs and distance as major constraints to seek care in health facilities. But findings from FGD revealed that other factors are contributing to the poor utilization of health facilities. Traditional medicine is prioritized because of its geographical accessibility and affordability but also diagnostic at household or community level also affects health-seeking practices. Mother in law, TBA and traditional healer are the first councillor to seek advices regarding pregnancy or child illnesses. In Pakistan, Mahk et al. (1992) have established a link between child's chances of survival and social etiology of his illness given by the family. The survey says that the distress of the mother is not the same as the presumed cause (natural disease or witchcraft, for example); moreover it does not engage, according to them, the same therapeutic choices. This relationship between belief and behaviour of the mother when her child is sick is also proposed by M.-C and E. Ortigues (1993) from Benin examples. If the mother thinks the child is subject to false teeth disease she will not react the same way to the disease. Similarly the health seeking practices will be influenced by the sex of the child. Girls, perceived as weaker than boys, will be taken to hospital faster than boys. The diagnosis and assessment of severity of the disease made by the relatives and the community define the health seeking practices. Studies of positive deviant cases revealed that caregivers with high level of education are more likely to sought advices at health facilities. Also, during our qualitative survey, we found that the reduce distance to the health centre has an impact on health seeking behaviour. Indeed communities living close to health centres are more susceptible to deliver and seek treatments in health centre. ANC attendance could also be used as a proxy to assess this risk factor. According to Gribble, inadequate ANC increased the risk of stunting by 1.27 times (Gribble et al., 2009). This indicates the importance of good quality ANC during pregnancy. The effect of ANC on stunting is likely to be mediated via socio economic inequalities and therefore limited access to health services. The World Health Organization recommends at least four ANC visits during pregnancy. 34.9 percent of women reported having four or more antenatal visits for their most recent birth. Qualitative survey found that women who live near a health facility and who are educated are more likely to have four or more ANC visits. Findings from the qualitative survey found that the major contributor of inappropriate ANC attendance is the poor knowledge and the high workload of mothers. Additionally, the place of delivery relates to the probability of stunting. Delivery in a private health establishment decreased the risk of stunting (Taguri et al., 2008). Home delivered children were 1.16 times more likely to be stunted compared to children delivered at a health facility in El Salvador (Gribble et al., 2009). Giving birth at home may indicate limited access to health services, which is associated with stunting and poverty. The risk factor survey found that 56 % of women delivered their last child at home.

Table 16 : Risk factor analysis on access to health services

Indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval- 95 %
Iron folate supplementation	% of women who took Iron - folate supplementation during last pregnancy	356	77.3	71.0	84.4
	% of women who took iron folate for less than 90 days during last pregnancy	275	77.8	73.4	82.3
	Mean of no of days iron folate supplementation	275	49.8	45.0	54.5
Assistance for delivery	% of women who were helped by No one during their last delivery	444	1.1	0.2	2.1
	% of women who were helped by a health professional during their last delivery	444	43.7	31.9	55.5
	% of women who were helped by a Traditional Birth Attendant during their last delivery	444	51.4	39.1	63.7
	% of women who were helped by a community health worker during their last delivery	444	0.2	-0.2	0.7
	% of women who were helped by a relative/ friend during their last delivery	444	3.4	1.4	5.4
Health seeking behaviour during diarrhea episode	Health seeking behaviour during diarrhea	Diagrams			

	% of children (0-59 months) who were taken to public health centre during last episode of diarrhea	112	50	39.6	60.5
	% of children (0-59 months) who were taken to a private clinic or chemistry during the last episode of diarrhea	112	11.6	4.7	18.6
	% of boys (0-59 months) who were taken to public Health centre during last episode of diarrhea	60	53.3	40.0	66.6
	% of girls (0-59 months) who were taken to public Health centre during last episode of diarrhea				
Health seeking behaviour when fever episodes	% of children who were taken to Public Health centre during the last episode of fever	288	46.5	38.3	54.8
	% of children who were taken to a Private clinic/ pharmacy during the last episode of fever	288	15.3	10.4	20.1
	% of boys who were taken to Public Health centre during the last episode of fever	143	44.1	33.7	54.4
	% of girls who were taken to Public Health centre during the last episode of fever	145	49.0	39.5	58.5

4.3.5 Hypothesis E: Inadequate breastfeeding practices

Breastfeeding practices and introduction of supplemental foods are important determinants of the nutritional status of children, particularly among children under age

two. With improved nutritional status, the risk of child mortality is reduced and development is enhanced.

Initiation of breastfeeding/ pre-lacteal feeding practices

The breastfeeding initiation practice has a strong impact on the development of the child's immunity (the mother's antibodies are passed through the milk especially in the first hours after birth, in the colostrum). A WHO analysis of 14 low-income countries showed that there are significant associations between early initiation of breastfeeding and a lower risk of underweight status for children (Marriott 2011). This factor is also important in the mother-child relationship, as the skin-to-skin relation builds a bond between the mother and her child. Thirdly, if the infant is not provided with breast milk in the first hours of birth, he/she is likely to be given other liquids, which often contain pathogenic agents that the child cannot yet fight. In total, 100 per cent of sampled children age 0-23 months had ever been breastfed. The survey found high levels of early initiation of breastfeeding, with 85.8 per cent of 0-23 month old children receiving breast milk immediately after birth (95% CI = 81.1- 90.5%, n=318). Within a slightly different according to the sex of the child: 88.2% of boys (95% IC= 82.4- 94.1%, n= 153) are breastfed immediately or within an hour against 83.6% of girls (95% IC= 76.2- 91%, n=165). During qualitative enquiry, mothers explained that boys need more food intake than girls because they are more "active". Findings revealed that 60.8 % of children aged 0-23 months (95% IC= 50.3- 71.4%, n=314) received a traditional mix made from herbs, cow's milk and (untreated) water immediately after birth by the TBA to "clean and protect their stomach".

Exclusive breastfeeding

The World Health Organization on Infant and Young Child Feeding Practices recommends exclusive breastfeeding for the first six months of life (WHO et al., 2008). In a meta-analysis Kramer and colleagues found that infants who are exclusively breastfed for six months experience less incidence of gastrointestinal infection than those who are mixed breastfed as three or four months. According to Edmond, et Al.[16] both predominantly and partially breastfed infants had higher risks of neonatal death than exclusively breastfed infants. If milk-based fluids or solids are provided to breastfed neonates, the risk of neonatal death is increased approximately fourfold. In Kenya, 61 percent of children less than six months are exclusively breastfed[17]. The RFS found low rates of exclusive breastfeeding, with 29.5 percent of children under 6 months old exclusively breastfed (n=95). Given the low number of children in this age group in the sample, the confidence interval is very high and so results should be taken with caution (95% CI=15.5-43.5%). 42% of children aged 0-5 months were given animal milk before 6 months (95% IC= 26.5- 57.4%, n=93). Evidence from the qualitative enquiry suggests that despite mothers are aware of recommendation of exclusive breastfeeding, the practice of feeding young children with traditional herbs, water, goat's and cow's milk, porridge, tea and ugali mixed with soup in addition to breast milk may still be common. The RFS found 42% of children aged 0-5 months were given animal milk before 6 months (95% CI= 26.5- 57.4%, n=93). Findings from the qualitative enquiry show that breast milk is viewed as important for children's health and an important part of childcare. Mothers reported breastfeeding their child until 2 years or before if they become pregnant. But exclusive breast-feeding is not a common practice and water and animal milk are introduced very early, mainly because while the mother is working in the field, older children and grandmothers are taking care of the baby. Indeed, high women workload, insufficient breast milk production and early childbearing are also major contributors to poor exclusive BF practices, according to the

[16] Edmond, K. M., Zandoh, C., Quigley, M. A., Amenga-Etego, S., Owusu-Agyei, S., & Kirkwood, B. R. (2006). Delayed Breastfeeding Initiation Increases Risk of Neonatal Mortality. Pediatrics, 117(3), e380-e386. doi: 10.1542/peds.2005-1496

[17] KDHS 2014

participants. Few months after giving birth, young mothers are going back to school, living the child with her mothers.

Timely introduction of complementary foods

The WHO recommends the introduction of solid foods to infants around the age of 6 months when breast milk is no longer sufficient to maintain optimal growth. The transition from exclusive breastfeeding to receiving complementary foods is a vulnerable period and a time when malnutrition starts for many infants because of inappropriate and/or inadequate feeding practices. Furthermore, early or late introduction of complementary feeding contributes to under nutrition. Introduction of complementary solid, semi-solid or soft foods from six months is regarded most advantageous for child growth. The quantitative survey revealed that 68.4% of children age 6-8 months (n=38) received semi-solid or solid food the previous days (95% CI= 52.5- 84.4%). Findings from the qualitative enquiry revealed that animal milk, porridge, ugali mixed with soup are usually introduced before six months due to insufficient production of milk, high women workload and poor birth spacing.

Continued breastfeeding practices at one year

The risk factor survey found that 78.7% of children are still breastfed after one year (95% CI= 65.3- 79.9, n= 47)

Continued breastfeeding practices at two years

More than half of children in Kenya are still breastfed at age 20-23 months (51 percent)[18]. In our study area, according to results from RFS, only 35.7% (95% IC= 19.6- 51.9%, n=42) are still breastfed at 2 years, as mentioned earlier this can be attribute to high women workload and poor child birth spacing.

Child feeding behaviour

Responsive feeding

It is a style of complementary feeding whereby the mother feeds her child in response to child cues and psychomotor abilities. Responsive feeding guidelines for caretakers may include: 1) self- feeding: let the child pick up food and eat; 2) responsiveness: watch, listen, and respond in words to the child's signals; 3) when the child refuses, pause and question why; don't force feed or threaten; and 4) offer a variety of foods, including fish, eggs, fruits, and vegetables[15]. he quantitative survey found that 58.5% of caregivers of children 6-23 months old have a positive attitude when the child refuse to eat (95% CI= 49.9- 67.2%, n=152), in addition findings from qualitative enquiry suggest that when mothers are working outside of the household, children are watched by older siblings or grandmothers and could get less attention.

Bottle-feeding practices

Feeding a child using a bottle with a teat is highly discouraged because it endangers the baby's health and survival through high risk of faecal-oral contaminations and interference with breastfeeding establishment. Findings from our quantitative survey revealed that 71.8% of children age 0-23 have been fed with a traditional gourd or another inappropriate drinking utensils (95% IC= 63.7- 79.9%, n=319).

Traditional gourds or plastics gourds are filled in the morning with animal milk or porridge or tea and given to baby during the day. Mothers see gourd as a good practice: it can keep the milk for 2 days and also allow the children to be fed while the mother is away.

[18] source KDHS 2014

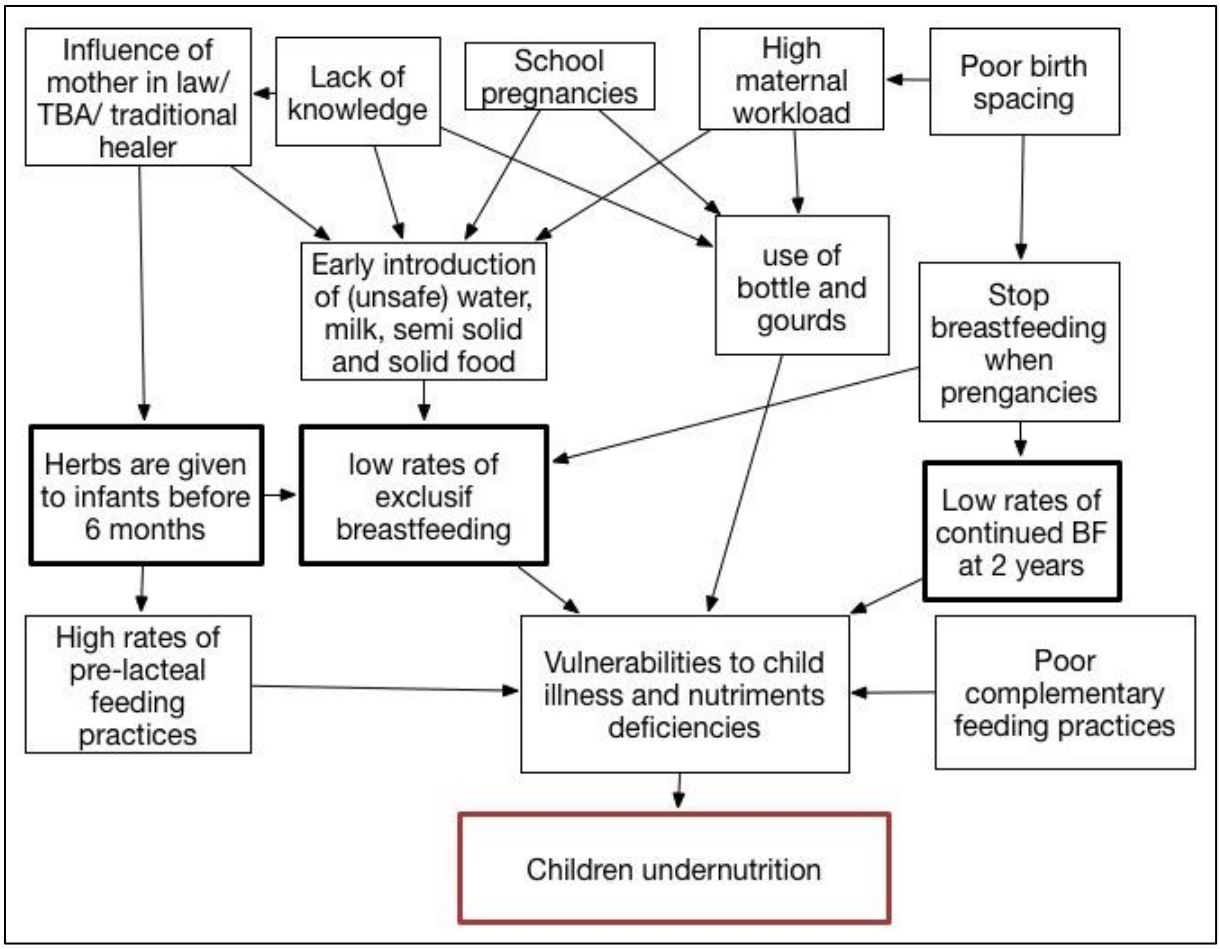


Figure 10: Pathway of IYCF indicators to stunting

Table 17: Infant and Young Child Feeding Indicators

IYCF indicators	Sample	Proportion	Lower Confidence Interval -95%	Upper Confidence Interval-95%
Proportion of children (0- 23 months) with adequate initiation of breastfeeding (<1hr after birth)	318	85.8%	81.1%	90.5%
Proportion of children (0-5 months) exclusively breastfed	95	29.5%	15.5%	43.5%
Proportion of children (12- 15 months) continued breastfed after 1 year	47	78.7%	50.3%	71.4%
Proportion of children (20- 23 months) who are fed breast milk (continued BF at 2 years)	42	35.7%	19.6%	51.8%
Proportion of Children (0-23	314	60.8%	50.3%	71.4%

months) who were given herbs at birth				
Proportion of Children (6-8 months) who received semi solid and solid foods the previous day	38	68.4%	52.5%	84.4%
Proportion of children who (0-5 months) were given animal milk before 6 months	93	41.9%	26.5%	57.4%

4.3.6 Hypothesis F: Inadequate dietary diversity and frequency

Studies have revealed that complementary diets offered to many infants in sub-Saharan Africa are monotonous, bulky and rarely cover the shortfall left by breast milk in providing the energy and nutrients required to support rapid growth, build nutrient stores and assure resistance to infections. For the majority of children in developing countries, growth stunting occurs from several months of birth to about two years of age. This coincides with the time when solid and semi-solid foods are introduced into the diets of infants. Continued BF into the second year of life has been found to have positive effects on the growth of the child.

Poor feeding frequency

Recommended minimum feeding frequency is two times a day for breastfed infants of 6 to 8 months old, three times a day for breastfed children of 9 to 23 months old, and four times a day for non-breastfed children of 6 to 23 months old (WHO et al., 2008). Children under five years of age who were fed less than three times a day were more likely to be stunted compared to children fed more than three times a day (Teshome et al., 2011). Also younger children, aged between five and eleven months old, were less likely to be stunted when fed more than three times a day (Umeta et al., 2003).The risk factor survey found that only half of children age 6 to 23 months have an adequate meal frequency (50.9%, CI = 95% 43.1-58.6%), with a slight difference between boys (48.1%, 95% CI = 37.9-58.4%, n= 110) and girls (53.3%, 95% CI = 41.3- 65.3%, n=120). Findings from qualitative confirm that the meal frequency is inadequate. Indeed, mothers face heavy workload and cannot have time to feed their children during daytime. The qualitative inquiry shows that feeding practices are adapted to the caregivers' daily schedule and not to the child hunger. In addition and during daytime, young children are often under surveillance of elder siblings or left alone. Also, participants explain that there is a difference of feeding practices between boys and girls; girls are more fed because they are kept with their mother at home because of gender roles and they are considered weaker than boys, so they need better care practices.

Table 18: Poor Feeding Frequency

Indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Adequate meal frequency	% of children 6-23 months with an adequate Meal frequency	230	50.9	43.1	58.6
	% of boys 6-23	110	48.2	37.9	58.4

	months with an adequate Meal frequency				
	% of girls 6-23 months with an adequate Meal frequency	120	53.3	41.4	65.3

Poor diversified diet

Besides introduction, frequency of feeding, and quantity of foods given to the child, the type of feeding is strongly associated with stunting as well (Umeta et al., 2003). Dietary diversity scores at individual level have found to be associated with stunting in children from6 to 23 months old (Arimond & Ruel, 2004). Dietary diversity was more strongly associated with stunting among children who were no longer breastfed (Arimond & Ruel, 2004). Dietary diversity is thought to be of increased importance in these children because they fully rely on foods given to meet their energy and nutrient needs. Findings from qualitative enquiry show that infants are often fed water, tea and cow's or goat's milk within a few days of birth, and by 3 months most infants are given other foods. The effects of early mixed feeding have been well documented and include greater risk of infection, particularly diarrheal disease and acute respiratory infections (ARI). Individual dietary diversity score (IDDS) was used to measure dietary diversity of children aged 6-23 months. Dietary diversity was found to be very low. Only 26.6 per cent of these children are reported having received foods from a minimum of four food groups the previous day (95% CI= 12.4- 41%). A different was noted according to the sex of the child with boys having access to a more diversified access than girl. 31.9 % (95% CI= 23.3- 40.3%, n=110) of boys received at least food from 4 food groups the previous days, while only 21.8% (95% CI= 13.2-30.5%, n= 119) of girls had access to food from at least 4 groups. It was verified by the qualitative enquiry, which revealed that communities think that boys should eat more than girl because they are more active and playful while girls are staying with their caregiver. This could also mean that girls are breastfed longer than boys.

Table 19: IDDS profile based on age group category

Access to diversified diet indicators	Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Proportion of children 6-11 months who received food from at least 4 food groups the previous day	82	17.1	8.8	25.4
Proportion of children 12-17 months who received food from at least 4 food groups the previous day	72	26.4	15.4	37.4
Proportion of children 18-23 months who received food from at least 4 food groups the previous day	75	37.3	26.5	48.2

Proportion of children 6-23 months who received food from food group 1: grains, roots and tubers	230	87.8	83.4	92.3
Proportion of children 6-23 months who received food from food group 2 legumes and nuts	230	27.0	20.4	33.6
Proportion of children 6-23 months who received food from food group 3 milk and milk products	230	86.5	82.1	90.9
Proportion of children 6-23 months who received food from food group 4 meat	230	10.4	6.1	14.7
Proportion of children 6-23 months who received food from food group 5 eggs	230	10.9	7.4	14.3
Proportion of children 6-23 months who received food from food group 6 vitamin A rich fruits and vegetables	230	63.5	57.6	69.3
Proportion of children 6-23 months who received food from food group 7 other fruits and vegetables	229	10.0	5.6	14.5
Proportion of children 6-23 months who consumed iron	230	10.5	6.2	14.7

The proportion of children with minimum IDDS is really low. Poor diet diversity was also used to assess the household dietary diversity score (HDDS) of sampled households. The following table shows the elaboration of profiles of HDDS. Included in this table are food categories eaten by at least 50 per cent of the households in their respective groups.

Table 20: HDDS profile for Agro-Pastoral Livelihood Zones

HDDS profile Agro-pastoral		
3-4 groups	5-6 groups	>6 groups
10.0%	49.5%	39.8%
Cereals roots or tuber	Cereals roots or tuber	Cereals roots or tuber
Vegetables	Vegetables	Vegetables
Condiments	Condiments	Condiments

Oil/fat	Oil/fat	Oil/fat
	Sweets	Sweets
	pulse/ nuts	pulse/ nuts
		Milk
		Fruits
		(Meat)

Table 21: HDDS profile in Mixed Farming Livelihood Zones

HDDS Mixed Farming profile		
3/4 groups	5/6 groups	>6 groups
7.9%	47.6%	44.1%
Cereals roots or tuber	Cereals roots or tuber	Cereals roots or tuber
Vegetables	Vegetables	Vegetables
Condiments	Condiments	Condiments
fat / Oil	fat / Oil	fat / Oil
	Milk	Milk
	Sweets	Sweets
		pulses/ nuts
		Fruits
		(Meat)

Evidence from the qualitative inquiry also supports the finding that household dietary diversity is very low throughout the year. Qualitative enquiries reflected that majority of household have tea (water+ tea leaves + sugar + milk) and leftovers of ugali for breakfast, (maize flour and green leaves vegetable cooked with fat). Lunch and dinner are made of ugali (made from maize flour and water) with vegetable (green leave + cooking fat). Intra-household food distribution is an important part of food security, as not all household members may have equal access to sufficient, safe and nutritious food. This hypothesis was explored through the qualitative inquiry. We found that fathers and older boys are prioritize in terms of quantify and quality. Men are seen as stronger and more actives. Both qualitative and quantitative confirm that mixed farming livelihood have a better access to diversified diet than agro-pastoral, especially regarding milk. Indeed, this can be explained by the fact that mixed farmers have a better access to selected breeds, and so a better milk production. Results from IDDS and HDDS revealed that children are seriously exposed

and very early to micronutrients deficiencies, particularly to iron, zinc and others vitamins.

