NUTRITION CAUSAL ANALYSIS

ZIMBABWE

CHIVI DISTRICT, MASVINGO PROVINCE

Publication : Juillet 2012

FINAL REPORT

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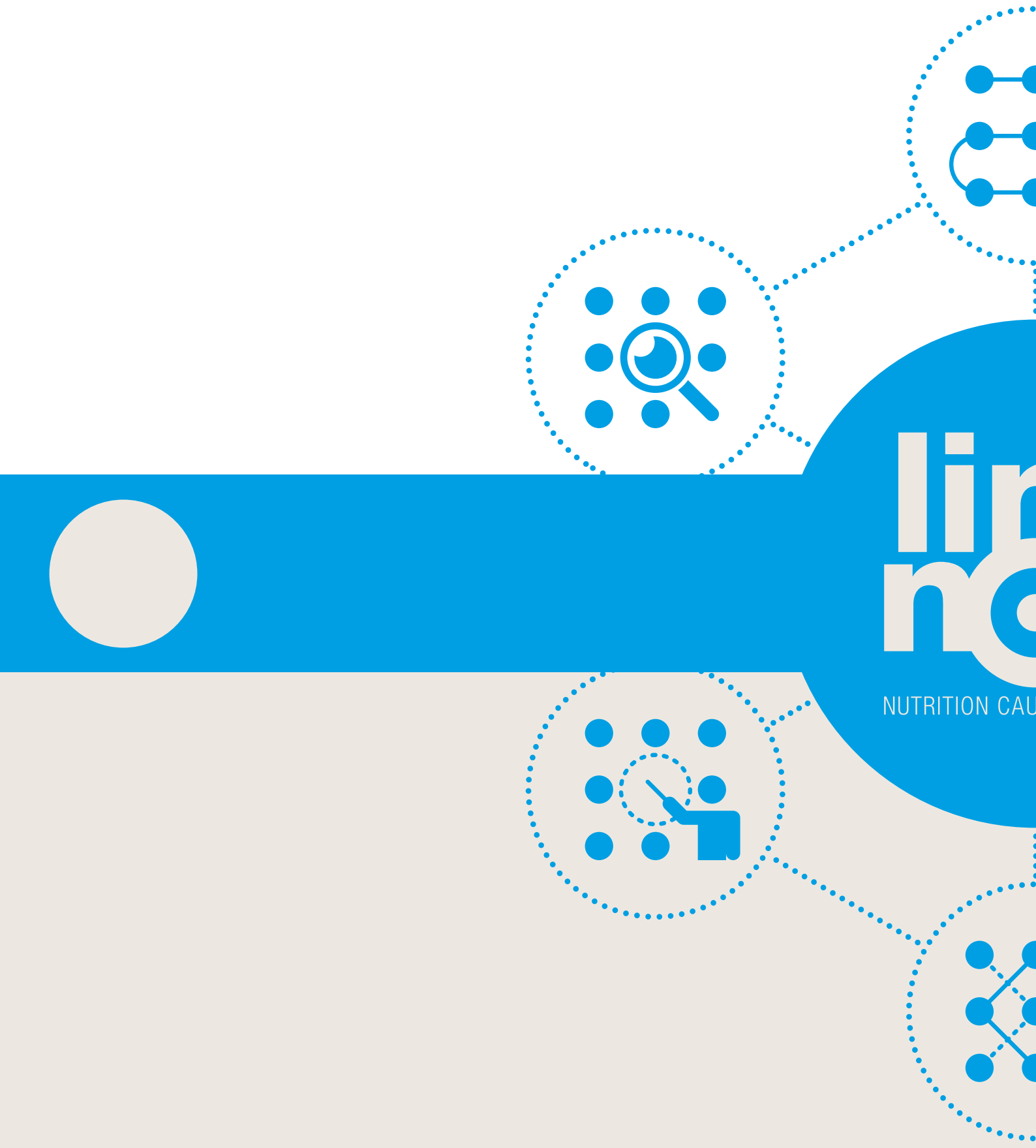

NUTRITION CAU

NCA Final Report

February 2011

Nutritional Causal Analysis in Chivi District
Masvingo Province - Zimbabwe

Pilot Study for
Nutrition Causal Analysis Research Project

Chivi District
Masvingo Province - Zimbabwe

Implemented by ACF, Zimbabwe with MOHCW- Feb 2011
Scientific support from TUFTS University (Boston MA)
Report published 2012

TABLE OF CONTENT

ACRONYMS 6
1. Acknowledgement 8
2. Summary 8
3. Introduction 9
a. Rational for NCA research 9
b. Rationale for NCA study in the country 9
c. Rational for NCA study for ACF 11
4. Objectives and localisation of the study 11
a. General Objective 11
b. Specific Objectives 12
c. Study questions 12
d. Study location 13
e. Study population 15
f. Temporal boundary 15
g. Nature and scope of the undernutrition problem 15
h. Shocks and hazards in Chivi District 16
5. Methodology 19
a. Defining and Describing the study 21
b. Developing candidate hypothesis 21
c. Develop data collection strategy 27
d. Gathering Evidence quantitatively & qualitatively 28
6. Main results 32
Household sample demographics characteristics 32
INFANT AND YOUNG CHILD FEEDING & FOOD UTILIZATION KNOWLEDGE AND PRACTICES 34
Hypothesis 1: Inadequate breastfeeding practices: late initiation, low exclusive breastfeeding, poor complementary breastfeeding practices until 2 years expose the child to malnutrition. 34
a. Child caretaker sample demographics characteristics 34
b. Child sample demographics characteristics 35
c. Nutrition sample indicators ..... **Erreur ! Signet non défini.**
d. Caretaker knowledge on child feeding 35
Hypothesis 2: Inadequate feeding practices during illnesses with maintenance or decrease of the amount of food and drinks contributing to child weight loss. 39
Hypothesis 3: Complementary food practices in quantity & quality don't meet food minimum standards needed for child development. 40
SOCIAL INFLUENCE AND TRADITIONAL BELIEF 42
Hypothesis 4 : Family influences on the breastfeeding practices have negative impact on the nutrition status of the child. 42
Hypothesis 5 : Traditional habits have influence on the utilisation of food items (preparation, conservation) which causes the loss of essential nutrients needed for child development. 42
Hypothesis 6 : Social influences on crop selection and land utilization limits HH food production and contributes to inadequate food intake by lack of diversity. 43
Hypothesis 7: Water and sanitation issues are not culturally perceived as a priority (in terms of HH budget, community facilities maintenance), contributing to disease occurrence. 43
FINANCIAL RESOURCES 43

Hypothesis 8 : Low or absent financial resources (unemployment) limit household purchasing power for additional food items needed to diversify and balance diet 43
Hypothesis 9 : Low or absent financial resources (unemployment) limit health facility access and contribute to case management delay and occurrence of malnutrition as disease complication... 45
Hypothesis 10: Low or absent financial resources (unemployment) limit the purchase of enabling facilities and contribute to poor hygiene practices, one of the factor of disease transmission. 47
Hypothesis 11 : Limited or reduced livestock ownership linked to livestock depletion (diseases and death including food needs during lean times) reduces household own production and purchasing power and consequently food intake..... 48
Hypothesis 12 : Low local production causes an increase of market prices, then food products become financially inaccessible for the household 51
DEFICIENCY OF HEALTH SYSTEM 52
Hypothesis 13 : Brain-drain and shortage of skilled health professionals limit the availability of services and quality of health care, contributing to disease. 52
Hypothesis 14 : Shortages in drugs and medical supplies reduce the quality of health care and contribute to the low utilization of health facilities, increasing the risk of health status degradation. 53
WATER ACCESS 53
Hypothesis 15 : Poor water facilities (poor condition or non-functioning existing facilities) reduce the availability of water for household, with negative consequences on hygiene practices and increase in the risk of diseases. 53
SANITATION ACCESS 57
Hypothesis 16 : Poor sanitation facilities (poor condition or non-functioning existing facilities) facilitate the propagation of insect vectors and intermediate hosts of pathogenic parasites, responsible for diseases. 57
8. Discussion 62
Hyp 1: Inadequate breastfeeding practices: late initiation, low exclusive breastfeeding, poor complementary breastfeeding practices until 2 years expose the child to malnutrition. 62
Hypothesis 2: Inadequate feeding practices during illnesses with maintenance or decrease of the amount of food and drinks contributing to child weight loss. 64
Hypothesis 3: Complementary food practices in quantity & quality don't meet food minimum standards needed for child development. 64
Hypothesis 4: Family influences on the breastfeeding practices have negative impact on the nutrition status of the child. 65
Hypothesis 5: Traditional habits have influence on the utilisation of food items (preparation, conservation) which causes the loss of essential nutrients needed for child development. 65
Hypothesis 6: Social influences on crop selection and land utilization limits HH food production and contributes to inadequate food intake by lack of diversity. 65
Hypothesis 7: Water and sanitation issues are not culturally perceived as a priority (in terms of HH budget, community facilities maintenance), contributing to disease occurrence. 66
Hypothesis 8: Low or absent financial resources (unemployment) limit household purchasing power for additional food items needed to diversify and balance diet 66
Hypothesis 9: Low or absent financial resources (unemployment) limit health facility access and contribute to case management delay and occurrence of malnutrition as disease complication... 66
Hypothesis 10: Low or absent financial resources (unemployment) limit the purchase of enabling facilities and contribute to poor hygiene practices, one of the factors of disease transmission. ... 67
Hypothesis 11: Limited or reduced livestock ownership linked to livestock depletion (diseases and death including food needs during lean times) reduces household own production and purchasing power and consequently food intake..... 67