While, in Kenya zinc deficiency is 51% among children under 5 years (Kenya Micronutrient Survey, 1999). Dietary surveys are conducted in many countries, but only few surveys of this type exist in developing countries (WHO, 1996). Zinc deficiency has far reaching effects particularly in children, contributing to stunted growth (Brown and Peerson, 2001), as well as morbidity from diarrhea, pneumonia and malaria (Shankar 2000). Worldwide, it is estimated that zinc deficiency is responsible for approximately 16% of infections of the lower respiratory tract, 18% of malaria and 10% of diarrheal diseases. In Ethiopia, children who were fed *attmit* (cereal gruel) and *injera* (flat type of bread) were more likely to be stunted than children who were fed cow's milk and mashed potatoes (Teshome et al., 2011). Animal milk as a (complementary) food seems to reduce the risk for stunting. Children in Ethiopia who were given cow's milk were less likely to be stunted (Umeta et al., 2003). Meat is only consumed on special occasions such as festivities. Furthermore, evidence from the qualitative inquiry suggests that at household level nutritious food such as fruits, vegetables, milk, beans, and eggs may be sold rather than consumed. This may reflect that food utilization is a more important factor than food availability. Considering all evidences gathered, this risk factor should be considered as a major cause to stunting. Main pathways to poor diet diversity identified are poor incomes, poor livestock and crop production and poor utilization of incomes.

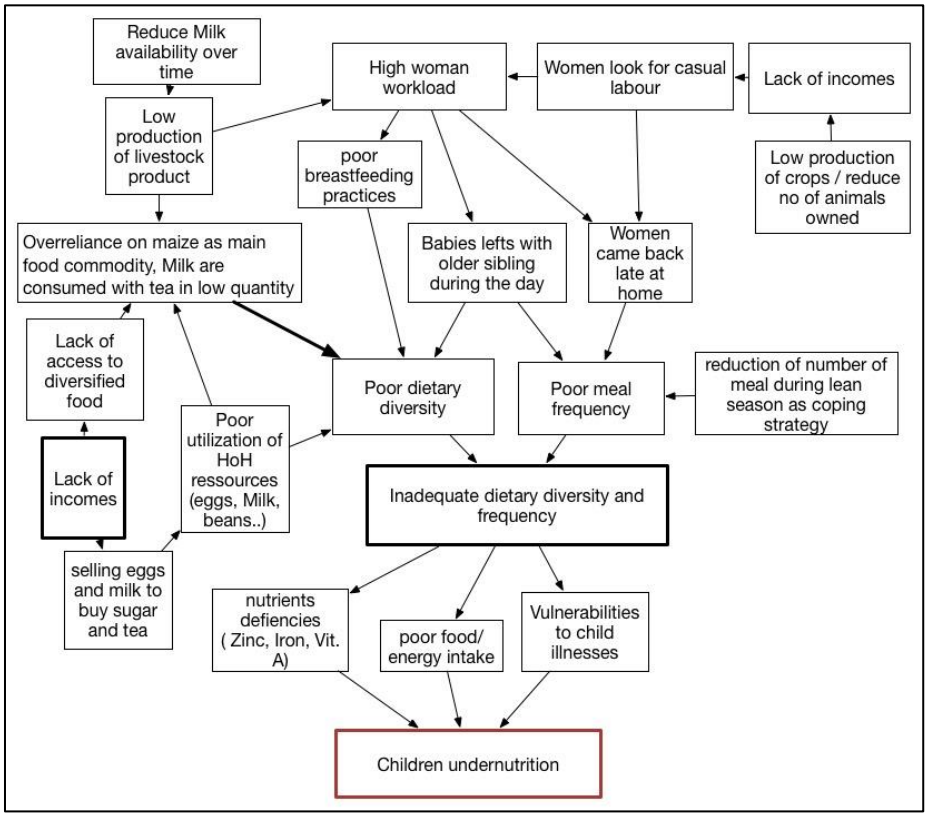


Figure 11: Inadequate Dietary Diversity Score

4.3.7 Hypothesis G: Poor nutritional status of pregnant and lactating women

Poor maternal nutrition has a detrimental impact on the nutritional status of a child at the foetal stage and beyond. When a mother is deficient in macro- or micronutrients it can negatively affect the foetus, which is solely dependent upon the mother to meet its nutritional needs. Evidence shows that there is an association between low birth weight and future child nutritional status (i.e. risk factor: low birth weight).

Poor maternal nutritional status may be due to insufficient food intake, excessive energy expenditure or poor utilization of nutrients, such as through illness. Maternal nutritional status, however, is a challenge to measure during pregnancy. One way to try to determine maternal nutritional status is through Mid Upper Arm Circumference (MUAC) and weight measurements in addition to serum ferritin tests on anaemia levels. A meta-analysis showed that improving intake through food supplementation during pregnancy reduced low birth weight (Kramer et al. 1987). Workload, dietary intakes, nutriment deficiencies, iron folate supplementation and nutritional status of pregnant and lactating women were explored as part of this hypothesis. The risk factor survey found that 1.2 per cent of mothers were currently malnourished as defined by having a MUAC <21cm. (n=442) Secondary data from County health authorities found that 2.7% women pregnant and lactating are malnourished in the West Pokot County. Micronutrient deficiencies of the mother during pregnancy and lactation may contribute to child stunting via low birth weight and decreased concentrations of micronutrients in breast milk. Possible causes of maternal micronutrient deficiencies are infections, inadequate dietary intake, poor dietary quality, poor bioavailability, and insufficient child spacing (Ramakrishnan, 2002). Vitamin A deficiency and iron-deficiency anaemia have been linked to stunting. Maternal iron-deficiency anaemia during pregnancy is associated with stunting via small infant size at birth (Allen, 2000). Iron-deficiency anaemia during pregnancy may cause intrauterine growth restriction, preterm delivery and subsequent low birth weight and/or small infant size at birth. Furthermore, maternal anaemia during pregnancy is associated with maternal mortality. Mothers with a short stature and iron deficiency anaemia have an increased risk of death at delivery, which accounts for at least twenty per cent of maternal mortality (Black et al., 2008). Evidence from micronutrient supplementation trials suggests that iron supplementation improves birth weight even in non-anaemic women (Shrimpton et al., 2009). This may act through improving placental or foetal metabolism, which facilitates foetal growth through pathways that do not involve maternal haemoglobin concentration.

However, according to Keverenge-Ettyang GA, 200619, "Women from the farming community in West Pokot, Kenya, have lower iron stores during the third trimester of pregnancy than women in the pastoral community. In addition, the mean weight of their new-born infants is lower than that of infants in the pastoral community". The study found that women from the farming community had significantly ($p < 0.05$) lower haemoglobin concentrations than women from the pastoral community during the third trimester of pregnancy. Pastoral women had significantly higher serum ferritin concentrations than farming women during the third trimester of pregnancy ($p <0.05$) and at 4 months postpartum. In the farming community of West Pokot, mean infant birth weight was significantly lower ($p <0.01$) than in the pastoral community and a significantly higher ($p < 0.05$) proportion of new-borns weighed less than 2.5 kg. At 4 months postpartum, the percentage of body fat was significantly lower in pastoral women than in farming women.

Iron folate supplementation rates has also been used as a proxy to assess this risk factor, the quantitative survey revealed 77.2 percent of mothers took iron folate pills during their last pregnancy, moreover, on those who took iron folate, 77.2 percent of mothers took iron folate supplementation for less 90 days as recommended by national health policies (95% CI= 73.4-82.3%, n=275). Weight gain by the mothers during pregnancy has an effect on stunting at birth (Neufeld et al., 2004). Infants whose mothers with poor gain weight from the first to the second trimester are more likely to be stunted. Weight gain from the second to third trimester does not have a significant effect on stunting. The study also revealed that 89.8 percent of mothers reported to eat more during their last pregnancy

[19] Food Nutr Bull. 2006 Sep;27(3):228-35.Maternal nutritional status in pastoral versus farming communities of West Pokot, Kenya: differences in iron and vitamin A status and body composition.Keverenge-Ettyang GA1, van Marken Lichtenbelt W, Esamai F, Saris W.

(95% CI = 86.5- 93% n=439). The qualitative inquiry explored maternal diet further and found that although mothers ate the same or less due to limited incomes and the desire for a small baby. Because of the low rates of malnourished mother in our study area, this risk factor was at first rated as a minor risk factor, but experts during the final workshop, felt that regarding the poor utilization of iron folate supplementation, the low rates of adequate ABC attendance, the high workload of pregnant mothers, the poor birth spacing and the reduction of food intake during pregnancy, mothers are at high risk of micronutrient deficiencies, and therefore, lead to low birth weight. After validation at the final workshop, this risk factor was rated as an important contributor to stunting.

Table 22: Nutritional status of pregnant and lactating Women

Maternal nutritional status indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Nutritional status of the caregiver	% of caregivers who had a MUAC >210 mm	442	98.8	97.6	100.0
	% of caregivers who had a >190 mm	442	1.2	-0.0	2.4
	% of caregivers who had a >160 mm	442	0	0	0
Iron folate supplementation	% of women who took Iron - folate supplementation during last pregnancy	356	77.2	71.0	84.4
	% of women who Took iron folate for less than 90 days during last pregnancy	275	77.8	73.4	82.3
	Mean of no of days iron folate supplementation	275	49.8	45.1	54.5
Food intake during pregnancy	% of women who reduced or had the same quantity of food intake during pregnancy	439	89.8	86.5	93.0
	% of MF women who reduced or had the same quantity of food intake during pregnancy	185	91.9	87.4	96.4
	% AP of women who reduced or had the same quantity of food	254	88.2	83.8	92.6

	intake during pregnancy				
Maternal workload	% of caregivers who did rest Less than 3 days after most recent delivery	430	3.3	0.7	6.0
	% of caregivers who did rest from 3 to 10 days after most recent delivery	430	6.1	3.3	8.8
	% of caregivers who did rest from 10-20 days after most recent delivery	430	8.4	5.1	11.7
	% of caregivers who did rest from 20-40 days after most recent delivery	430	32.3	26.2	38.5
	% of caregivers who did rest above 40 days after most recent delivery	430	50	42.9	57.1

4.3.8 Hypothesis H: High rates of Low Birth Weight

Low Birth Weight (LBW) is defined as a weight at birth of less than 2.5kg. Common risk factors that may contribute to LBW are known as multiple pregnancies, short birth spacing, early pregnancies, insufficient prenatal care and poor maternal nutrition. Infants with LBW are considered to be disadvantaged, more likely at risk of illnesses and at risk of stunting. LBW is also affecting long-term development with more important risk of neurodevelopmental problems[20]. There is strong evidence for low birth weight as an immediate cause of stunting. Several studies show a significant association between low birth weight and stunting (Mamiro et al., 2005; Medhin et al., 2010) or even find low birth weight as the most important factor contributing to stunting (Chopra, 2003). Infants who are in low birth weight begin their lives at a disadvantage, as they are more likely to become stunted than their peers, among other potential negative long-term consequences related to mental and physical health and development (Hack et al. 2003). In a large study in Ethiopia, by far the most significant and consistent predictor of stunting and under nutrition among infants at 6 and 12 months was low birth weight; other important factors included male gender, poor household sanitary facilities and rural residence (Mehdi et al. 2010). Due to the high proportion of births still delivered at home, we were not able to find any secondary data on the prevalence on low birth weight at county level, findings from qualitative enquiry revealed that mothers who delivered at home visit health facilities after few days of delivery. So the weight on the birth certificate was not a good

[20] Hack, M. Klein, NK. Taylor, HG. 1995. *Long-term developmental outcomes of low birth weight infants*. The Future of Children, vol 5, no1. Princeton University. pp 176-196

indicator to access the weight at birth. Consequently, we were only able to measure perceived birth weight during the risk factor survey. Using this indicator, 17.4 percent of children were perceived by their caregivers to be small or very small at birth. Like mentioned previously "poor nutritional status of pregnant mother" and antenatal care could also be an important cause leading to LBW as only 34.9 percent of the mothers consulted a health professional at least 4 times during their pregnancy. Furthermore, quantitative and qualitative results show that pregnant women may deliberately eat less during pregnancy in order to have a smaller baby. 89.7% of mothers reported to eat less or same as usually during pregnancy. In fact, the women interviewed explained that they could eat less because of lack of appetite but also to avoid pain during labour. Mothers reduce the quality and the quantity of food intake during pregnancy, they avoid milk, eggs, beans, fruits and vegetables and reduce portion of ugali. In addition there is no reduction of the workload of women during pregnancies; this should lead to nutriment deficiency to the foetus. Qualitative survey findings show that mothers do not link food intake during pregnancy to low birth weight. Causes of LBW are more associated to genetic or due to illnesses. Early pregnancy could also be a risk factor to LBW or IUGR. Indeed there was a significant association between foetal growth in early pregnancy and the risk of delivering a small for gestational age infant and/or low birth weight infant. The risk factor survey found that 5.58% of mothers had their first child before 16 years old, 70.3 percent had their first child after 18 year old.

The risk factor was rated as an important contributor to child under nutrition in our study area. The pathway to this risk factor is illustrated in figure 12.

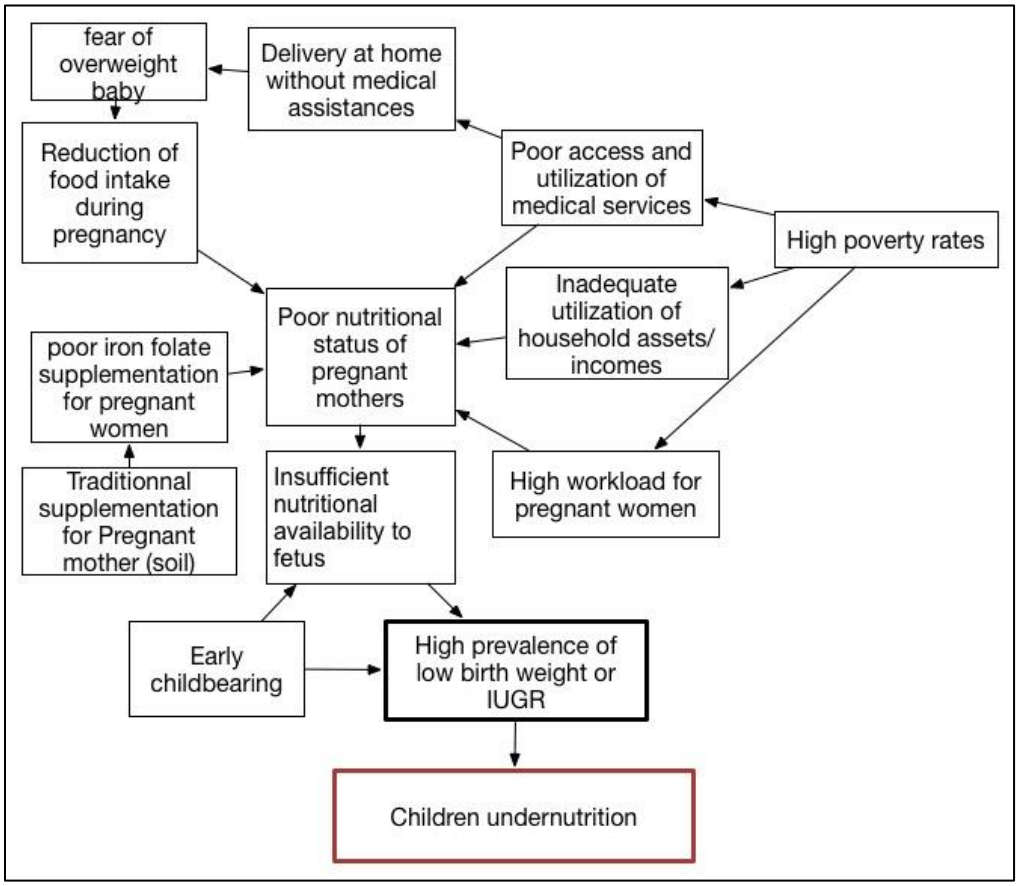


Figure 12: Pathway to High prevalence of Low Birth Weight (LBW)

Table 23: Summary indicators analysis that relates to Low Birth Weight

LBW indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Early pregnancy	Age of first childbearing				
	% of caregiver who had their first child after age of 18	448	70.3	65.6	75.0
	% of caregiver who had their first child Between 18 and 16 year old	448	23.4	19.0	27.9
	% of caregiver who had their first child before age of 16	448	5.6	3.0	8.2
Iron folate supplementation	% of women who took Iron -folate supplementation during last pregnancy	356	77.2	71.0	84.4
	% of women who Took iron folate for less than 90 days during last pregnancy	275	77.8	73.4	82.3
Food intake during pregnancy	% of women of reduce or have the same quantity of Food intake during pregnancy	439	89.8	86.5	93.0
	% of MF women of reduce or have the same quantity of Food intake during pregnancy	185	91.9	87.4	96.4
	% AP of women of reduce or have the same quantity of Food intake during pregnancy	254	88.2	83.8	92.6

Low birth weight	Means of birth weight of children when booklet was available	175	2.6	2.5	2.7
	% of LBW <=2.5 kg when booklet was available	175	13.1	8.7	17.6
	Perceived birth weight				
	% of children who were born « very large » according to their caregiver		2.7	1.3	4.0
	% of children who were born « larger than average » according to their caregiver		13.9	10.8	16.9
	% of children who were born « Normal » according to their caregiver		41.2	36.2	46.1
	% of children who were born « smaller than average » according to their caregiver		15.3	11.8	18.8
	% of children who were born « very small » according to their caregiver		0.4	-0.1	0.9

4.3.9 Hypothesis I: Lack of women empowerment

Low status of women may contribute to poor maternal nutritional status as well as to the ability to provide adequate care and therefore, nutritional status of the child. The Gender Inequality Index (GII) reflects gender-based disadvantage in three dimensions—reproductive health, empowerment and labour market. The index shows the loss in potential human development due to inequality between female and male achievements in these dimensions. It varies between: 1—when women and men fare equally and 2-where one gender fares as poorly as possible in all measured dimensions. Kenya has an overall GII of 0.651 (Draft 7th Human Development Report). This is however, not equal everywhere as there are regional disparities with West Pokot being known to have experience poverty. These vulnerable groups include children living in poor households, the disabled and the youths. The status of women in the West Pokot County is thought to be low as measured along many proxy indicators. In fact, women are considered as inferior as men, as much as girls are less active, weaker, and more fragile than boys. It explains why some care, hygiene practices are enhanced on girls than boys. The low status of women is also

reflected in low education access to women. Despite 79.7 per cent of mothers went to school, only 14.2 per cent of them went to secondary or tertiary, which is very low compare to national rates. Emotional wellbeing of the mother is associated with infant's health and nutritional status. Depression of mothers is a risk factor for stunting. A systematic review and meta-analysis found maternal depression to be associated with early childhood stunting in developing countries (Surkan et al., 2011).The risk factor survey attempted to measure the psychological state of mothers using the WHO5 well-being index and MDI10 (Major Depression Inventory). In total, 14.5 per cent of mothers were found to be at risk of depression using the WHO5 (n=472) which is quite low. Of those women at risk of depression 10.3 per cent, 32.65 per cent and 28 per cent were found to have mild, moderate and severe depression respectively (n=68). The risk factor survey aimed to assess perceived social capital through asking if mothers felt supported. 64.6 per cent of mothers said that they felt supported by their family and/or community (n= 478). Mothers-in-law could support mothers with household duties, particularly after delivery; also friends of the mothers from working groups could also be a support by helping the mothers in farm labour. Our qualitative survey revealed that men are rarely involved in household duties or childcare. "This is women duties" said a man from one of our FDG in Ktaima village. On the contrary, women from our FDG complained that men are losing money and productive time by going in the trading centre, taking lunch, collecting information and drinking alcohol and identify men behaviours as a major risk factor to children under nutrition as it increased workload of women, and reduce resources available to provide adequate food and care for children.

Furthermore, early childbearing is significantly linked to low birth weight as well as increasingly the risk of maternal mortality. Furthermore, early childbearing may be used as a proxy indicator for women's empowerment. It is considered a risk factor of child under nutrition because young women may not be ready, motivated or mature enough to take care of a child, which tend to less caring, attention and patience provided to the child's development. Early childbearing and early marriage may also be used as proxies for women's empowerment. The survey found that almost 25.6 per cent of all mothers gave birth for the first time when they were younger than age 18 and 5.6 per cent below age 16. Moreover, 25.6 per cent of mothers were married before age of 18. Qualitative inquiry found that women typically get married between ages 18-20, while childbearing begins shortly after. Decision making power was measured by asking a series of questions on who makes key financial, social and health-seeking related decisions. Based on this scale, 35.6 per cent of mothers were found to have a lack of decision-making power (husbands make key decision in all cases). In fact in Pokot tribe, the man is the head of household and the major decision maker. The land, animals and their outputs/incomes belong to men. The woman has low independent access to resources except for chickens, eggs, vegetables and sometimes milk. Table banking is also mechanisms which allow women to have independent access to incomes. Our qualitative enquiry revealed that the poor empowerment of women is also responsible of the poor utilization of family planning (with the lack of information to access the family planning services). Indeed, women are still dependent on their husband will about utilization of contraceptive methods, which are prohibit by men who value having a lot of children which are considered an asset for the family prosperity. Lastly, the number of days rest after delivery was also measured as a proxy for women's workload and empowerment. The risk factor survey found that half of the mothers did rest less than the recommended 40 days (50 per cent, n=430). Furthermore, 17.7 percent of women rested for less than 20 days or more days after their last delivery, which confirm the severity of this risk factor to stunting.

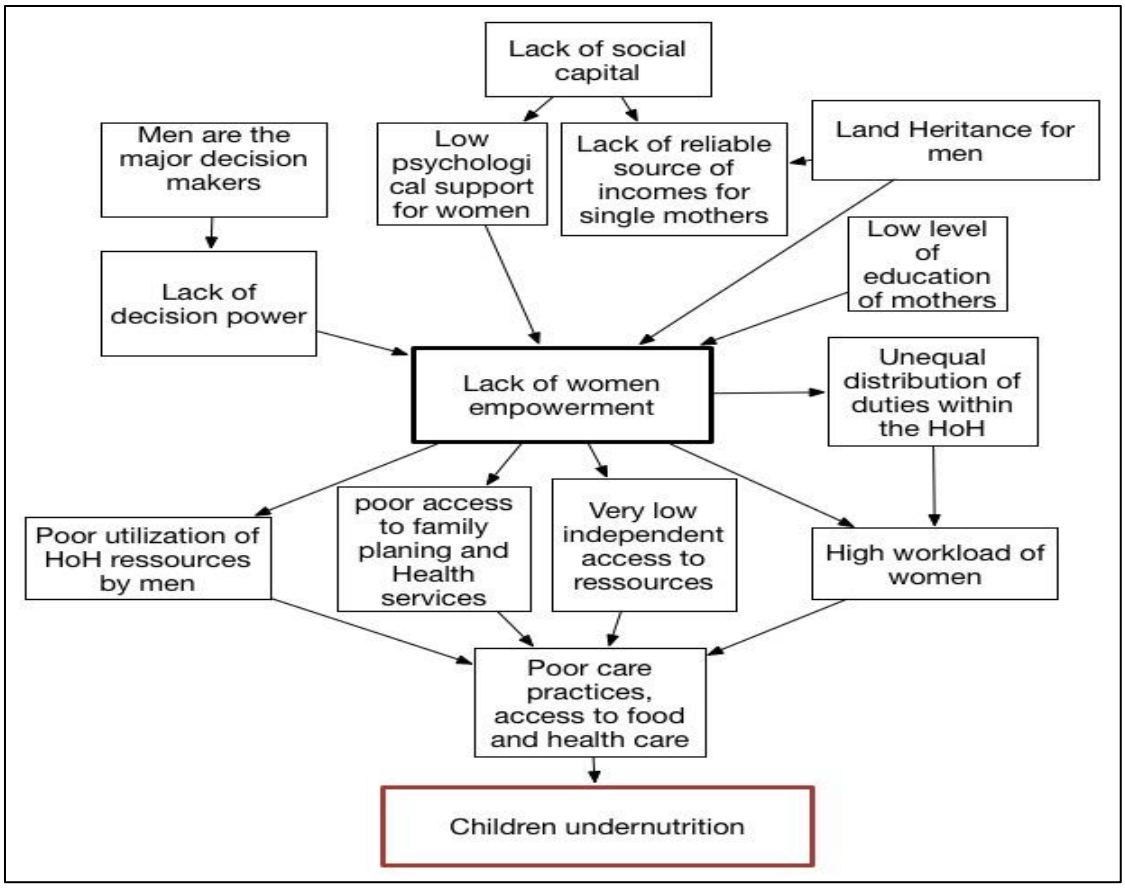


Figure 13: Pathway of lack of women empowerment with regards to child undernutrition

Table 24: Indicators related to women empowerment

Women empowerment indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Maternal workload	% of caregivers who did rest above 40 days after most recent delivery	430	50	42.9	57.1
Early marriage	% of caregivers who were married after age of 18	446	58.5	54.2	62.9
	% of caregivers who were married Between 18 and 16 year old	446	25.6	21.1	30.1
	% of caregivers who were married before age of 16	446	9.4	6.2	12.7
	% of caregivers who were married who were never been married	446	5.8	3.3	8.4

Early pregnancy	Age of first childbearing				
	% of caregivers who had their first child after age of 18	448	70.3	65.6	75.0
	% of caregivers who had their first child between 18 and 16 year old	448	23.4	19.0	27.9
	% of caregiver who had their first child before age of 16	448	5.58	2.969	8.192
Women empowerment	Decision power				
	% of main caregivers with low decision power	472	35.6	29.3	41.9
Perceived capital social	% of caregivers who felt extremely supported by community/family	478	17.4	13.4	21.4
	% of caregivers who felt somehow supported by community/ family	478	47.3	42.3	52.3
	% of caregivers who felt not very supported by community/ family	478	13.2	10.0	16.4
	% of caregivers who felt not at all supported by community/ family	478	22.2	17.0	27.3
Education of main caregiver	% of main caregivers who went to school	385	79.7	74.0	85.5
	% of caregivers who complete pre-primary as highest level of education	385	59.2	51.4	67.0
	% of caregivers who complete primary	385	25.7	20.8	30.6
	% of caregivers who complete secondary	385	6.8	4.6	8.9
	% of caregivers who complete tertiary	385	7.5	3.7	11.3
Contraceptive prevalence rates	% of women (15_49) who are currently using a contraceptive method	434	27.7	19.6	35.7
Undesired pregnancy/ unmet need for family planning	% of Women who did wish to delay their last pregnancy or did not want to be pregnant	443	58.7	52.6	64.8

4.3.10 Hypothesis J: High Maternal workload

High workload of women may contribute to maternal and child nutritional status and impact on care giving practices. Excessive calorie expenditure in the absence of increased caloric intake can also result in poor maternal nutritional status. The effect of maternal workload on child's nutrition status can be bidirectional as shown in the figure 14.

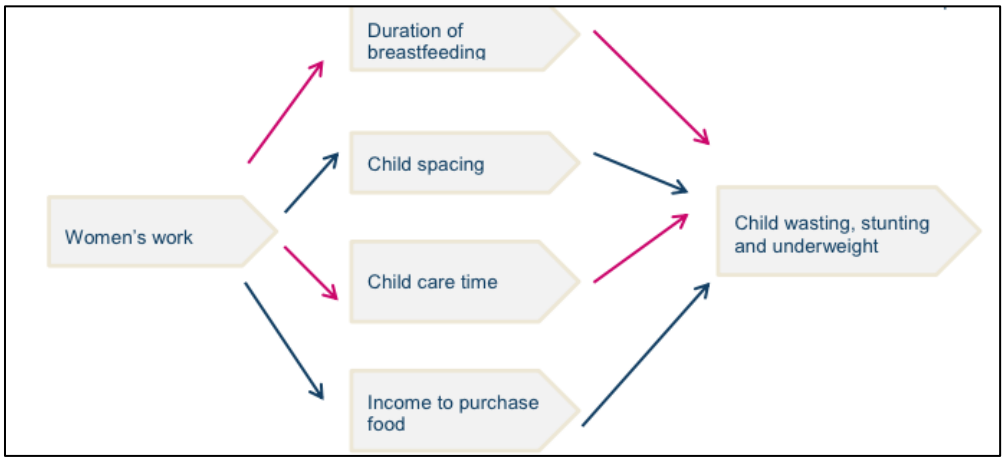


Figure 14: Pathway to high maternal workload

On the one hand maternal income generating activities increase household's food availability by increasing food production directly or indirectly by increasing household income. On the other hand, maternal workload may decrease the time spent by mothers caring for, feeding, and breastfeeding their children, which would negatively impact children's nutritional status. However, the negative relationship between maternal workload and child stunting did not seem mediated by amount of time spent on childcare. It appeared to be mediated via sociocultural factors, such as traditional household size, and household economic factors, like consumption of a less valued staple. In Kenya mothers acknowledged the influence of heavy workload on their child's nutritional status (Abubakar et al., 2011). During focus group discussions, mothers explained that they often felt overwhelmed by their daily chores. They identified the heavy workload as a major contributor to being unable to monitor the nutritional intake and status of their children. Women are main labourers in Pokot community. High maternal workload contributes to poor health seeking behaviour, care, hygiene, access to water, and breastfeeding practices. Women participate in activities to provide money to buy food for the children and therefore lack enough time to take care of children left at home. Since the livestock and crop loss lead to lack of food in the family, they end up engaging in most of the activities that can provide money to the household (casual labour) which was noted to be too physical to be done by the mothers. This is on top of regular household chores that the woman does in a normal day. The number of days rest after delivery was also measured as a proxy for women's workload and empowerment. The risk factor survey found that half (50%) of mothers rest less than the recommended 40 days. The findings also revealed that 17.7 percent of women had less than 20 days rest after their last delivery. Qualitative data results showed that low income is the main reason of short rest after birth, since mothers have to go back to fieldwork quickly after birth to avoid important gaps in the family income. Likewise, mothers being in charge of water collection and other house chores, they quickly have to resume their daily activities, without being able to properly take care of their children. The risk factor survey found that 36.2 per cent of mothers feel they have too much work to adequately care for their children. The workload of women was further explored in the qualitative inquiry. Majority of women found that high workload of women is a major risk factor to child under nutrition but when we asked them what would they do if they had less workload, majority respond that they will go to look for casual labour. So, at community level, household duties are seen as a constraint to get more sources of

incomes which lead to child under nutrition. Also women complain about the low involvement of men in farm and pastoral work. The qualitative enquiry also found that women's workload is very high in comparison with men. Women in our study area perform a significant portion of farm work as well as all work within the household. In particular, during a day women are responsible for: preparing breakfast, milking animals, looking for firewood, fetching water, cooking lunch and dinner, washing clothes and utensils, bathing children, buying food from the market, cleaning the house and compound, working in the farm and/or looking after cattle if the men are not around and looking for casual labour during lean months. On the other side men daily activities are much lighter, they are responsible to fetch the farm, look after animal when there is no paddock and collect information in centre, collect wood. Heavy workload has an important impact on feeding practices as children' meals are prioritized among other tasks. In the majority of situations grandparents, elder siblings who are too young to be at school can be in charge of the young child during the day. Men did not identify women workload as a risk factor to child under nutrition, actually men perceived maternal workload as normal. In terms of seasonality, qualitative study found that women workload increased from March to August, during lean month, because of farm work and engagement in casual labour (firewood, or employment in bigger farm, mining of trace gold along river banks). Qualitative findings shown that workload of women have increased over time, indeed men are less involved into farm work and children are more enrolled to school than 10 years ago so they are not at home to help the mother with household duties. The study also revealed that single mothers are more engaged in casual labour since they do not have access to animal and land.

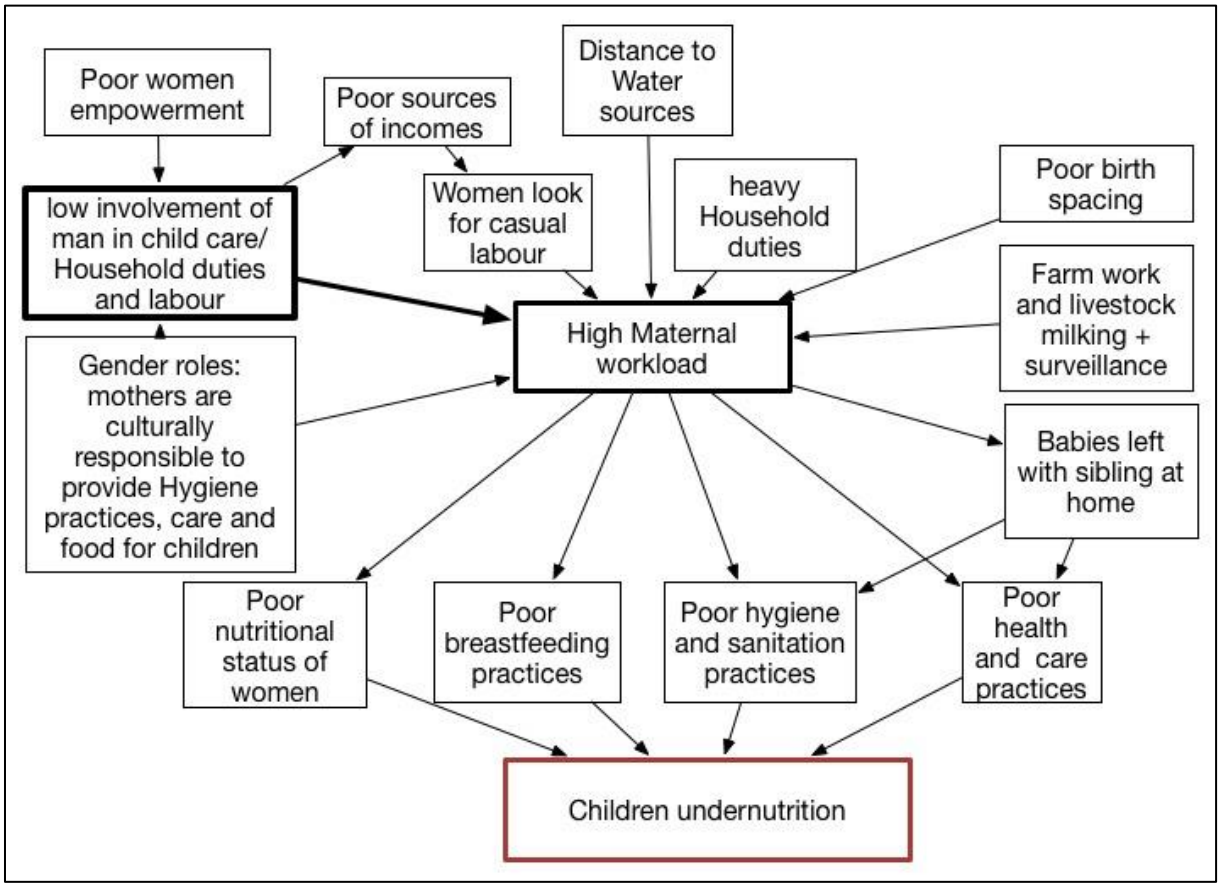


Figure 15: Pathway to Women Workload Indicators

Table 25: Indicators aligned to women workload

Women workload related indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Maternal workload	% of caregivers who did rest less than 3 days after most recent delivery	430	3.3	0.6	5.9
	% of caregivers who did rest from 3 to 10 days after most recent delivery	430	6.1	3.3	8.8
	% of caregivers who did rest from 10-20 days after most recent delivery	430	8.4	5.1	11.6
	% of caregivers who did rest from 20-40 days after most recent delivery	430	32.3	26.2	38.5
	% of caregivers who did rest above 40 days after most recent delivery	430	50	42.9	57.1
Caregiver perceived workload	% of caregivers who perceived they have too much workload to take care of their children	470	36.2	30.4	42.0

4.3.11 Hypothesis K: Low incomes/ Low sources of diversified incomes

Secondary data revealed that high poverty rates in the County at 68.7 percent coupled with high women workload was affecting household ability to access food and health. It is affecting all the aspects of the life: the ability to diversify food and access basic services with 45 percent of households citing lack of money to purchase basic health commodities as highlighted in figure 16.

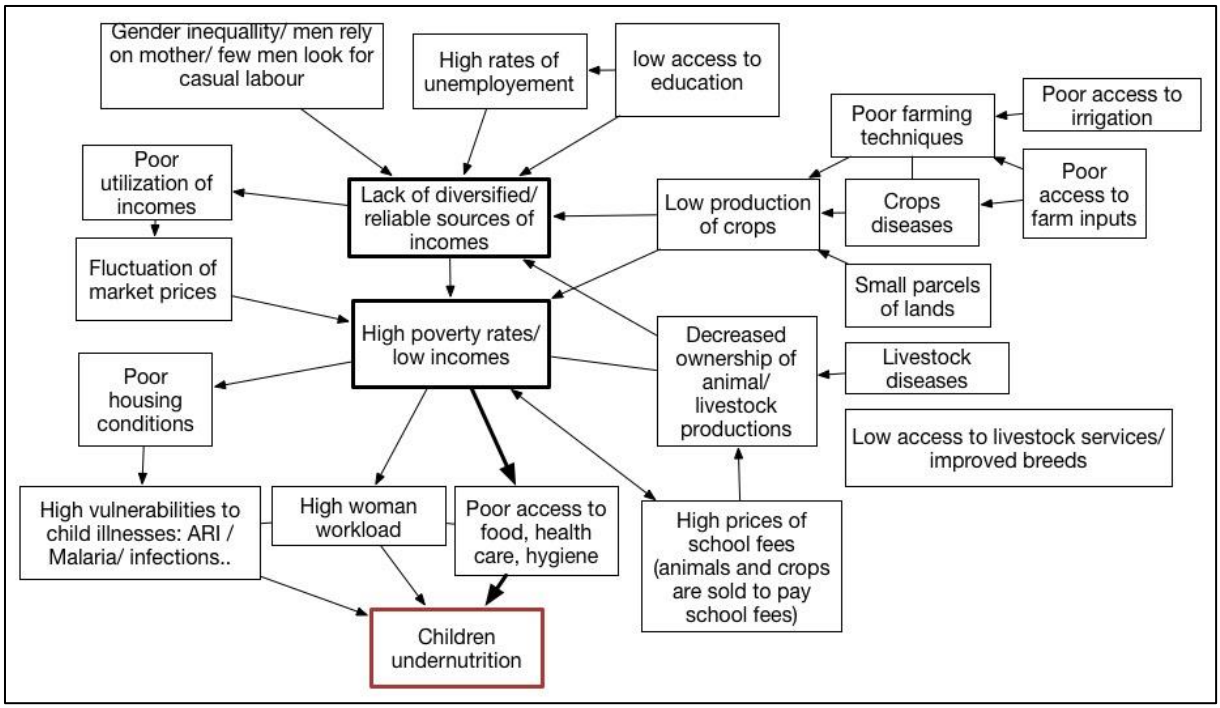


Figure 16: Pathway to low sources of diversified incomes

Low incomes is also considered as a major pathway to poor access to food as crops and livestock production remain insufficient to cover household needs (food, health and other needs). Incomes generated from livestock and crops are insufficient, population relies also on casual labour. Qualitative enquiry shows that they are highly dependent on casual labour and selling eggs, milk and others vegetables from March to August, during lean months, when livestock and harvest have been sold to cover school fees and other large expenditure in January-February and before harvesting of beans in August. Debts are mainly contracted at this time to cope with social events expenses and shortage of money regarding basic needs (food and health). Main pathways to low incomes are believed to be: low production of crops (due to crops diseases poor farming technique, lake of rain and small parcel of land), reduce number of animal (due to high expenditure for school fees, small parcel of land, vulnerabilities to disease) and low productivity of milk (due to poor access to veterinary services), and also poor utilization of incomes (poor capacity of stock and savings : crops are sold in January-February and bought at a higher price between March to August). All these pathways can be seen as the result of low income that can be seen as the root cause of many of the other risk factors. On average, Agro-pastoral communities rely on less diversified sources of incomes than Mixed farming communities, as shown in figure 17 and 18:

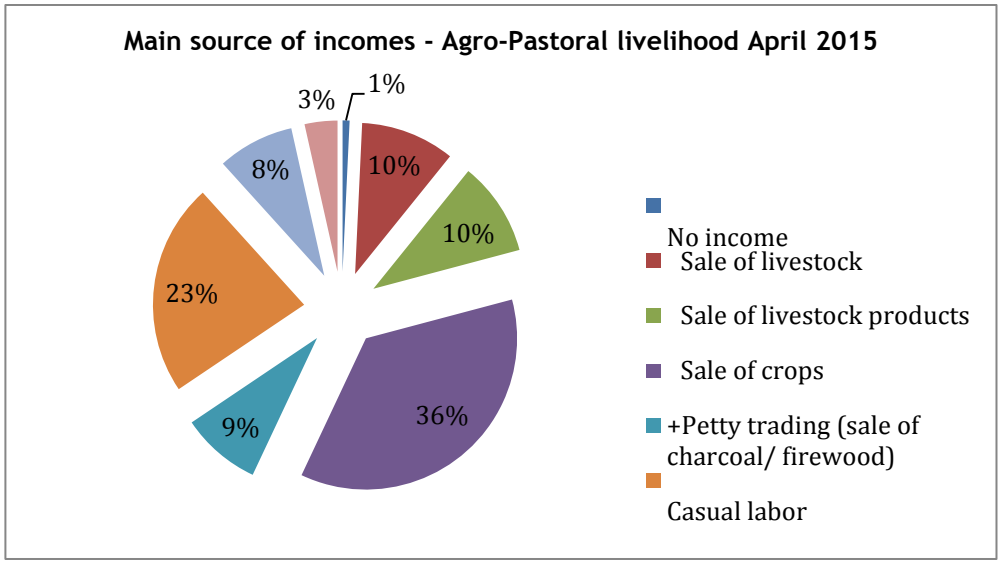


Figure 17: Sources of income for Agro-pastoral Livelihood Zones

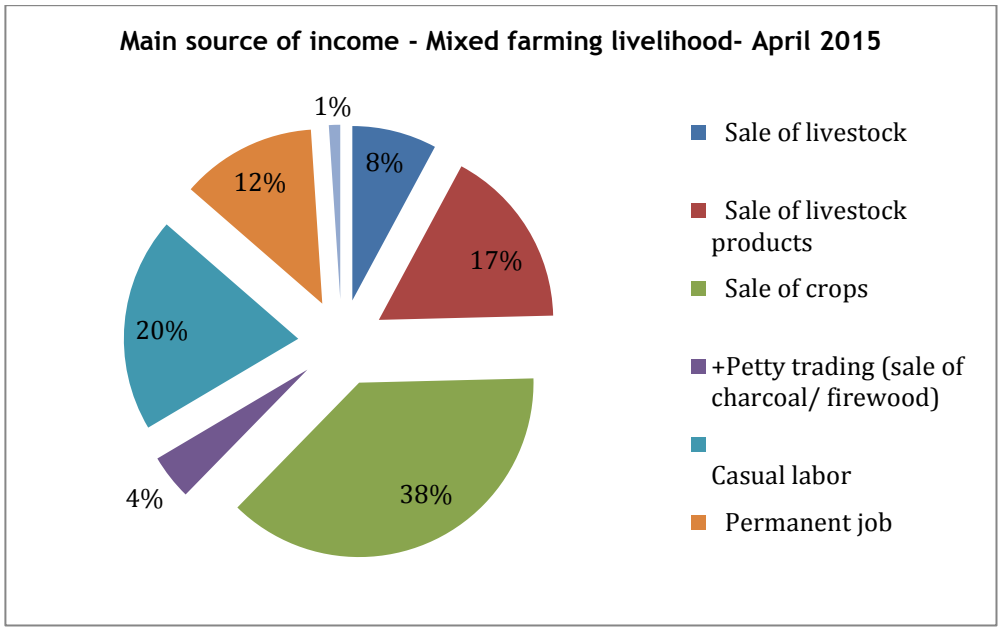


Figure 18: Sources of income for Mixed Farming Livelihood Zones

Agro-pastoral communities rely more on casual labour than Mixed farming communities, this trend was confirmed during qualitative enquiry, indeed, due to decreased number of animals, communities rely more on casual labour to access to incomes. Also we can learn than Mixed farming communities rely more on selling livestock product this mainly due to access to better breeds and better productivity of milk than breeds owned by agro-pastoral. Agro-pastoral are more vulnerable than Mixed Farming Livelihood Zones. Most households from Agro-pastoral and Mixed farming livelihoods in the West Pokot County face an annual food gap at the household level, leaving households unable to produce enough food or income. This emphasis that levels of acute malnutrition, child illness, women workload peaks during this season; this is a major risk factor. The risk factor survey measured months of adequate household food provisioning (MAHFP). The results show that 72.3 percent of households face at least one month in the year of food shortage. The average number of months of inadequate food provisioning was 2.7 months. The results show that the hunger gap lasts from around April to July. Survey found that communities from Agro-pastoral areas are more likely to lack food than Mixed-farming: indeed 75.3% of

agro-pastoral household ran out of food last 12 months (95% CI= 71- 79.7%, n=280) while 68.1% of mixed farmers ran out of food last year (95% CI= 59-77.3%, n=204). The mean of number of months were food provisioning in the household was not adequate was 2.6 months for mixed farming and 2.7 months for Agro-pastoral. The survey found that using the household food insecurity access scale score (HFIAS) 40 per cent, 16.5 per cent, 24.2 percent and 19.2 percent of households were found to be secure, mildly, moderately or severely food insecure respectively. The following diagram illustrates the categories of food security of households according to the livelihoods, according to this results Agro-pastoral are likely to be more food insecure than Mixed-farming, this could be explained by the fact that Agro-pastoral have access to less diversified source of incomes than mixed farming.

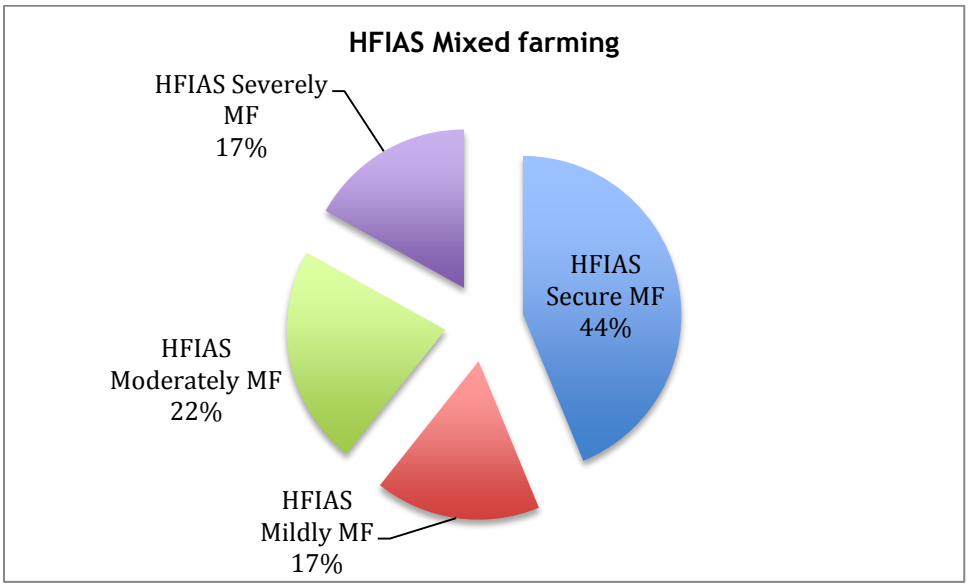


Figure 19: HFIAS -Mixed Farming Livelihood Zones

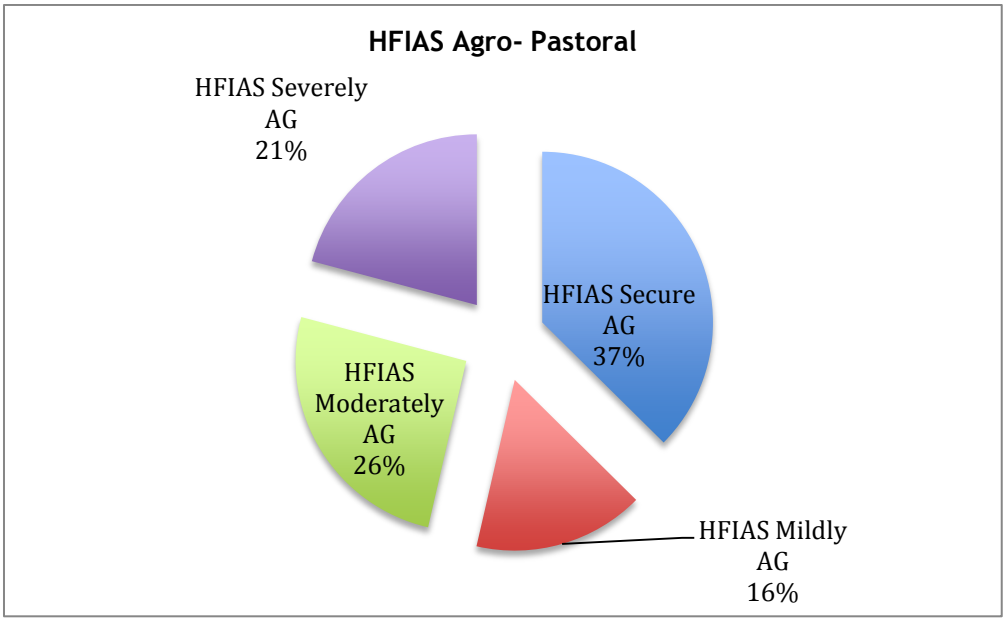


Figure 20: HFIAS-Agro-pastoral Livelihood Zones

Table 26: Summary Analysis of HFIAS and MAHFP

Indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
HFIAP : household food insecurity access scale score	% of households with HFIAP score secure	479	40.1	33.9	46.3
	% of households with HFIAP score mildly insecure	479	16.5	13.3	19.6
	% of households with HFIAP score moderately insecure	479	24.2	19.5	29.0
	% of households with HFIAP score severely insecure	479	19.2	14.9	23.5
	% of MF households with HFIAP score secure	201	43.8	32.0	55.6
	% of MF households with HFIAP score mildly insecure	201	16.9	11.5	22.3
	% of MF households with HFIAP score moderately insecure	201	22.4	13.7	31.1
	% of MF households with HFIAP score severely insecure	201	16.9	10.4	23.4
	% of AP households with HFIAP score secure	278	37.4	30.7	44.0
	% of AP households with HFIAP score mildly insecure	278	16.2	12.4	20.0
	% of AP households with HFIAP score moderately	278	25.5	19.8	31.2

	insecure				
	% of AP households with HFIAP score severely insecure	278	20.9	14.8	27.0
Adequate food provisioning	% of households who did not have enough food last 12 months	484	72.3	67.6	77.0
	% of MF households who did not have enough food last 12 months	204	68.1	59.0	77.3
	% of AG households who did not have enough food last 12 months	280	75.4	71.1	80.0
	Mean no of months of inadequate food provisioning	354	2.7	2.5	2.9
	Mean no of months of inadequate food provisioning	141	2.652	2.188	3.1
	Mean no of months of inadequate food provisioning	213	2.746	2.536	3.0

4.3.12 Hypothesis L: Poor crop production (quantity, diversity and quality)

One important hypothesis is farming production and in particularly, crop production is not sufficient to meet the needs of farming households and to generate enough cash to be able to meet with basic needs (both in quantity and quality). Pathways to this risk factor can be attribute to low awareness on farming techniques and access to extension services, unreliable rainfall and poor access to irrigation, small size of parcel of farming land, high vulnerability to crop diseases, and decreased fertility of soil over time.

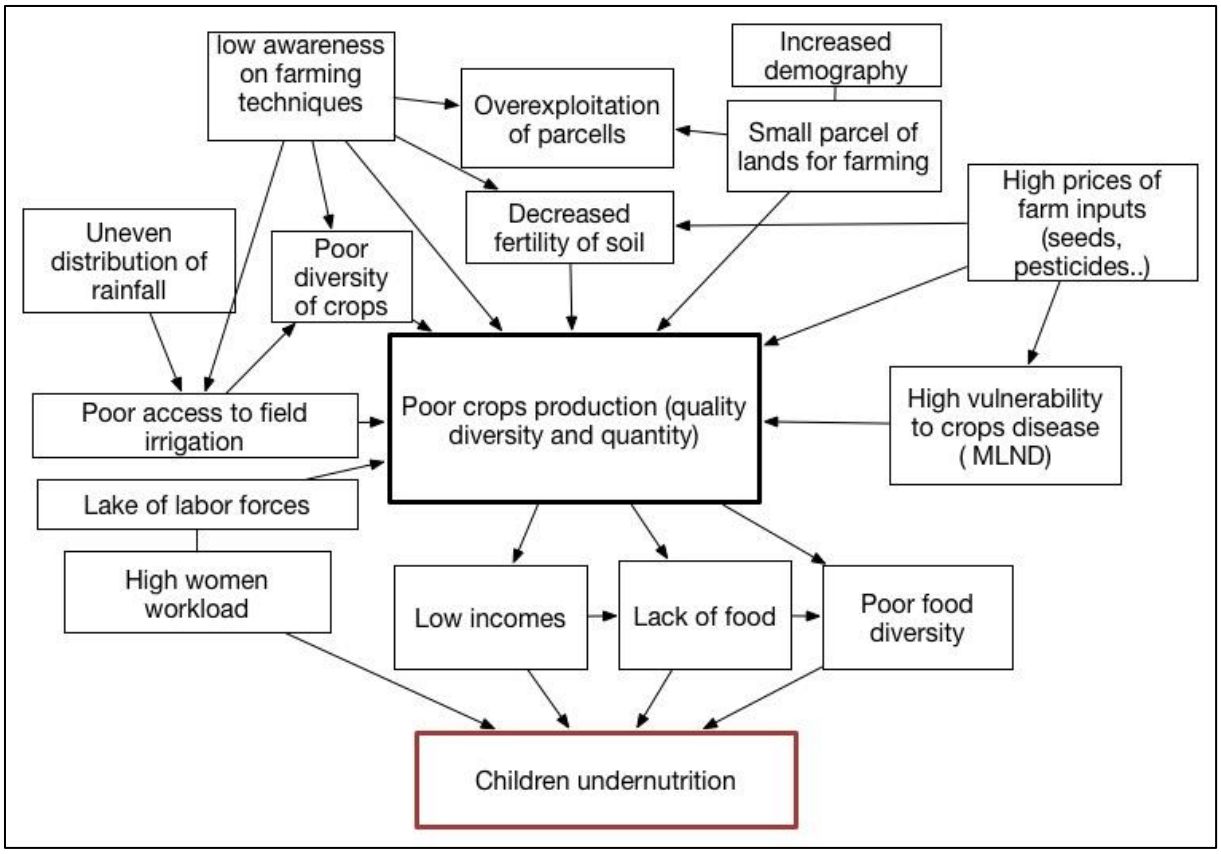


Figure 21: Pathway on poor crop production and the link with child undernutrition

Unreliable rainfall and low access to irrigation

Most households depend on one or two rain fed crops and there is not a culture of vegetable growing due to poor access to irrigation. This leads to a situation in which households are overly dependent on one or two crop(s), and are vulnerable to weather patterns and crop diseases. Furthermore, over-dependency on the same crop depletes nutrients from the soil. Poor agricultural knowledges and challenging physical conditions are known to contribute to food availability and low income related to cash crops availability. Indeed the uneven distribution of rainfall over time could be responsible for losses of 30-40 per cent of total production. Findings from the qualitative inquiry show that most households are very vulnerable to weather conditions, dependent on one or two rain fed crops in addition to some cash crops.

Small parcel of land

One important hypothesis that emerged during the qualitative inquiry is that landholding size is not sufficient to meet the needs of farming households and to generate enough cash to be able to meet with basic needs of the household. Low farmland size is compounded by large family size, as farmland is traditionally split between sons. Our study area has very high rates of demography increased. From discussions with community members in the qualitative inquiry, small land size is seen as a significant factor hindering crop production and diversity.

Low awareness of better farming techniques

Findings from the qualitative inquiry support this hypothesis with lack of resources for agricultural inputs emerging as an important challenge across all four villages.

Low access to farm inputs

Lack of agricultural inputs was found to be a significant challenge for households affecting both crop production and crop diversity, an issue which is compounded by the degrading quality of the local soil. In addition to fertilizer, participants reported to be unable to afford special high yielding seeds.

High vulnerability to crop diseases

Finally, findings from the quantitative and qualitative inquiry show that households are very vulnerable to crop diseases. Since 2012, MLND was reported in our studied area. 60.1 percent of our sampled household reported crops diseases namely MLND with 4% of them correctly identified symptoms of MLND. The disease affects maize crop reducing yields while households are forced to withstand to vulnerabilities of food insecurity.

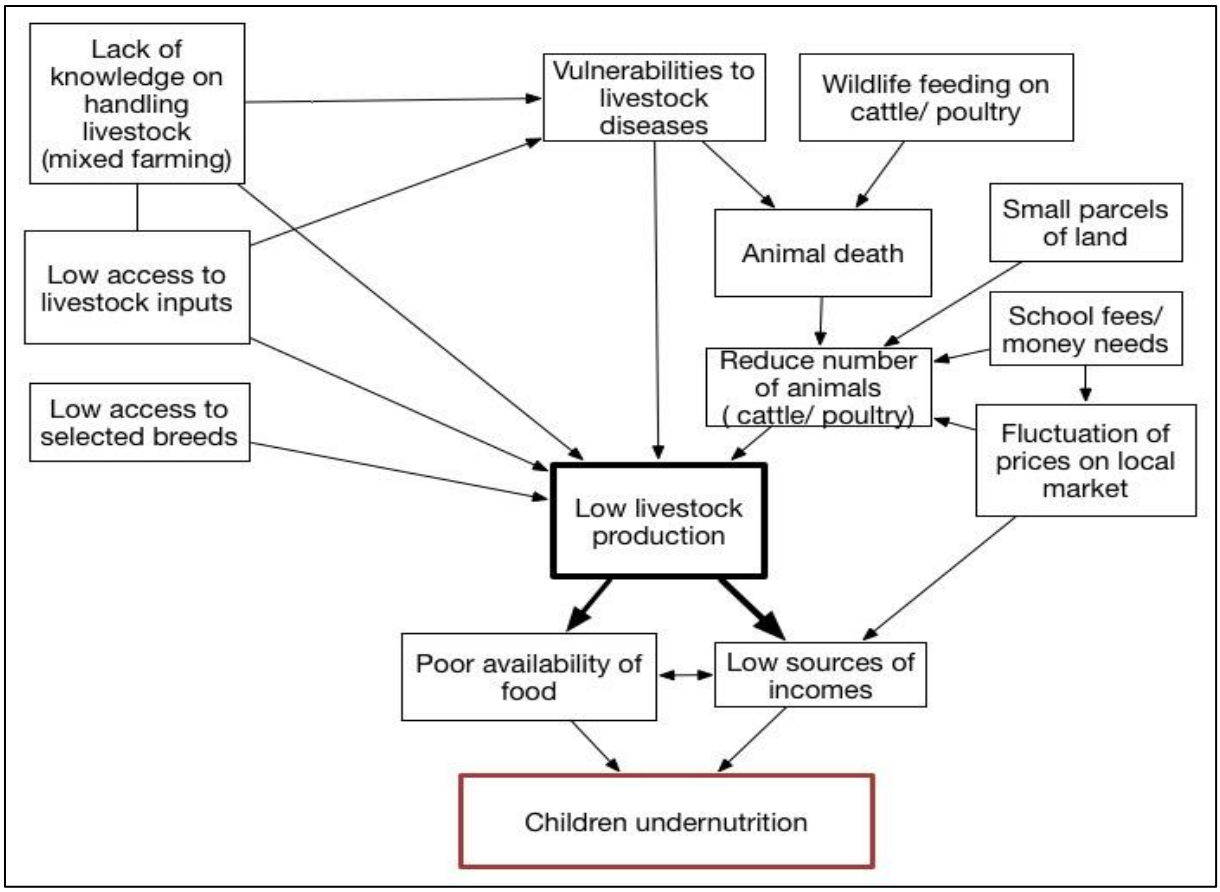
4.3.13 Hypothesis M: Losses of crop incomes during storage

This risk factor was not mentioned by communities during the qualitative enquiry, certainly because the poor production did not allow household to stock the crop production for a long time. Indeed, crop incomes are mostly sold after harvest to meet the household cash needs. However, the qualitative survey revealed that household have poor crops handling technics as they dry grains and mix them with chemicals and put them in sacks. Then they keep crops incomes in storage outside of the house, while some others keep in the house. Also some farmers revealed suffering from losses after harvesting, caused by weevil and rodent. This risk factor was rated as minor.

4.3.14 Hypothesis N: Poor livestock production

One important risk factor identified by communities is that livestock production is not sufficient to meet the needs of households and to generate enough cash to be able to meet with basic needs (both in quantity and quality), especially for Agro-pastoral communities who rely on livestock as they have a lower access to other diversified sources of incomes. The major livestock reared in our study area are indigenous zebu cattles, sheeps, and goats. The RFS found that water source for livestock is quite accessible, as it takes on average 19.9 minutes to reach the sources during rainy season, and 25.8 minutes during dry season. While the NDMA report from April 2015 revealed that the average distance to grazing land is 4.02km from households. Findings from our qualitative survey show that there is no migration of livestock. Qualitative survey revealed that there is no significant impact of livestock market closure on household incomes.

Pathways to this risk factor can be attribute to the low access to veterinary services and other inputs due to low awareness on animal and milk handling technics, high prices of selected breeds and lack of quality animal husbandry and livestock products but also to the reduced number of head in the cattle owned due to small size of grazing land owned, the high vulnerability to livestock diseases, and the increased needs of cash in particular to pay school fees. Also in Chemusar, wildlife as leopards and baboons are the major threat to livestock.



4.3.15 Hypothesis O: Poor access to market

The main markets in our study area are located in Makutano, Chepareria, Lomut, Sigor, Ortum Kacheliba and Amakuriat, Kabichbich, Kamelei, Kishaunet, Cheptuya and Orolwa. Main crops traded include: maize, beans, Irish potatoes, cabbages and sorghum. While the main livestock traded include: cattle, sheep, chickens and goats.
Most of the buyers are from Turkana, Kitale or Eldoret.
During our qualitative survey, communities did not identify this risk factor as market access is relatively good in those livelihood zones. As 74.8 per cent of households reach the nearest market in less than 2 hours (n=482, IC95%= 64.7-85%) and 76.4 per cent of households go to the market at least once a week, findings from qualitative enquiry found that the main constraint to access is due to harsh terrain. Indeed, 74.9 per cent of households access market by walking due to the poor road infrastructure and the cost of transportation when transportation mean are available. Our qualitative survey also revealed that closure of livestock markets due to outbreaks of livestock diseases (i.e. foot and mouth disease) do not have an important impact on households' incomes as they used coping strategy as credit for school fees or in shop. Contradictorily, findings from our qualitative enquiry found that access to market might have a negative influence on child nutritional status as men who live next to market centre spend more time in market area and are more likely to have expenditures patterns which do not benefit children (refer to causal hypothesis: poor utilization of household resources). This risk factor was rated as minor.