Hypothesis 12: Low local production causes an increase of market prices, then food products become financially inaccessible for the household 68
Hypothesis 13: Brain-drain and shortage of skilled health professionals limit the availability of services and quality of health care, contributing to disease. 68
Hypothesis 14: Shortages in drugs and medical supplies reduce the quality of health care and contribute to the low utilization of health facilities, increasing the risk of health status degradation. 68
Hypothesis 15: Poor water facilities (poor condition or non-functioning existing facilities) reduce the availability of water for household, with negative consequences on hygiene practices and increase in the risk of diseases. 68
Hypothesis 16: Poor sanitation facilities (poor condition or non-functioning existing facilities) facilitate the propagation of insect vectors and intermediate hosts of pathogenic parasites, responsible for diseases. 69
9. Conclusion 70

ACRONYMS

ACF	Action Contre la Faim
AGRITEX	Agricultural Extension
AIDS	Acquired Immuno-Deficiency Syndrome
ART	Anti-Retroviral Therapy
BC	Behavior Change
CMAM	Community Management of Acute Malnutrition
DID	Department of Infrastructure Development
EU	European Union
FAO	Food and Agriculture Organization
FNC	Food and Nutrition Council
GAM	Global Acute Malnutrition
GDP	Gross Domestic Product
GIN	Garden of Improve Nutrition
HBC	Home base Care
HIV	Human Immuno-deficiency Virus
IMC	International Medical Corps
IRD	Institut de Recherche pour le Developpement
MOHCW	Ministry of Health and Child Welfare
MIMS	Multiple Indicator Monitoring Survey
MUAC	Middle upper arm circumference
NCA	Nutrition Causal Analysis
NGO	Non Governmental Organization
NNS	National Nutrition Survey
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SIRDC	Scientific and Industrial Research and Development Centre

SMART	Standardized Monitoring and Assessment of Relief and Transition
UN	United Nation
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VTC	Voluntary Testing and Council
WASH	Water Sanitation and Hygiene
WFH	Weight For Height
WFP	World Food Programme
WHO	World Health Organization
ZDHS	Zimbabwe Demographic and Health Survey

1. Acknowledgement

We thank the women and men in Chivi District for their participation to the study without whose involvement this study would not have been accomplished; the staff part of the field team (ACF team leaders, NCA assistant, NCA data entry and epidemiologist, MOHCW staff, drivers); Mrs Chigumira Head of Nutrition Department – MOHCW and her team; the keys partners involved in the Expert Meeting and stakeholders meetings - CARE International, Fews Net, Food and Nutrition Council, GRM International, IMC, Save The Children, UNICEF, the MOHCW Provincial Nutrition Department , AGRITEX, Department of Infrastructure Development - DID and the local health authorities; the keys persons who was involved internationally for the review of the collection strategy: Mr Yves Martin Prevel (IRD), Mrs Emilie Crozet (EU), Mr Julien Chalimbaud (ACF), Mr Karl Riber (ACF) and Mrs Beatrice Mounier (ACF); the technical support of Dr Jenifer Coates from TUFTS University.

2. Executive Summary

Objectives

General objective: Test a methodology for analyzing the causes of malnutrition applicable in different countries and to different types of malnutrition.

Specific objectives:

1. To get a better understanding of the multi-sector causes of malnutrition in Chivi District.
2. To recommend interventions to mainstream nutrition problematic in all the programmes.
3. To recommend methodological modifications

Methods

The methodology proposed is divided in 6 main steps:

Step 1 : Define and Describe the study

To set the objectives and scope of the study with partners with an Advisory Group at country level.

Step 2 : Develop Hypotheses

With thecnical experts, this step is devoted to pre-select risk factors of undernutrition that are believed to be the most prevalent in the area under study.

Then, the method is using a combination of qualitative inquiry and cross sectional survey to collect information:

Step 3 : Gather Qualitative Evidence

30 community focus groups have been conducted between January 17, 2011, and February 5, 2011

Step 4 : Gather Quantitative Evidence

Cross sectional study of 360 infant and young children (from birth to 2 years) has been conducted between January 17, 2011, and February 5, 2011 to assess multi-sector aspects (nutrition, heath, food security, water sanitation and hygiene) and anthropometric measurements (weight, height, age, MUAC).

Step 5 : Analyze the evidence

All the information collected is analysed hypothesis by hypothesis. Analysis of household survey includes bivariate associations between risk factors and undernutrition outcomes and linear regression models (set of risk factors for immediate / underlying / basic causes with undernutrition outcomes).

Step 6 : Reach consensus on highest priority causes and action

A final workshop with technical advisory group and stakeholders has been organised to present and agree on the main results of the survey.

Findings

Main recommendations for NCA methodology and Update on the research project.

3. Introduction

a. Rational for NCA research

Action Contre la Faim would like to develop a standardized method for analyzing the causes of malnutrition, as a starting point for improving the relevance and effectiveness of the organization's programming in a given context. The Nutrition Causal Analysis is also intended to be useful as platform for informing the broader stakeholder response and for ensuring that this response reflects an appropriate contextualized understanding of malnutrition's complex multi-causality.

While there are a number of documented approaches for conducting NCAs, the results of these NCAs are typically constrained in three main ways. First, they often yield only a static picture of the causes of malnutrition. Rarely the methods examine the interaction among various risk factors, or take into account feedback loops and dynamic process, such as seasonality or changes in caring practices at different stages of child growth. The second limitation of most NCAs as currently conducted is that they fail to prioritize causes, rendering the results less actionable and operationally useful. A third issue with NCAs is that they often focused on a single type of malnutrition (eg. stunting vs. wasting), rather than considering the different etiologies of different malnutrition outcomes, and how these causes may vary by age.

Though this is a demanding set of criteria, ACF has risen to meet this challenge by investing in the development of a standardized method for Nutrition Causal Analysis that can incorporate the elements describe above and be applied across the various contexts in which it works. ACF has enlisted Mrs Jennifer Coates at TUFTS University to advise the responsible of NCA study in Zimbabwe in developing the protocol for the standardized method in collaboration with the MOHCW and provide guidance during the field work and analysis of the findings.

b. Rationale for NCA study in the country

Over the past two decades (1990-2010), Zimbabwe underwent a number of economic and political challenges including economic decline (hyper inflation, high unemployment, decrease in GDP, shortage of basic supplies) exacerbated by repeated poor harvests, increase of political instability, combined with demographic changes such as internal population displacement, loss of livelihoods and emigration of a significant proportion of the skilled labour in the country. In this same period, Zimbabwe experienced climate changes consequences (drought, erratic agro-ecological conditions), epidemic outbreaks (cholera, measles) with a persistent high level of HIV/AIDS prevalence (13.7% in 2009)[1] having a large and multi sector impact.