Table 27: Market access related indicators

Market access related indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Market utilization					
	% of households who go twice or more times to the market/week	484	30.372	21.566	39.178
	% of households who go once to the market/ week	484	46.074	35.947	56.202
	% of households who go to the market about once every two weeks	484	5.785	3.577	7.993
	% of households who do not go regularly to the market	484	17.769	11.698	23.839
Mode of transport to go to the market					
	% of households who walk to the market	482	74.896	65.249	84.544
	% of households who take vehicles to go to the market	482	7.884	2.956	12.812
	% of households who take motorbike to go to the market	482	16.598	9.785	23.41
Distance/ time to reach the market	Time to go to market				
	% of households who are able to reach the market in less than 2 hours	482	74.845	64.669	85.021
	% of households who are able to reach the market in about half a day	482	23.918	13.7	34.135
	% of households who are able to reach the market in more	482	1.031	-0.03	2.092

	than half a day				

4.3.16 Hypothesis P: Fluctuation of prices on local market (market utilization)

Fluctuation of prices of crops and livestock on local market has been rated as a minor risk factor to child under nutrition as prices of crops vary seasonally and therefore influence the incomes of households.

Finding from secondary data and qualitative enquiry revealed that crop prices are low after harvesting (from September-October for maize to February- March) at this time the supply is high, household are selling a large part of their production to afford school fees and farm inputs. The prices could also vary annually according to the production which can be affected by the poor rainfall or the diseases. In that case the supply is lower in the market and the prices increased. Lastly buyers can affect prices, for example in 2015, the government did not buy maize to stock in case of droughts, so the supply in the market was higher than previous years and the prices were cheaper. Livestock prices vary seasonally; the prices are low from January to April, when the supply in the market is high because of the household needs to provide school fees and other farm inputs. Findings from the qualitative survey have shown that middle men/brokers are not seen as a threat, but more as opportunity to sell their livestock easily as they increase trading.

4.3.17 Hypothesis Q: Inadequate intra-household resources utilization

The inadequate resources management within the household has been rated as a major factor affecting children malnutrition. In fact, poor management of incomes by men, which are not benefiting to children, poor utilization of livestock and farm products, which are sold to buy less nutritious food, are major contributors to the poor dietary diversity of children.

Men are main decision makers on household expenditure and do not prioritize children optimal nutrition and health. Women from our qualitative enquiry identified this as a major contributor to child under nutrition.
According to communities, men alcoholism affects ability of household to meet children basic needs. Indeed, men prioritize alcohol instead of food and health care (maternal and child care). Findings from our qualitative enquiry revealed that men are spending time in the afternoon in trading centre to “collect information” but this is also the occasion to have lunch and alcoholic drinks with others men. Especially after they sold crops or livestock, men are spending on average 300 to 400 Kenyans shilling per week for lunch and drinks. The RFS found that for 26.7 per cent of households, alcohol have been brought the day before the survey. As the respondents were mainly women, this proportion is certainly minimized as women are not aware of men expenditures. Moreover, women are complaining of the loss of productive time of men as while they are in trading centre they are not involve in farm work, which is a contributor to increase the maternal workload. The RFS found that 63.4% of Mixed farming households and 71% of Agro-pastoral households own poultry. 52.5 % of Agro pastoral household and 63.4% of Mixed farming household own a cow who produces milk. Findings from the qualitative revealed that agro-pastoral have less access to selected milking cow than agro pastoral. Furthermore, because of cultural taste preference and lack of diversified sources of incomes (especially for Agro-pastoral communities), beans, vegetable, fruits, milk, eggs and animal meat produced by household are rarely consumed by the children. Indeed during lean month (April to August) milk and eggs are main sources of incomes for the household (especially for Agro-pastoral communities who rely on less diversified sources of incomes than Mixed farmers). Those products are sold to re-buy the maize which has been sold from January to March to covers school fess and buy farm inputs. But also, cultural preferences for example tea at breakfast (instead of the traditional breakfast of porridge with milk) or ugali are

influencing the utilization of the resources and assets of the household. Nutritious foods are sold to buy sugar, tea leaves, but also modern needs as phone credit. In conclusion, with the low sources of diversified incomes, poor management of household resources is one of the major contributors to the low access to dietary diversity and frequency which is directly link with child under-nutrition as shown in the diagram bellow.

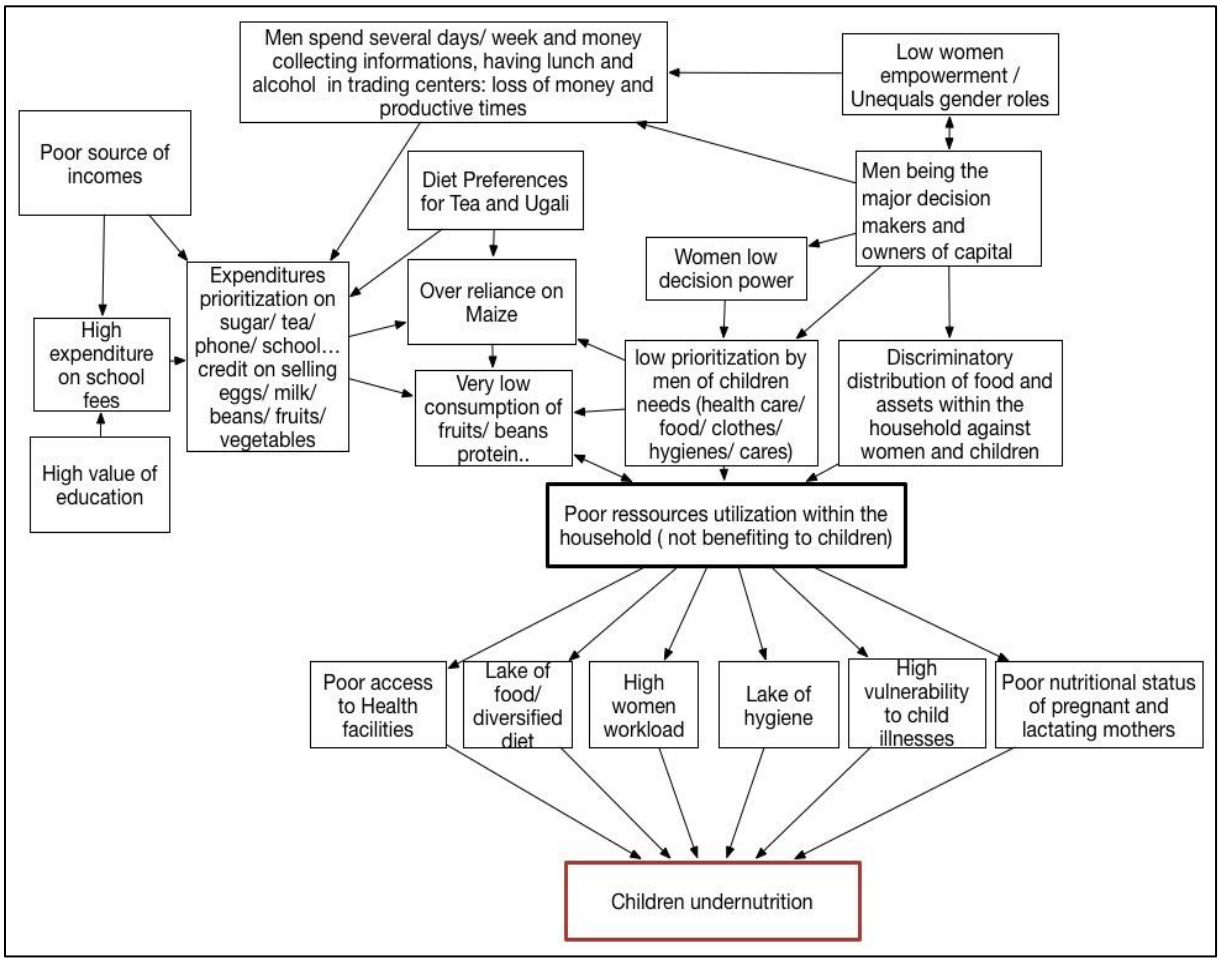


Figure 22: Pathway to poor resources utilization

4.3.18 Hypothesis R: Low level of education

Parental education, particularly of the mother, is linked to nutrition and child health, and is an important influencing factor for child under nutrition. It is also viewed as a proxy for socioeconomic status and improved care practices. A number of studies have found that parental education, particularly of the mother, is linked to child nutrition and health. In fact, based on statistical analysis of the determinants of child malnutrition in 66 developing countries, a major paper by IFPRI ranked women's education as the top priority for child malnutrition reduction in all regions studied: South and East Asia, Sub-Saharan Africa, Near East and North Africa, and Latin America and the Caribbean (Smith 2000). Despite strong evidence of an association, the causality of this pathway is not yet proven. With regard to this pathway and findings from our qualitative enquiry and particularly in positive deviant case study we found that education may reduce child malnutrition not through schooling itself, but rather because it may improve access to knowledge about proper health, hygiene and nutrition child care practices and will be less influenced by advices from TBA, mothers-in-laws or traditional healers, by strengthened women empowerment and power of decision. A predominant theme emerging from the scientific literature is that educating mothers improves their children's nutritional status. There is strong and generally consistent evidence that maternal education— whether it operates

alone, through socioeconomic status or knowledge— has a positive impact on child stunting, in addition to other child welfare indicators. The association of maternal education with stunting might be explained by increased awareness that educated mothers have about their children's nutritional requirements (Babatunde et al.,2011). Educated mothers provide improved health care to their children as a result of their awareness. The risk factor survey found that the 79.7 percent of child caregivers ever went to school, but from those who went to school, 59.2 percent did not complete primary school and 85 percent did not complete secondary school, what are very low rates compare to national rates. Findings from our qualitative enquiry revealed that the main reasons for caregivers to drop out school were early pregnancy, and lack of money to pay school fees. Risk factor survey found that 41. The findings revealed that 4 percent of the caregivers were married before the age of 18. Early pregnancy is not anymore a main factor for school dropout in our study area, indeed, after delivery, the parents of the girl or the boy will take care of the baby and the girl will get back to school. This can be considered as a risk factor to stunting, the care practice provide by the grandmothers will not be adequate (infant are not breastfed).

Table 28: Caregiver education indicator analysis

Education indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Education of main caregiver	% of main caregivers who went to school	385	79.7	74.0	85.5
	% of caregivers who complete pre-primary as highest level of education	385	59.2	51.4	67.0
	% of caregivers who complete primary school	385	25.7	20.8	30.6
	% of caregivers who complete secondary school	385	6.8	4.6	8.9
	% of caregivers who complete tertiary school	385	7.5	3.7	11.3

4.3.19 Hypothesis S: Insecurity and conflict

Stakeholders identify insecurity and conflict about cattle rustling and conflict over farming and grazing land as risk factors to food security during the preliminary workshop. However, this risk factor was rated as minor according to the communities who do not feel insecure., In the four villages from our qualitative enquiry, communities reported no cattle rustling and that the main conflict were over land heritance between brothers (due to increased demography, parcels are considered as too small to meet the household needs) and conflict on land borders between neighbours. Also other conflicts were mentioned between father and mother regarding incomes managements within the household.

4.3.20 Hypothesis T: Low access to safe water

Domestic water supply covers both access and quantity. Poor water supply can negatively impact child nutritional status due to exposure to pathogens, which may cause illness, with EE and diarrheal diseases being the most common among children under 5. Although households may have access to a water supply, it may become contaminated due to maintenance issues. The amount of water available will also affect hygiene practices. Domestic water supply, water storage and transportation practices were explored with relation to this causal hypothesis.

Access to improved water source

Distance to water source is a major contributor to access adequate quantity of water. Our risk factor survey found that 57% of respondents take less than 15 minutes to reach the water sources (95% IC = 48.6-65.5%), and 19.1% of Household live at more than 30 minutes from the water source which is beyond the Sphere standards guidelines. Queuing time by community was noted to be of concern with only less than half of the population (37.7%) managing to spend less than 15 minutes to fetch water, according secondary data (SMART survey, 2014). Findings from qualitative survey revealed than women are responsible to fetch water for the family, sometimes helps by the older children on the weekend. On average women go to the water sources on the morning and in the evening. Distance to water source is perceived as a major contributor to increased maternal workload. An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular from contamination with faecal matter. Improved sources include piped water into a dwelling or yard/plot, public tap, borehole and protected spring. Unimproved water sources, on the other hand, include unprotected springs or hand dug wells and surface water. Findings from risk factor survey found that only 24.7 % of household have access to an improved water source (95% IC= 14.4- 35%, n=482), 54 % of households rely on unprotected springs to get water, as shown in the figure 23.

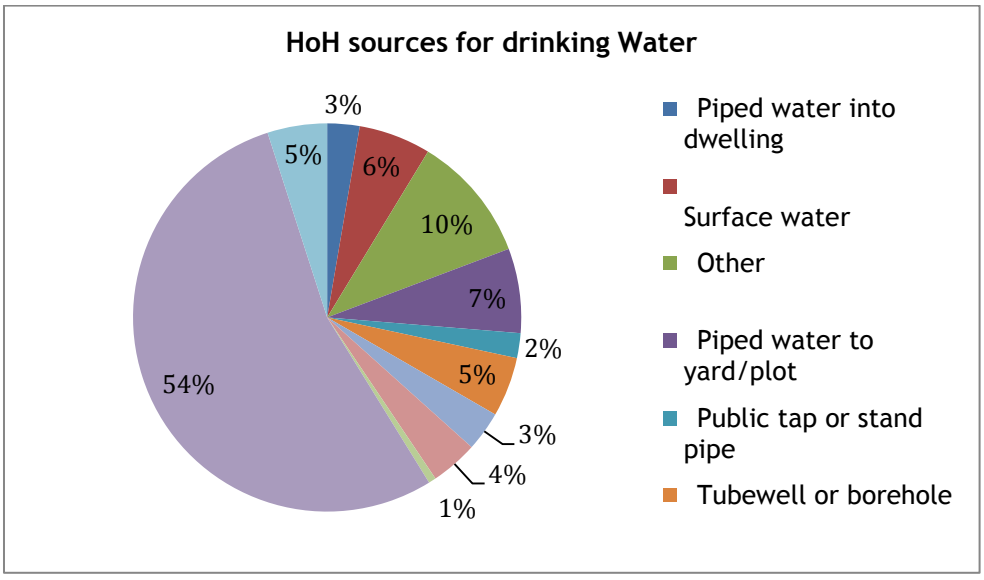


Figure 23: Households sources for drinking water

The findings from the qualitative enquiry revealed that sources might be contaminated by the utilization of the sources. Indeed, the unprotected spring are also used by communities to wash the clothes, by men and boys to bath and by livestock which also drink from the same water source. Moreover, the high rates of open defecation made this situation even

worse, especially during the rainy season were unprotected sources become contaminated. This could explain the high rates of child intestinal infection during this season.

Table 29: Household sources for drinking water

Water sources indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Distance to Water source	Time to go to Water source from HH				
	% of households who are able to reach the water source in 15 minutes or less		57.054	48.617	65.491
	% of households who are able to reach the water source in 15-30 minutes		23.859	17.519	30.199
	% of households who are able to reach the water source in 30 min - 1 hour		14.523	10.031	19.015
	% of households who are able to reach the water source in 1-2 hours		3.942	0.986	6.897
	% of households who are able to reach the water source in More than 2 hours		0.622	-0.645	6.897
Access to improved water source	% of households who have access to an improved water source	482	24.689	14.394	34.984

Table 30: water source contamination risk indicator

Water source contamination risk indicator	Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
No risk	118	10.169	5.072	25.411

Mild risk	118	20.339	5.929	34.749
Moderate risk	118	36.441	22.97	49.912
Severe risk	118	33.051	16.513	49.589

Access to adequate quantity of water

The amount of water available may also negatively affect hygiene practices and women domestic workload. Access to a sufficient domestic water supply may be hindered by limited availability of water, extended time or distance to collect water, and having to pay for water. If access to water is poor, the household member responsible for water collection may go less frequently and store drinking water for a longer period of time, which can result in a proliferation of pathogens if improperly stored. A sufficient domestic water supply is necessary for hygiene and sanitation practices that keep food, hands, bodies, and home environments clean. (Van der Hoek et al. 2002)

Household water consumption was at an average of 17.8 litres per person per day (95% IC= 16- 19.6%), which is in phase with the recommended Sphere (7.5-15 litres per capita per day for basic survival needs) and national standards of 15-20 litres per person per day. But Fanta measurement guide recommendation for development context is 50-liters/capita/day. The following table shows the quantity of water available compared to FANTA standards recommendations. Such low water usage per capita could be explained by the fact that the men and boys wash themselves in the rivers and clothes are also washed in the river, where the river is predominant source of drinking water.

Table 31: Access to adequate quantity of water

Quantity of water indicators	Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Number of litres of Drinking water/capita/day FANTA recommendation = 5lcd	475	1.415	1.283	1.547
No of litres of water for food preparation/ capita/day FANTA recommendation = 10lcd	481	3.765	3.469	4.061
No of litres of water for bathing/capita/day FANTA recommendation = 15lcd	480	4.952	4.436	5.468
No of litre of water for hygiene and sanitation/capita/day FANTA recommendation = 20lcd	480	6.917	5.746	8.087

Water management from the source to the household

Water contamination can occur at point of use i.e. at the household. This can happen depending on the storage container used to draw.

Water management is a risk factor of under nutrition, as supported by the findings of Palit *et al.*, 2012, who studied the risks of in-house contaminations of drinking water and found them to contribute to the transmission of diarrheal diseases in Indian slums.

Water management score is also showing a high rate of severe risk (74.7%). This indicator based on the water source observation scores and household handling water scores is mainly explained by the way villagers treat water. Indeed, qualitative and quantitative findings reflect that most of the respondents do not filter their water. They store water with the same jerrican used for collecting water, with which is often dirty or uncovered, increasing the risk of faecal-oral contaminations. The severity of observed contamination risk is related in the table 32.

Table 32: severity of observed contamination risk

Water management risk of contamination indicators	Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Proportion of household where a mild risk was observed	482	5.394	3.151	7.637
Proportion of household where a moderate risk was observed	482	19.917	15.849	23.985
Proportion of household where a severe risk was observed	482	74.689	69.129	80.248

In addition, 83% of households reported doing nothing to make the water safer to drink (n= 482). Of those, about half did something using a correct method including a water filter or adding bleach. Even though majority of the respondents are getting water from unsafe water source, nearly all (76.3%) of the communities do not subject water to any treatment before use. This poses a risk in WaSH related diseases to the most vulnerable group such as children. The methods of water treatment are highlighted in the figure 24:

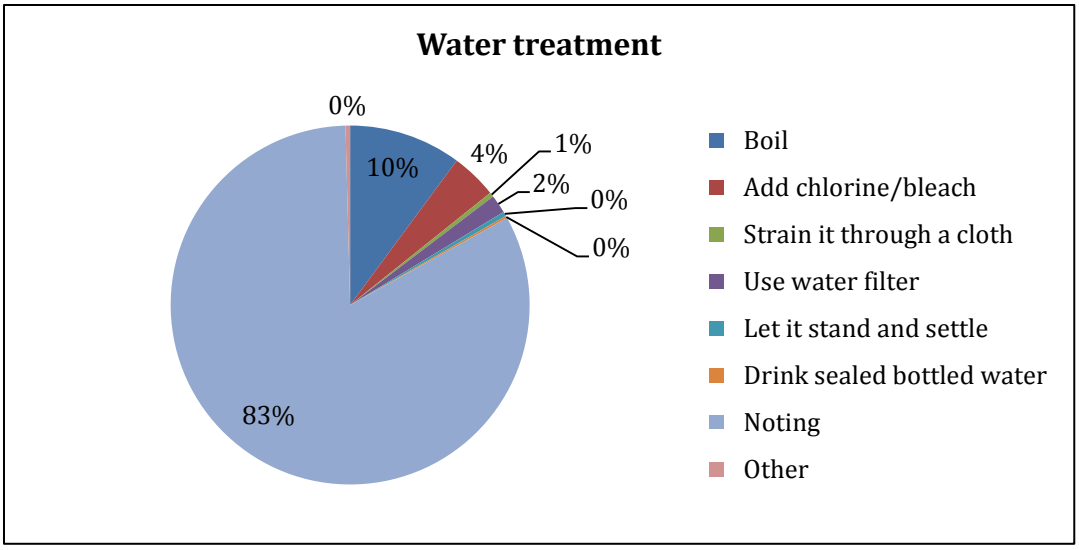


Figure 24: Household water treatment options

The Pathways to the low access to safe water is highlighted in figure.25:

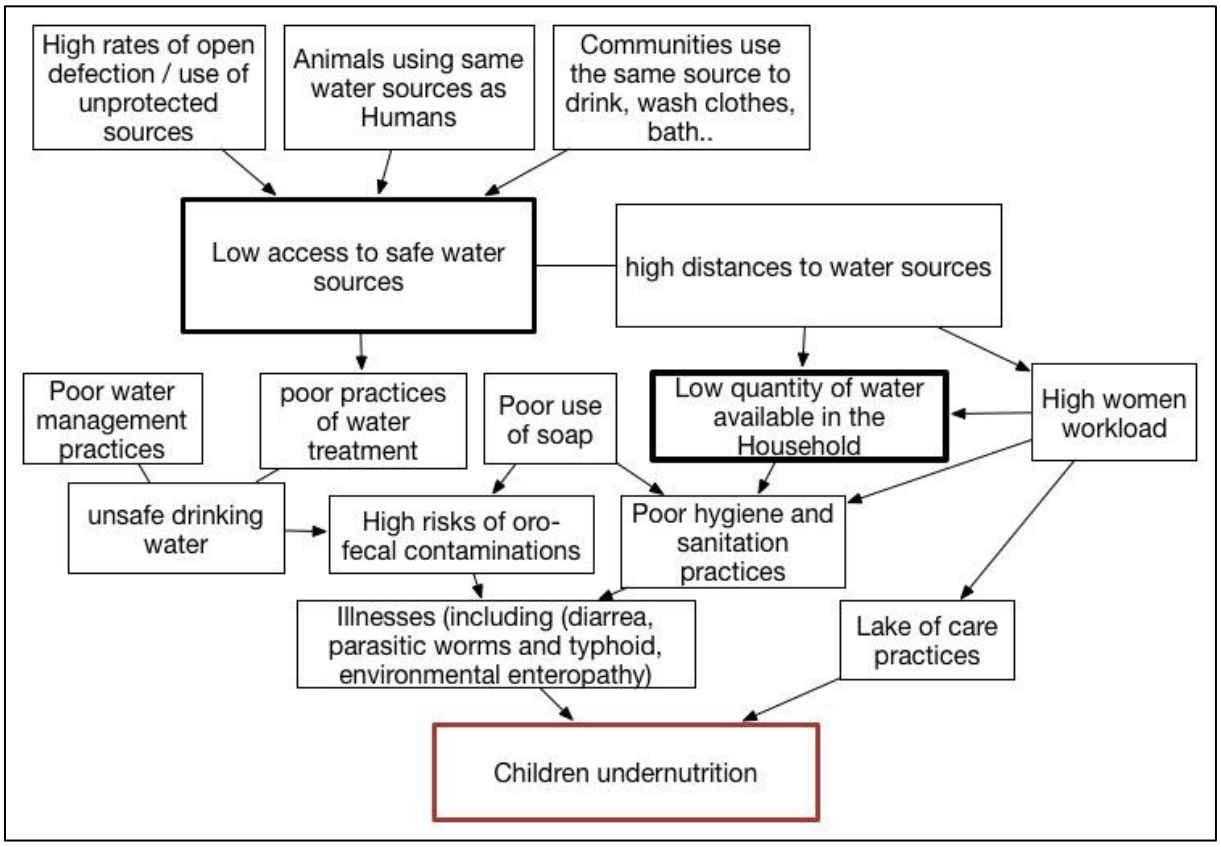


Figure 25: pathway to unsafe water use at household level

4.3.21 Hypothesis U: Poor sanitation access, utilization and practices.

Poor sanitation negatively impacts child nutritional status due to exposure to pathogens, if the outlet of faeces is not well isolated from the environment by the use of appropriate sanitation facilities, it can contaminate water, food and insects that can in turn contaminate food and water. The relationship between sanitation and stunting is likely to be mediated via EE, diarrhea and other intestinal infections.

The absence of sanitation facilities has a strong negative impact on child illness, particularly diarrhea. Among children under five, estimates of the reduction in diarrheal incidence through improved sanitation ranges from 13% (Gunther et al. 2010) to 20-30% (Esrey et al. 1991; Waddington et al. 2009; Fewtrell et al. 2005). In these major studies, the impact of sanitation on child illness is greater than the impact of improved water infrastructure. There is strong evidence that sanitation infrastructure — but not water infrastructure — may have a positive spill over effect on the larger community, based on Gunther's major study analysing data from 172 data sets.

Use of latrines is the most appropriate method of human excreta. Poor disposal contributes to contamination of water sources and provides environment for the transfer of the germs by flies to food. The study assessed the proportion of HHs with latrines and those practicing open defecation. Latrine coverage was quite high in the target area, with only 29.2 per cent of households who do not have access to latrines or toilets (95%CI= 18.8-39.8%, n=482). However, the proportion of households with a safe and hygienic sanitation facility as measured through observing the toilet facility was very low. Based on these criteria only 22.2% of households have a safe and hygienic sanitation facility (95% CI = 14.4-30.3% n=282). For those households who have access to sanitation facilities, 47% of them use a pit latrine without slab.

The type of Sanitation points used is highlighted in the figure 26:

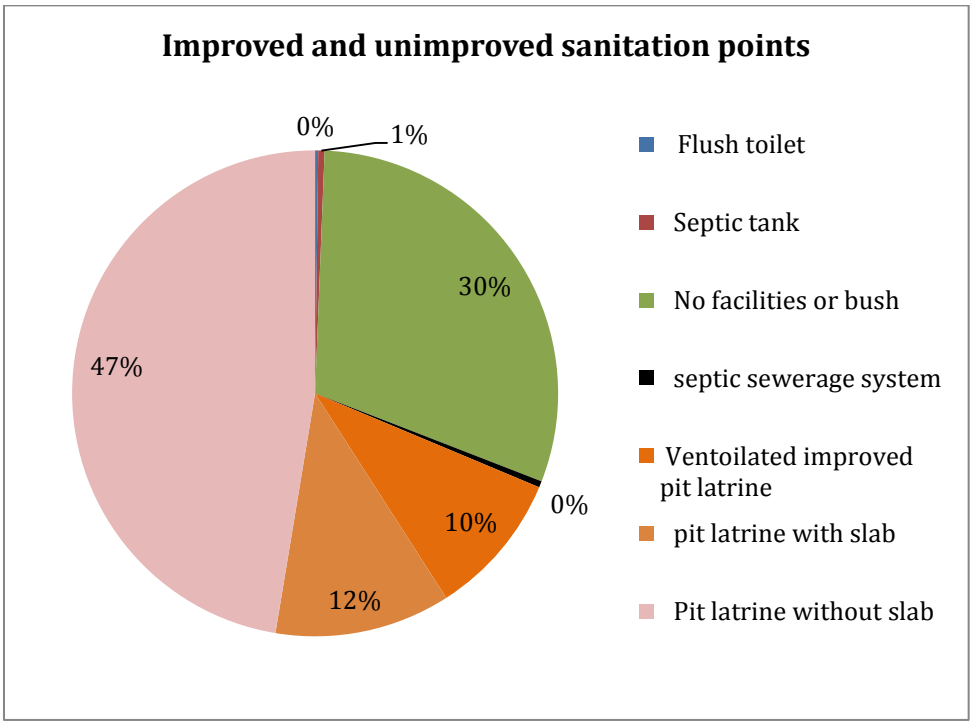


Figure 26: Improved and unimproved sanitation points

Disposal of child faeces was also examined as a risk factor. Only 11.2% of all children aged 0-23 months (95% IC= 4.8- 17.6% n=322) reportedly have their faeces disposed of in a safe way. This finding is supported by observations of the Link NCA team in the qualitative inquiry where mothers where observed to throw children faeces behind the house.

The qualitative inquiry also revealed that men and women practice open defecation when they are working in the field. Risk factor survey illustrated that animal faeces were observed in 70.2% of households (95% IC= 61.6- 78.8%, n= 480). Indeed, communities' value having animal faeces in the compound, this is a social sigh of the wealth of the household which signify that the household owns animals. Qualitative findings revealed men and

women especially from Agro-pastoral communities, of having no knowledge about the risk of contamination from livestock faeces. On the contrary, livestock and livestock faeces are seen as safe if not valuable. Moreover, proper disposal of solid/liquid and human wastes in sanitation is the hygienic means of promoting health through prevention of human contact with the waste hazards. The qualitative survey established the most main method of solid waste disposal is to throw on the open field and also pouring liquid waste outside the house. Probably this contributed to poor environment status on some of the households that were observed to be dirty at the time of the assessment. The pathway to the poor sanitations practices is represented in the figure 27:

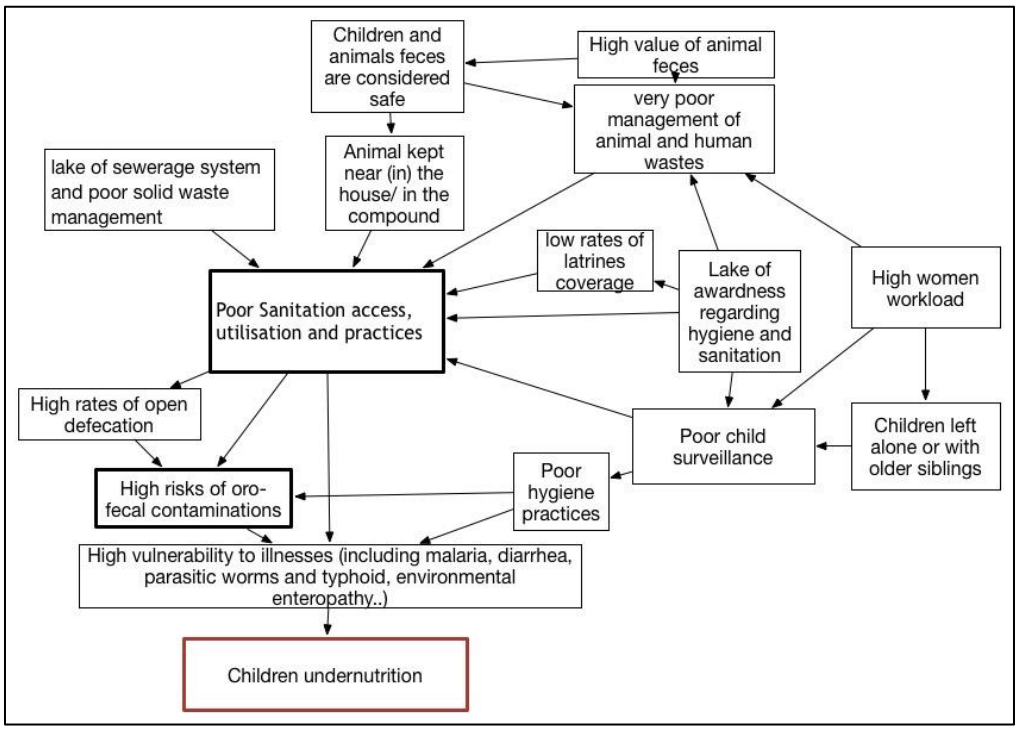


Figure 27: Pathway to poor sanitation practices

Sanitation indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Sanitation access	% of households with no access to toilet or latrine	482	29.253	18.761	39.746
	% of households who have access to an improved sanitation	478	22.238	14.438	30.331
	% of households were animal waste were observed in the compound/ playground of children	480	70.208	61.598	78.819
Safe disposal of children faeces	% of caregivers who practice a safe disposal of children faeces	322	11.18	4.779	17.581

4.3.22 Hypothesis V: Poor hygiene practices

Poor hygiene practices can negatively impact child nutritional status due to exposure to pathogens, which may cause illness, with diarrheal diseases being the most common among children under 5.

Most cases of endemic intestinal infections are transmitted between individuals due to a lack of personal and household hygiene (Cairncross et al. 2003). Poor household sanitation and caretaker hygiene are leading causes of diarrhea (Sheth 2006). Diarrhea or other illness may arise when food or water is contaminated with bacteria, viruses or parasites. Intestinal parasites (such as hookworms, giardia) may be spread through food, through faecal-oral transmission from infected humans or from infected domestic animals.

The faecal oral route of diseases transmission from infected humans or infected domestic animals operates through poor sanitation and hygiene practices. This disease path can occur when animal or human excreta is near the home, caretakers reuse rags that have been used to clean a child after defecating or do not wash their hands after defecating (or handling defecation) (Sheth et al. 2006). When soap and water are available, there is strong evidence that hand washing alone can reduce the frequency of diarrhea by approximately 30 to nearly 50% among children under 5 (Cairncross et al. 2003; Ejemot-Nwadiaro et al. 2012). Cairncross' meta-analysis finds that the impact of this hygiene practice is stronger than either water quality improvement (17% reduction in risk of diarrhea) or excreta disposal (36%).

Hand washing practices were measured by asking child caregivers to demonstrate only for those respondents who confirmed practicing handwashing. Through observation to the respondents explained when they do so and how they wash their hands and then assigning a score of 0-10, with scores over 8 indicating appropriate hand washing practices. Using this indicator, only 28.4 percent of child caregivers demonstrated appropriate hand washing practices (95%CI=23.2-33.6%, n=482). The qualitative findings revealed that the majority of the respondents do not wash their hands at critical times. It is only before eating and before cooking are the main instances reported by respondents to wash their hands while other critical times mentioned are after using the latrines, before cooking, and after cleaning baby were mentioned by few people.

Furthermore, RFS shows that 86.5% of the respondents had soap available in the house. (95% IC= 82.5-90.5%, n=481).The last result is confirmed by the qualitative survey, as most of the mothers prioritize soap for washing cooking utensils and clothes and seem not washing their hand before breastfeeding their child, or after defecation.

This is also supported by findings from the qualitative inquiry which found that knowledge of good hygiene practices was weak among the community; moreover communities have a poor knowledge about determinants of diarrhea. In addition, a common challenge for most households is the lack of income to purchase soap on a regular basis.

All children under five in the survey were observed as being either clean (recently cleaned or washed), moderately clean (child's hands and/or clothes are dirty but no faeces visible or can be smelled) or very dirty (stools are visible or can be smelt on the child's body or clothes). Using this observation scale, 21.3 per cent, 69.3 per cent and 9.3 per cent of children were found to be clean, moderately clean and very dirty respectively (n=770). Girls were found clean (24.2%, IC 95%= 17.5-31%, n= 388) than boys (18.3, IC 95%= 12.8-23.8). This result was confirmed during the qualitative enquiry. In fact, participants explained that girls should be cleaner than boys, explanations were related to genders roles: girls are the ones who will handle food, but also because they are the « picture » of the family. While girls and women are supposed to be clean and in charge of household duties, boys are supposed to be more active, playful and spend more time outside of the house, so this is commonly accepted that boys are less clean than girls. Findings from the qualitative enquiry revealed that girls are also prioritized for their sleeping places and

clothes they wear. This difference in hygiene and care practices between boys and girls should explain also that boys are more vulnerable to stunting than girls. Food contamination is an additional risk factor. This may result from storing food at ambient temperature or unsafe handling of food, and is particularly dangerous for those children. Studies demonstrate the importance of educating food handlers (mothers, in particular) on food safety to try to prevent diarrheal disease. Feeding a child leftover food that has been improperly stored, not washing hands before cooking and feeding, consumption of food that has touched the floor, use of dirty dish cloth (wiping hands and utensils) and the use of dirty feeding bottles are all examples of poor hygiene practices that can negatively impact child nutritional status (Sheth et al. 2006). Observations during the qualitative enquiry confirmed that children feeding bottle are very dirty, and this could contribute to increase the risk of faecal-oral transmission as 71.8 % of children aged 0-23 months are fed with bottles or gourds. Furthermore, observations from RFS, revealed that 61.6% of the respondents do not cover their food at the household level (IC 95%= 55.6-67.6% n=482). As ugali leftovers are consumed by children, this could be an important contributor to children illness.

The pathway poor hygiene practices risk factor to stunting is highlighted in figure:

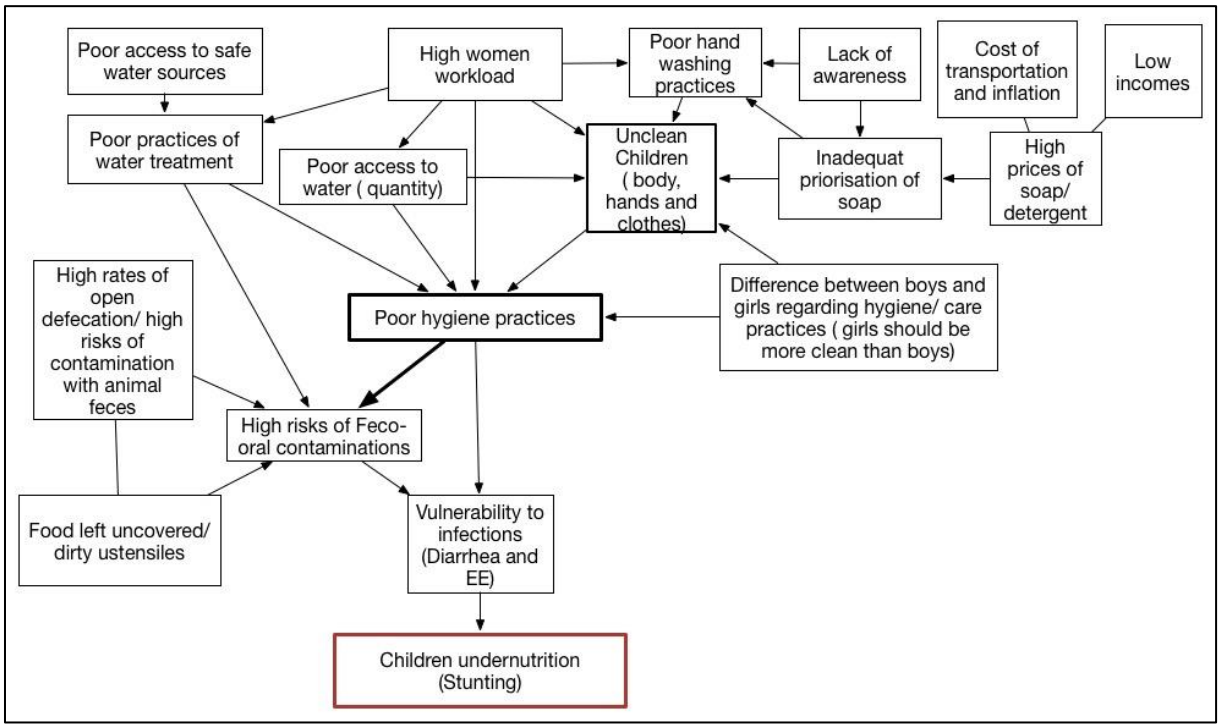


Figure 28: pathway to poor hygiene practices

Table 33: Risk factor survey findings for Hygiene indicators

Indicators of hygiene's practices		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
Hand washing practices	% of caregivers with appropriate hand washing practices	482	28.423	23.217	33.63
Soap availability	% of households which owned soap/ detergent	481	86.486	82.481	90.492

Risk of faecal-oral contamination	% of households were animal waste were observed in the compound/ playground of children	480	70.208	61.598	78.819
	% of households were poor food hygiene was observed (leftovers uncovered or dirty cooking utensils)	482	61.618	55.587	67.649
Bottle feeding and use of other inappropriate drinking utensils	% of children (0-23 months) who are ever been fed with an inappropriate drinking utensil	319	71.787	63.698	79.876
Child body cleanliness and hygiene practices	Observation of the cleanliness of the hands/ body/ clothes of the child				
	% of children aged 0-59 months who were observed clean	770	21.299	15.73	26.867
	% of children aged 0-59 months who were observed moderately clean (child's hands and /or clothes are dirty but no faeces visible or cannot be smelled)	770	69.351	64.031	74.67
	% of children aged 0-59 months who were identified as very dirty (faeces visible on clothes and body)	770	9.351	5.787	12.914
	% of boys aged 0-59 months who were observed Clean	382	18.325	12.812	23.837
	% of girls aged 0-59 months who were observed Clean	388	24.227	17.49	30.963
	% of boys aged 0-59 months who were observed moderately clean	382	72.513	67.025	78.001
	% of girls aged 0-59 months who were observed moderately clean	388	66.237	58.988	73.486
	% of boys aged 0-59	382	9.162	5.204	13.12

	months who were identified as very dirty				
	% of girls aged 0-59 months who were identified as very dirty	388	9.536	5.022	14.5

4.3.23 Hypothesis W: High HIV/AIDS prevalence

HIV infection in a child may be an immediate determinant for stunting. Sunguya et al. (2011) found high stunting rates among HIV infected children, however in multivariate analysis HIV status of the child was associated with underweight and wasting, but not with stunting. A study across countries in sub-Saharan Africa found that mothers infected with HIV form an increased risk for children under five in that household to be stunted (Magadi, 2011). Children whose mothers are HIV positive had a 28 per cent higher risk of being stunted compared to children living in households with no adult infected with HIV. In Kenya, a significant higher degree of stunting was found among children residing in HIV affected households compared to children residing in unaffected households (Ndirangu et al., 2011).According to secondary data, HIV/AIDS remains a developmental challenge in West Pokot County especially due to its socio-economic impact. Its prevalence rate is 2.8 per cent in the County, which is quite low compare to national prevalence. The most affected age group is 15-49 years which is the economically active population. In fact, households affected with loss of caregivers attributed to HIV/AIDs have had huge gaps in maintaining accessibility to household income and food. Kenyan demographic health survey findings reveal that Nairobi recorded the highest coverage of prior HIV testing at 90 percent, while West Pokot was one of the County which reported lower testing coverage compared with the rest. Findings from our qualitative enquiry shows that women are tested during ANC visits, and a high majority of them know their HIV status, but few men have a lower access to HIV test, the KDHS found that West Pokot County has one of the lowest coverage at 35 percent. In all other counties, over 50 percent of men age 15-49 have ever been tested and received results. Findings from our qualitative enquiry show that teenager have sexual relationship with multiple partners before marriage, this should be considered as a risks for STD and HIV prevalence. But, considering the relative low prevalence of HIV/ AIDS in our study area, this risk factor will not be considered as a cause of stunting but people living with HIV should be considered as very vulnerable group.

4.3.24 Hypothesis X: Poor birth spacing

Household size has been associated with the occurrence of stunting (Engebretsen et al., 2008; Mamabolo et al., 2005). Larger households have an increased risk for stunted children in that household. Indeed, a larger household size increases demand for food and incomes within a household but also the mother‘s workload.

The fertility rate in the West Pokot County is one of the highest of the country, with an average of 7.2 children per women. The national fertility rates stock at 3.9.

The risk factor survey found that the average size of household is 6.9 persons (n=482) (the survey only include household within a child under five) and there is no significant difference between household from Agro-pastoral and Mixed farming livelihoods.

The effect from household size on stunting may be partially explained by the poor child spacing. Gribble et al. (2009) found that as the length of birth interval increases, the risk for stunting in the next born decreases.

The WHO recommends two to three years between pregnancies to reduce infant and child mortality and also benefit maternal health (Marston, 2005). There are three major interconnected mechanisms by which birth spacing may affect nutrition outcomes. The first refers to "maternal depletion", or the fact that short intervals between births limit the amount of time that mothers can recover from the nutritional burden of pregnancy and lactating (T. J. Boerma & G. T. Bicego, 1992). Being pregnant increases energy needs by 13%, protein by 54% as well as mineral needs 0-50%. If a mother's reserves have been depleted, the next child is at risk of foetal malnutrition and compromised gestational period. However, this model of maternal depletion does not take into account breastfeeding; lactation is an even greater nutritional burden than pregnancy.

The second mechanism by which birth spacing may affect child nutrition is through "sibling rivalry". Young children, born close together might have to compete for food, maternal care, attention or other resources.

Short subsequent birth intervals prompts weaning of the first child and stop of breast milk consumed for that child. Both factors can make the first-born child more vulnerable to infection and nutritionally disadvantaged. When the younger sibling is born, the older is at an age at which children are particularly exposed to infectious diseases, notwithstanding the potential decrease in care and early termination of breastfeeding listed above. The younger child is also vulnerable to infection at such a young age and may contract a secondary case of infection (J. T. Boerma & G. T. Bicego, 1992; Whitworth, 2002).

However, women from our qualitative survey identify short birth spacing as an important factor to child malnutrition, because they will stop breastfeeding the first child as soon as they found out they are pregnant again and because the milk is perceived as contaminated or in insufficient quantity for the first child.

Unmet need for family planning contributes to short birth intervals and high fertility rates, which in turn affects household resources and ability to provide adequate care.

Current use of family planning was found to be 27.6 per cent among mothers in the survey (n=434). However, the risk factor survey found that 58.7 per cent of mothers had wanted to get pregnant later or not at all at the time of their last pregnancy (95% IC= 52.6-64.8%).

The qualitative inquiry also found that family planning usage was reportedly very rare. Women had no information about access to family planning but also no knowledge about it and lot of them ask our team how to delay pregnancy. Having a lot of children is very important for Pokot men, lot of children are synonym of wealth. Interview with medical staff from health centre indicate that only educated women are asking for contraception, the others are afraid of the reaction of their husband or do not know where they can access. Our risk factor survey revealed that 52.5% of women did not discuss with their husband about having or not more children. The pathway to this risk factor is described in the diagram bellow:

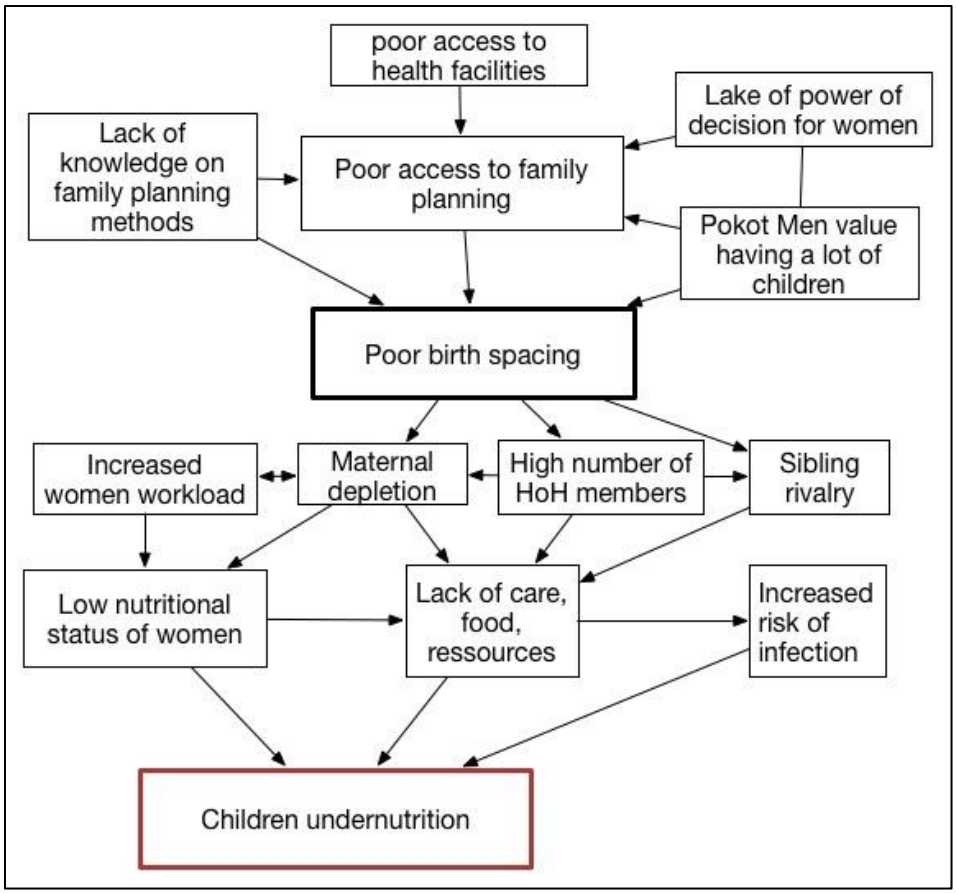


Figure 29: pathway to low family planning practices

Indicators		Sample	Mean or proportion	Lower confidence interval -95 %	Upper confidence interval-95 %
	Household average size	482	6.946	6.658	7.234
	MF	200	6.93	6.411	7.449
	AG	282	6.957	6.594	7.321
	No of children 0-59/ HoH	481	1.628	1.554	1.702
Contraceptive prevalence rates	% of women (15-49) who are currently using a contraceptive method	434	27.65	19.582	35.718
Type of contraceptive method used	Contraception methods used				
	% of caregivers who are using male/female condoms		1.613	-0.682	3.908
	% of caregivers who are using pills		15.323	7.338	23.307
	% of caregivers who are using implant		15.323	9.878	20.767
	% of caregivers who are using no sexual		1.613	-0.722	3.948

	activity to avoid pregnancy				
	% of caregivers who are using locational amenorrhea method		0	0	0
	% of caregivers who are using Other medical methods		58.065	50.987	65.142
	% of caregivers who are using Other traditional methods		8.065	2.567	13.562
Undesired pregnancy/ unmet need for family planning	% of women who did wish to delay their last pregnancy or did not want to be pregnant	443	58.691	52.57	64.812

4.4 Overview of historical seasonal calendar for risk factors linked to stunting

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept	Oct.	Nov	Dec.
High prevalence of ARI												
High prevalence of Diarrhea												
High prevalence of Malaria												
Hunger gap												
High expenditures for school fees and farm inputs												
High maternal workload												
Poor quality of water												
Poor quantity of water available												
High Prices of Maize on the Market												
High Prices of livestock on the Market												
Harvesting of Maize												
Harvesting of beans												
Availability of vegetables (when relying on rain)												
High use casual labour as a coping strategy												
Accessibility of a diversified diet												

Poor diversified sources of incomes												
HoH sell milk and eggs as important source of incomes												
Short rains												
Long rains												
Long dry lean season												
Short dry lean season												
Planting												

4.5 Overview of the rating exercise

4.5.1 Summary of the rating exercise and confidence note given

Based on the RFS, qualitative enquiry, secondary data, literature review, causal hypothesis were rated by the NCA expert as major, important, minor, untested or rejected causal pathways[85]. The results of rating of risk factors from Link NCA team are highlighted in table 34:

Table 34: Summary rating exercise of risk factors

Risk factors	Prev. from secondary data	Rating from initial workshop	Prev. from quantitative survey	Strength of association with stunting from literature review	Participatory raking exercise with communities	Interpretation	Comments from Link NCA Analyst
High prevalence of childhood illness: ARI, clinical malaria, diarrhea and environmental enteropathy	+++	+++	+++	+++	++/ +	Major	Need to assess the prevalence of EE
Inadequate dietary diversity and meal frequency	+++	+++	+++	+++	+++	Major	
High maternal workload	++	+++	++	++/ +	+++	Major	
Low sources of income/=low sources of diversified income	+++	+++	+++	+++	+++	Major	

Inadequate income and assets utilization within the household	+++	+++	+++	++	+++	Major	
Poor access to safe water	+++	+++	+++	++	++	Major	
Poor hygiene practices	++	+++	+++	+++	+	Major	
Low access to health services	+++	+++	+++	++	+++	Important	
Poor health seeking behaviour	+++	+++	+++	++	+	Important	
Inadequate breastfeeding practices	+++	+++	+++	++	+	Important	
Low birth weight	++	++	++	++	+	Important	
Low women empowerment	++	+++	++	+	+	Important	
Poor crop production (quantity , quality and diversity)	++	+/++	+++	+	+++/++	Important	
Poor livestock productivity	++	++	N/A	+	++	Important	Major for Chemusar (wildlife) AP are more vulnerable than MF
Poor birth spacing	+++	Add Hyp	++	++	++	Important	This risk factor was added during qualitative enquiry
Low level of education among caregiver	+++	++	+++	++	++	Important	
Poor sanitation access, utilization and practices.	++	++	+++	+++	Did not identify this risk factor	Important	
Low supplementation and immunization coverage	+++	+++	+	+	+	Minor	Or important (supplementation) but less impact on child illness

							than access to health facilities, hygiene practices, health seeking behaviour and poor access to diversified diet
Poor nutritional status of pregnant and lactating women	+	+++	++	+(+)	Did not identify this risk factor	Minor	Nutriment deficiencies could have a major influence on LBW or IUGR
Losses of crop value during storage	++	++	N/A	+	Did not identify this risk factor	Minor	Minor because the households who store the crops for long times are the one who are less vulnerable (with a higher economic status). Vulnerable HoH (poverty) sell the crops immediately after harvesting.
Poor access to market	++	+/++	++	+	+	Minor	
Fluctuation of prices on local market	++	+		+	Did not identify this risk factor	Minor	Does not have a direct link to stunting, impact on low incomes (less important than crop and livestock production)
Insecurity and conflict	+	++	N/A	+	+	Minor	

High HIV/AIDS prevalence	+	++	N/A	+++	+	Rejected	This hypothesis was rejected, however HIV.AID patients should be consider as a vulnerable group
Low access to education	++	++	+	+	Did not identify this risk factor	rejected	Low access to education was rejected as risk factor; however the cost of school fees was identified by communities as a major risk factor though untested

At the final multi-stakeholder workshop, results of the preliminary rating exercise were presented at the forum. Following the presentation, participants were split into three sectorial working groups and each group was given information regarding all causal hypothesis including Link NCA results and rating. Each group was asked to review the evidence and for each result, to provide a confidence note (low=1, medium=2, high=3). Link NCA expert rating with technical expert average confidence notes are presented in the following table 35:

Table 35: Final Confidence note exercise

Risk factors	Interpretation by NCA team	Average of confidence note given by working groups	Suggested rating amendment by technical experts	Final rating
High prevalence of childhood illness: ARI, Clinical malaria, diarrhea and environmental enteropathy	Major	3		Major

Inadequate dietary diversity and meal frequency	Major	3		Major
High Maternal workload	Major	2.6	Minority of participants suggested to rate this risk factor as important because there is no direct impact on child undernutrition	Major
Low sources of income/ low sources of diversified income	Major	3		Major
Inadequate income and assets utilization within the household	Major	3		Major
Poor access to safe water	Major	3		Major
Poor hygiene practices	Major	3		Major
Low access to health services	Important	2.4		Important
Poor health seeking behaviour	Important	2.6		Important
Inadequate breastfeeding practices	Important	2.6		Important
Low birth weight	Important	2.4		Important
Low women empowerment	Important	2.4		Important
Poor crop production (quantity , quality and diversity)	Important	2.6		Important
Poor livestock productivity	Important	3		Important
Poor birth spacing	Important	2	Minority of participants suggested to rate this risk factor as major	Important
Low level of education	Important	3		Important

among caregiver				
Poor Sanitation access, utilization and practices.	Important	2.6	One group suggested to rate this risk factor as major	Important
Low supplementation and immunization coverage	Minor	2.8		Minor
Poor nutritional status of pregnant and lactating women	Minor	1.4	Technical expert agreed to rate this risk factor as important considering the impact of nutriment deficiencies among pregnant women on Low Birth Weight	Important
Losses of crop value during storage	Minor	2.8		Minor
Poor access to market	Minor	2.8		Minor
Fluctuation of prices on local market	Minor	3		Minor
Insecurity and conflict	Minor	2.8		Minor
High HIV/AIDS prevalence	Vulnerable groups	3		Vulnerable groups
Low access to education	rejected	2.8		rejected

4.5.2 Overview of the community rating exercise

In order to understand how the community prioritize risk factors a final rating exercise was conducted with participants. Table 36 illustrates the results of the rating exercise, and the perceived top 10 biggest risk factors for each village (most significant risk factors are shown in red, and medium risk factors in orange). A number of the perceived major risk factors are shared across each of the four villages including low household incomes due to low livestock productivity, small farmland size and poor crops production, inability to provide children with a balanced diet, poor utilization of household resource, High women workload, poor access to health facilities, and poor access to safe water.

Table 36: overview of community rating exercise

Tukomwok/ AP	Ktaima/ MF	Chemusar/ AP	Mayakit/ MF
Poor crop production	Poor crop production (Maize diseases)	Poor crop production (Quality , diversity and quantity)	Poor crop production
Poor ability to provide diversified diet	Poor ability to provide diversified diet	Livestock vulnerability to wildlife/ poor livestock productivity	Low household incomes
Poor utilization of household resources/ assets	Low household incomes (High prices of school fees)	low household incomes	Poor access to safe water
Poor livestock production	Poor access to safe water	Poor access to health facilities	High maternal workload
Poor access to health facilities	High women workload	Low ability to provide a diversified diet	Poor utilization of household assets/ incomes
Poor access to safe water	Poor access to Health services	High women workload	Low ability to provide a diversified diet
High prevalence of child illness	Poor utilization of household incomes	Poor birth spacing	Poor birth spacing
High women workload	High prevalence of child illness	Low level of education among caregivers	High prevalence of child illnesses
High prices of school fees	Poor birth spacing	Poor utilization of household resources/ assets	Poor access to health facilities
Small parcels of land	Poor livestock productivity (livestock diseases)	Poor access to safe water	Poor livestock productivity

4.5.3 Local Causal Model

A major output of the Link NCA survey is the design of a local causal model to explain the main causes and pathways to under nutrition in the target area. A key component of the qualitative inquiry was the exploration of community perceptions and causal pathways to under nutrition. By triangulating the results from the preliminary research, the result of the risk factors survey and the findings of the qualitative survey, a local causal model was designed. It shows how risk factors impact child nutritional status and how they are interlinked. In the following figure, direct causes are highlighted in bold . Most of the underlying causes are interrelated. The Link NCA revealed that major causes for stunting are low ability to provide a diversified diet to children, high recurrence of child illnesses (including malaria, diarrhea, ARI and potentially environmental enteropathy) poor access to safe water, poor hygiene practices, high women workload, low household incomes and poor household resources and assets management. The Local causal model as highlighted in figure 30 is only valid for the Mixed farming and Agro pastoral livelihood zone in the West Pokot County, Kenya. It should be interpreted with attention since causes and pathways may change over years.

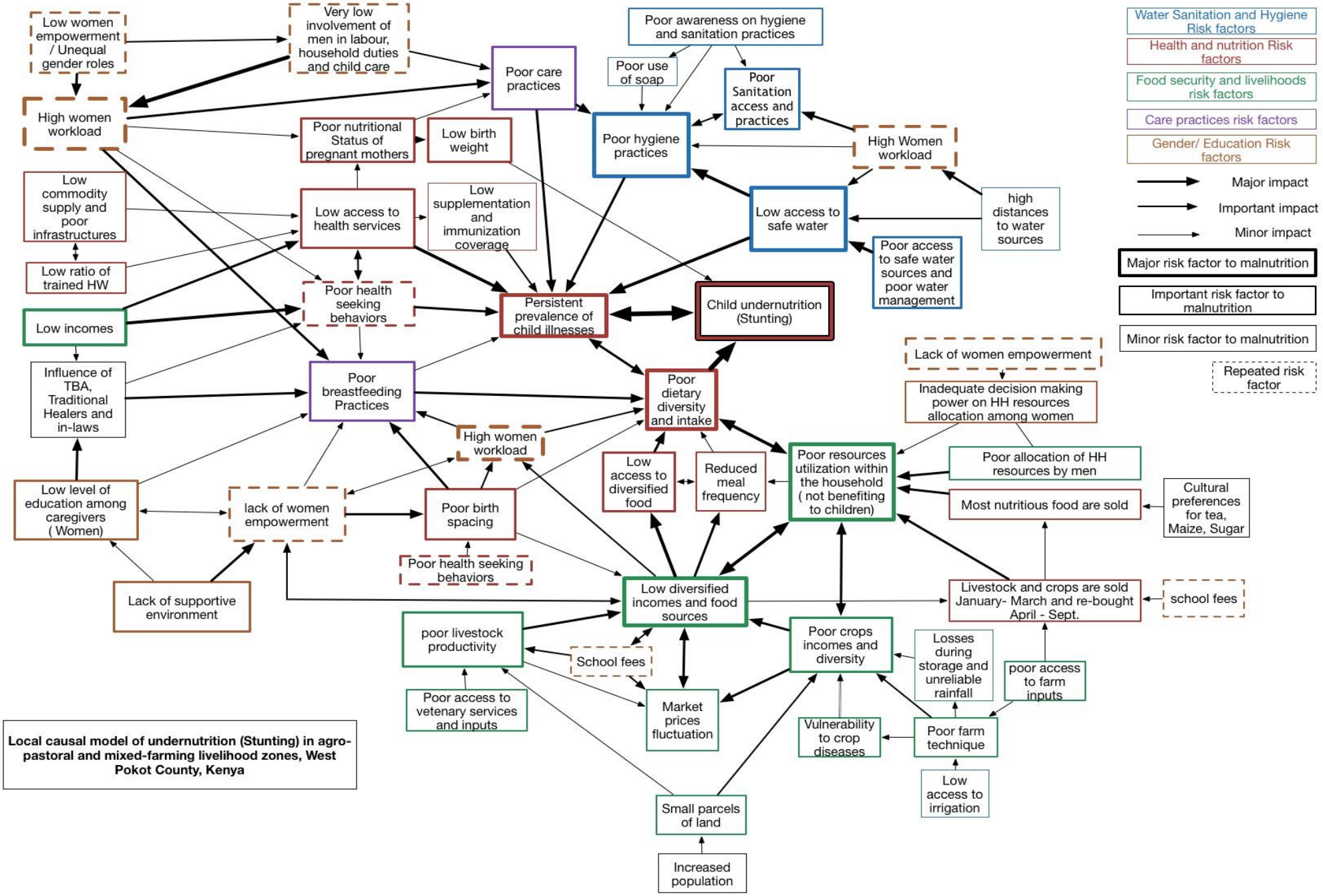


Figure 30: Local causal model to child undernutrition (stunting)

5.0: Conclusions and Recommendations

The results of this Link NCA show that in line with the UNICEF Conceptual Framework causes of under nutrition in the Agro-pastoral and Mixed farming livelihoods area of the West Pokot County are multi-sectoral and that addressing each of these factors is vital to ensure healthy outcomes for mothers and children. Link Nutrition Causal Analysis findings were disseminated at validated at county and national levels.

The key risk factors to stunting in the 2 livelihood zones included: the persistent prevalence of child illnesses including clinical malaria, acute respiratory infections and intestinal infections which are mainly due to poor hygiene practices and low access to safe drinking water. The poor access to a diversified diet has also been identified as a major contributor to stunting among children, as income from farming and livestock production are not sufficient to meet the needs of households and to access diversified food or generate enough cash to be able to meet with basic needs of children. Furthermore, the utilization of household assets and incomes, which is not benefiting to the children, is also a major contributor to the poor access to a diversified diet. Indeed, to cope with the low sources of income during the lean season and because of cultural taste preferences, the most nutritious food (eggs, milk, beans and fruits) produced by households are sold and as men are the main decision makers of the household capital do not prioritize the children needs on their expenditure patterns. Finally, the high maternal workload has also been enlightened as an important contributor to child malnutrition as mothers are engaged in heavy household duties, farm and casual labour; they are not able to provide optimal care, hygiene and feeding practices to their children. With the highest stunting rate (46.5 per cent) of the country there is an urgent need to consider the situation very seriously.

There is clearly a need to strengthen preventative efforts, and the Link NCA provides much needed data on major causal pathways to child under nutrition. Each of these causal pathways must be addressed in order to prevent such annual nutrition emergencies, and to ensure healthy outcomes for mothers and children. Based on the results of the Link NCA, technical experts in related fields have made the following sectoral recommendations and a description of actions during the final workshop those recommendations from Link NCA teams, communities and multi-sectoral experts are presented in the following sections.

5.1 Recommendations from participants drawn at community level

As discussed in the methodology, an important part of the Link NCA qualitative inquiry was a presentation and discussion of results at the community level. Based on these discussions, the following recommendations and strategies to address the risk factors were made from the community.

Table 37: Recommendations from participants drawn at community level

Major risk factors to malnutrition identified by communities	What is the objective	What are the strategies?
Lack of diversified diet for children	Children have access to a diversified diet	Improve irrigation to increase farm incomes
		Improve livestock productivity
		Reduce school fees expenditure
		Improve access to diversified sources of incomes

		Enhance diversified source of food at Household
		Sensitization of optimal nutrition for children for men and woman
Poor utilization of household incomes	Men prioritize their children health in incomes utilization	Reducing alcoholism with help of community leader
		Raise model of men who provide what their family need as example during public meeting
		Men are aware of children needs (to improve their health and nutritional status)/ Men are more involve on children care)
		Sensitization of women and men of optimal utilization of asset and incomes to benefit nutrition and health for children
		Reduce price of school fees
High Women workload	Women have more time to take care of their children	Improve birth spacing
		Enhance men involvement in farm work, child care and household duties
		Enhance farm and livestock productivity
		Improve access to water sources
Poor crops production	The crops production is sufficient to provide food and cash to covers household needs all year	Reduce price of fertilizer/Provide seeds and fertilizer
		Reduce vulnerability to crop diseases
		Improve farm technique by providing irrigation and diversification
		Reduce price of pesticide
		Enhance access to horticulture

		Improve access to larger parcels of land
Low incomes	Incomes are sufficient to covers household needs	Reduce prices of school fees
		Improves production of livestock and crops
		Improve access to diversified sources of incomes (fruits/ vegetables, diversified seed)
Poor access to safe water	Household have access to safe water	Improve access to safe water sources (distance and quality)
		Sensitize population about water sources utilization (for washing clothes, animals...)
Improve livestock productivity	Livestock and poultry productivity is sufficient to cover food and cash need of the household	Reduce vulnerabilities to wildlife
		Improve access to land
		Improve access to veterinary services (medication and selected breeds)
Improve access and behaviour to health care	Household have access to health care	Improve access (motor road) and distance to health facilities
		Reduce price of health services
		Improve supply of medication in health facilities

5.2 Recommendations and intervention plan during the final workshop

During the second day of the final workshop, based on the local causal model and pathways of risk factor identified by the Link NCA findings, stakeholders from different sectors went further to develop response plans to alleviate stunting in the county. In addition to prioritizing key interventions, the response outlined desired changes, advocacy objectives, stakeholders who will implement the interventions and specific timelines. Key messages from the multi-sectoral response plan as highlighted in table 36 include:

Table 38: Summary Multi-sectoral response plan

Major risk factors	Interventions	Stakeholders	Desired change	Resources Required	Timeline
High prevalence of childhood illness: ARI, clinical malaria, Diarrhoea and EE	• Develop and implement a multi-sectorial social behaviour change strategy. • Increase integrated health outreach programmes and scale up community level services-ICCM[21], IMCI[22] and community health units by MOH. • Advocate for opening of access roads to health facilities. • Advocate for recruitment of technical staff.	County government Line ministries led by MoH, partners, community, BCC[23] experts, Media, political leaders and civil society.	• Improved service delivery. • Improved health seeking behaviour and other practices affecting health outcomes. • Improved service delivery. • Improved nutrition situation. • Reduced case morbidity among children. • Improve child health care practices. • Improve dietary intake.	Develop and implement a multi-sectorial SBC strategy Upscale integrated health outreach programmes from current 20 to 35 sites Advocacy towards recruitment of technical staff	2 years
	• Strengthen supply chain management. • Provision of IFA supplements	Partners, MOH[24], private sector and community.		Training and monitoring of supply chain management IFAS sensitization	2 years

[21] Integrated Community Case Management
[22] Integrated Management of Child illness
[23] Behavior change communication
[24] Ministry of Health

	and awareness creation. • Scale up Vitamin A supplementation. • Strengthen disease/nutrition surveillance • Advocate for utilization of indigenous foods and development of recipes.	MOH, partners and community. MOH, partners and community. MOH, MOALF, partners, NDMA.		Scale up Vitamin A supplementation Strengthen disease/ nutrition surveillance Advocate for utilization of indigenous foods and development of recipes	
Inadequate dietary diversity and meal frequency	• Create awareness on food fortification. • Implement BFCI[25] Cooking demonstrations. • Advocate for utilization of indigenous foods and development of recipes. • Provide dairy goats. • Scale up home fortification. • Introduction and promotion of diversified food crops/ Livestock • Procurement of agricultural machineries	MOALF,MOH,MOE Private sector NDMA Community members Local Media Politicians	• Improved dietary diversity. • Increased crop\livestock production and crop and livestock diversity. • Increased income sources • Increased level of education. • Women empowerment.	Diversified types of food crops: green grams, soya beans, indigenous vegetables, Cassava, Sweet potatoes (Traditional High Value Crops) Procurement of agricultural machinery	2-5 years
Low sources of incomes/ low sources of diversified incomes	• Introduce integrated pest and disease control for livestock and crops and use of disease resilient seeds/crops/livestock breeds e.g. farm hygiene,	MOALF,KARLO,FAO[26] CSG-NDMA, MOALF,MOH		Resistant/ tolerant crop varieties Pest and disease control Funds for procurement of seeds/ farm inputs:	2-5 Years

[25] Baby friendly community initiative
[26] Food Agriculture Organization

	destruction of alternate hosts for pest and diseases • Promote new farming techniques such as irrigation technologies (drip/ sprinkle), double digging • Develop an integrated coordination mechanism at the county to steer multi-sectorial approach • Introduce and promote bulk drought tolerant crops • Subsidize cost of seeds for pasture and bulking • Advocate on fish farming • Establishment of pasture production • Procurement of grass seeds and pasture production machineries • Introduction and promotion of livestock breeding centres • Introduction and promotion of diversified livestock (Galla goats, poultry and camels)	and ASDSP[27] MOA, KARLO[28] MOALF MoALF[29] and Partners MoALF and partners MoALF and partners MoALF and partners		fertilizers Funds for coordination Funds to supply seedlings Implement 14 irrigation schemes Water harvesting for crop production Capacity building Promotion of new farming technology Coordination support Introduction of new crops and livestock varieties Development and advocating for fish farming Establishment of pasture and fodder	

[27] Agriculture sector development strategy programme
[28] Kenya Agricultural and Research Organization
[29] Ministry of Agriculture, Livestock and Fisheries

Poor access to safe Water Poor hygiene practices	• Provision of water treatment chemicals and filters at household level. • Conduct CLTS, PHAST and CHAST. • Advocate for a central water storage. • Connectivity and expansion of pipe water to HH to main sources e.g. River Muruny. • Provision for tanks for roof/rain water harvesting at communal level	Institution and HHs, MoW[30], MoH, NDMA, Partners: WARMA[31], Yangat, WV, ACF	• Reduce child illnesses (Diarrhoea). • Reduce women workload. • Improved hygiene and sanitation practices. • Increase access to potable/ safe water for consumption. • Improved child care practices	Procurement of water treatment chemicals and filters Scale up of CLTS, PHAST and CHAST 4 Conference package for Advocacy workshops Funds for procuring water tanks	2-5 Years
Inadequate incomes and assets utilization intra-household High Maternal workload	• Linking women to enterprise funds and loans. • Training on financial literacy and alternative IGAs institution. • Advocate for improved education infrastructure. • Advocate for shared gender roles and responsibilities. • Advocate for adult literacy education classes.	Ministry of trade, cooperatives, gender, development partners, MOA, MOALF, NDMA[32]. MOE[33], Action Aid, World Vision) Ministry of gender and Social Services, MoE , Partners	• Reduced workload • Promote agro forestry; reduce burden of women to fetch firewood; increase income; *environment • promotion of water harvesting techniques e.g. roof and rock catchment • Promotion of energy saving stoves/ jikos • Women rights to own land	Train and supply agro forestry tree seedlings Funding educate on roof and rock catchment and purchase tanks Funds for capacity building women groups to manufacture energy saving stoves/ jikos locally Advocacy initiatives	2-5 Years

[30] Ministry of Water
[31] Water, Resource Management Authority
[32] National Drought Management Authority
[33] Ministry of Education

5.3 Next steps for the Link NCA

A taskforce comprising of representatives from the ministries of health, water and agriculture, UN agency and implementing partners will be charged with the responsibility of ensuring that the recommendations are implemented within the required timelines. The multi-stakeholders present in the workshop emphasized on the importance of each one taking a role in implementing the identified interventions. It will also be essential to mobilize resources to conduct a Link NCA in the pastoral livelihoods so as to ensure an overall picture of the County and come up with responses relevant to the local context.

Response analysis/planning and implementation

Response analysis/planning is a step to link NCA findings to action based on program design (Oxfam GB 2008, WFP 2008, Levine and Chastre 2011, Maxwell et al 2013, ACF 2015a) as highlighted in figure 31. Situation analysis itself is understood as a discrete phase that follows assessment but precedes response analysis, or more commonly included as an initial or precursor step in response analysis, where the results of situation analysis are viewed through the lens of response, analytical 'gaps are plugged' where they exist (severity, magnitude, target groups, vulnerability analysis, gap and risk analysis, etc.), and forecasting and scenario-building is undertaken, before potential response options are identified (FAO 2011b, ERC 2015). Across the board, response analysis is essentially focused on identification, examination and selection of a set of appropriate and feasible response options, based on certain predefined technical and operational criteria. The Link NCA process in Mixed Farming and Agro-Pastoral Livelihood Zones is current at response implementation of proposed multi-sector action plan as highlighted in table 38, with monitoring of progress and status of actions proposed ongoing.

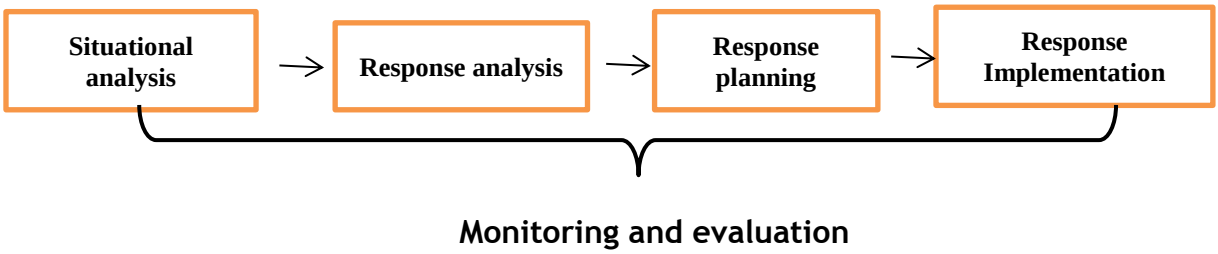
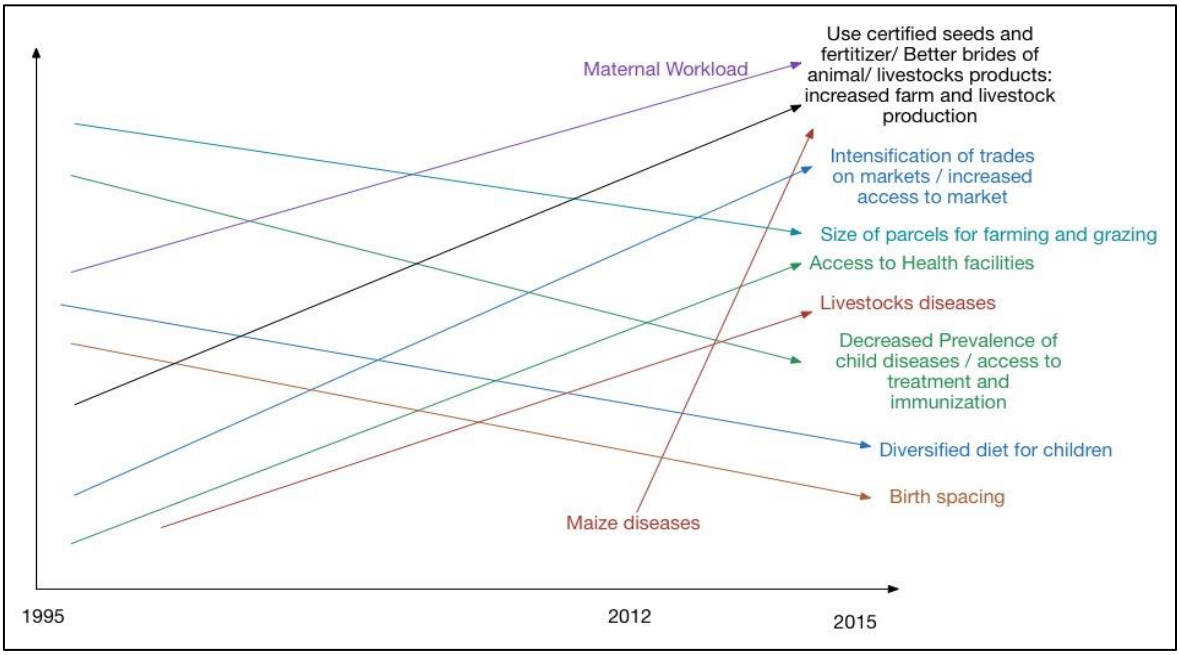


Figure 31: Response analysis process: 2015 (Action Against Hunger)

Annex 1: Activity plan for the Link NCA study in Agro-pastoral and Mixed Farming Livelihood Zones, West Pokot County

Activity plan: 2015	**January-February**	**March**	**April**	**May**	**June**	**July**	**August-Date**
Multi-sector secondary data review							
Initial multi-stakeholder workshop-formulation and validation of casual hypothesis							
Training of Supervisors on Link NCA							
Risk factor+anthropometric survey-training, field work and analysis							
Qualitative survey-training, field work and content analysis							
Link NCA Report writing							
Final multi-stakeholder workshop							
Ongoing implementation of proposed response plans							

Annex 2: Historical trend pathway for Mixed farming and Agro-pastoral livelihood zones



Annex 3: Criteria of Link NCA rating exercise

Source of information	Notes
Strength and consistency across contexts of association between the risk factor and under-nutrition (from the Pathways to Under- nutrition Module)	[-] NA: only risk factors having a demonstrated association with undernutrition are considered in the Pathways to Undernutrition Module [-] Weak association has been demonstrated in many or few contexts [+] Medium strength association has been demonstrated in few contexts [++] Medium strength association demonstrated in many contexts OR strong association demonstrated in few contexts [+++] Strong associations demonstrated in most contexts or an association demonstrated in the particular context of the NCA
Seasonality and medium-term trends of risk factor related to seasonality and medium-term trends of under-nutrition (applies mainly for wasting)	[-] the seasonal variation and medium-term trends of the prevalence of the risk factor does not correspond to the seasonal variation and medium-term trends of the under-nutrition outcome considered. [+] No seasonal variation of the risk factor OR No contradiction observed. [++] The seasonal variations of risk factor and under-nutrition are as expected. [+++] The seasonal peak(s) of prevalence of the risk factor matches with the seasonal peak(s) of the under-nutrition outcome considered.
Participatory rating exercise	[-] The risk factor is rarely or never mentioned in the

with community	rating exercise [+] The risk factor is irregularly mentioned as one of the top 5 risk factors [++] The risk factor is regularly mentioned as one of the top 5 risk factors [+++] The risk factor is consistently mentioned as one of the top 3 risk factors

Continuation of criteria for NCA rating exercise

Category	Criteria
Major risk factor	No contradictory information AND strength of association from literature review is classified as [++] or [+++] AND majority of [++] or [+++] for all other sources of information
Important risk factor	A minor amount of contradictory information exists AND strength of association from literature review is classified as [++] or [+++] AND majority of [++] or [+++] for all other sources of information
Minor risk factor	A moderate level of contradictory information is permitted AND strength of association from literature review is classified as [+] or [++] AND majority of [+] for all other sources of information
Rejected risk factor	No contradictory information AND Majority of [-] or [+] for all sources of information
Untested risk factor	Contradictory information AND / OR Information gathered not complete or not available

Annex 4: List of participants

(a) Multi-stakeholder engagement workshop held in West Pokot County on July 8th -10th 2015

	Name	Organization/role
1	Jedidah Ngui	Action Against Hunger
2	Isaac K.Lopeli	Ministry of Health
3	Emmy Chepkwony	Action Against Hunger
4	Kevin Mutegi	Action Against Hunger
5	Lokwialuk Lotodo	Ministry of Health
6	Rodgers Marong	Ministry of Health
7	Leah Chelobei	Ministry of Health
8	Valerian Micheni	National Drought Management Authority
9	Oyundi Nehondo	Action Against Hunger
10	Alice Jesse	Food Agriculture Organization
11	Shirley Rondel	Action Against Hunger
12	Josephine Mwema	World Food Programme
13	Lucy Gathigi	Ministry of Health
14	Nancy Charito	National Drought Management Authority

15	Dennis Musioma	National Drought Management Authority
16	Musa K.Lelterit	Ministry of Agriculture and Livestock
17	Luke K.Chebet	Ministry of trade
18	Elizabeth Cherop	United nation childrens fund
19	Lawrence Plapan	Ministry of Health
20	Lelei Asa	Action Against Hunger
21	Lucy Ngunjiri	World Food Programme
22	Charles Tulel	Ministry of Health
23	Johnson Bitange	Ministry of Health
24	Mable Serem	Action Against Hunger
25	Maurice K.Wanjala	Ministry of Agriculture and Livestock
26	Betty Singoei	Ministry of Agriculture and Livestock
27	Kibet K.Carlos	Kenya Red Cross Society
28	Dr.Enock Nyakundi	Ministry of Health
29	Scholastica Mwongela	Action Against Hunger
30	Dr.Limo Ibrahim	Ministry of Health
31	Jacob K.Korir	Action Against Hunger
32	Jacob Pkorir	Action Against Hunger
33	Marjolie Volege	United Nation Children Fund
34	Joyce Mukiri	Food and Agriculture Organization
35	Nahashon Kipruto	Action Against Hunger
36	Gwenaelle luc	Link NCA consultant
37	Henry Katuria	Ministry of Education
38	Careen Nasiaki	Ministry of Water
39	James Akudian	Ministry of Agriculture and Livestock
40	Catherine Akuto	Ministry of Health

(b) Link NCA training of technical supervisors in West Pokot County; held on 10th - 12th March, 2015

	Name	Organization
1	Benedict Pkatey	Action Against Hunger
2	Jacob Pkorir	Action Against Hunger
3	Naomi Sang	Kenya Red Cross Society
4	Elizabeth Cherop	United Nation Children Fund
5	Leah Chelobei	Ministry of Health
6	Mable Serem	Action Against Hunger
7	Kevin Mutegi	Action Against Hunger
8	Scholastica Mwongela	Action Against Hunger
9	Henry Katuria	Ministry of Education
10	Emmy Chepkwony	Action Against Hunger
11	Isaac K. Lopeli	Ministry of Health
12	Joseph Khaemba	Ministry of Agriculture
13	Irene Wairimu	World Food Programme
14	Careen Nasiaki	Ministry of Water
15	Betty Singoei	Ministry of Agriculture
16	Nahashon Kipruto	Action Against Hunger
17	Limangole Simon	Ministry of Health
18	Wilson Tarus	Ministry of Health
19	Carren Nasiaki K.	Ministry of Health
20	Maurice K.Wanjala	Ministry of Agriculture and Livestock
21	Timothy Letooyia	National Drought Management Authority
22	Luke K.Chebet	Ministry of Trade
23	Musa K.Lelterit	Ministry of Agriculture and Livestock

24	Blanche Mattern	Link NCA technical expert
25	Julien Chalimbaud	Former head of Link NCA project

(c) Initial workshop held in West Pokot County on 18th-19th January, 2015

	Name	Organization
1	Kevin Mutegi	Action Against Hunger
2	Jacob Korir	Action Against Hunger
3	Jacob L. Pkorir	Action Against Hunger
4	Naomi Sang	Kenya Red Cross
5	Nahashon Kipruto	Action Against Hunger
6	Emmy Chepkwony	Action Against Hunger
7	Lelei K Asa	Action Against Hunger
8	Mable Chemeli Serem	Action Against Hunger
9	Gladys Saraku	Ministry of Health
10	Owaka Isaack	Ministry of Health
11	Okwany Peter	ACTED
12	Wilson Tarus	Ministry of Health
13	Zipporah Kisotu	Ministry of Health
14	Edwina Ochola	Ministry of Health
15	Betty Singoei	Ministry of Agriculture, Livestock and Fisheries
16	Lucy Ngunjiri	World Food Programme
17	Joseph Khaemba	Ministry of Agriculture, Livestock and Fisheries
18	Evans Lokoma	YANGAT
19	Timothy Letooyia	National Drought Management Authority
20	Silvester Nyang'an	Food and Agriculture Organization
21	Koolic Losenge	National Drought Management Authority
22	Henry Katuria	Ministry of Education
23	Isaac K. Lopeli	Ministry of Health