Last January 2010, a National Nutrition Survey has been conducted. The results revealed a high prevalence of stunting (33.8%) with a low prevalence of acute malnutrition (2.1%). Unexpected trends showed a significant increase of stunting prevalence from 21% in the 1994 ZDHS, 22% in 1995, 28% in 2005-06 to 33.8% in 2010[2] [3] with the proportion of infants with low birth weight remained above 10%[4] .

[1] Zimbabwe National HIV Estimate – Ministry of Health and Child Welfare, 2009

[2] Zimbabwe Working Paper, based on further analysis of Zimbabwe Demographic and Health Surveys – Biological, Social & Environmental Determinants of Low birth weight and stunting among IYC in Zimbabwe. Mduduzi N.N.Mbuya, Memory Chidem Bernard Chasekwa, Vinod Mishra. Feb 2010

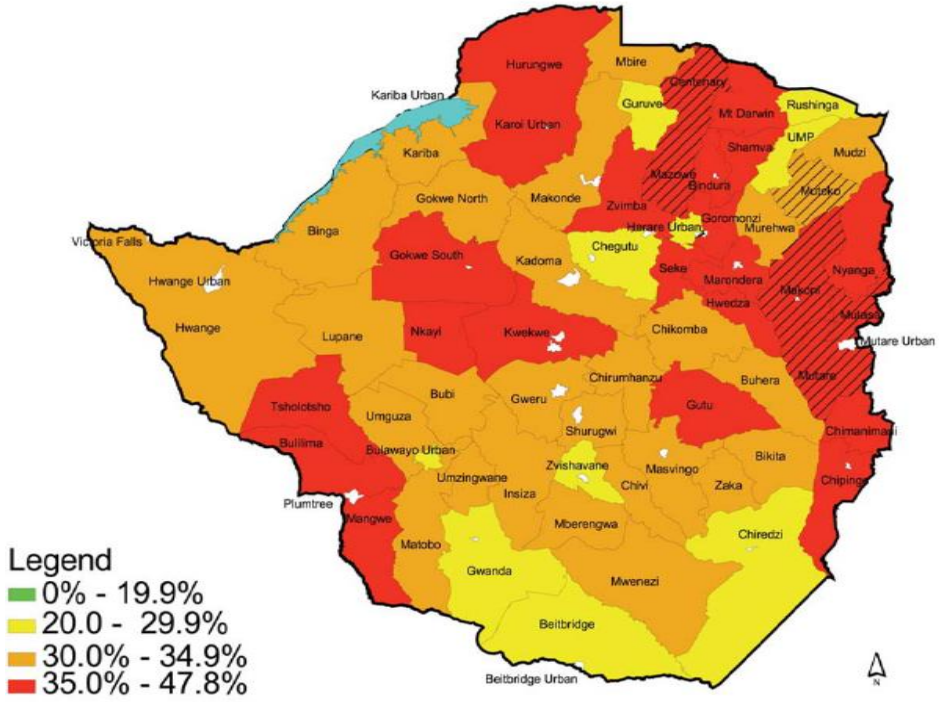


Fig 1: Percentage of children from 6 to 59 months of age having a Height for Age (WHO Standard) indicator below -2 SD in Zimbabwe. Source: National Nutrition Survey, January 2010.

All over the world, stunting is known as responsible of around 20% of all the mortality of children younger than 5 years of age and long term cognitive deficit, poorer performance in school, fewer years of completing schooling, and lower adult economic productivity[5].

In opposite way, the prevalence of acute malnutrition has decreased from 6.4% in 2005-2006[6] to 2.1% in 2010.

[3] Strengthening Food & Nutrition Security Analysis Lesson learnt from : Strengthening Food & Nutrition Security Analysis in Zimbabwe – May 2010

[4] Central Statistics Office (CSO) [Zimbabwe] and Macro International Inc., 2007).

[5] Victoria CG, Adair L, Fall C, et al. Maternal and child undernutrition 2: Maternal and child undernutrition: consequences for adult health and human capital. Lancet 2008; 371: 340-57.

[6] Zimbabwe Demographic and Health Survey 2005-2006.

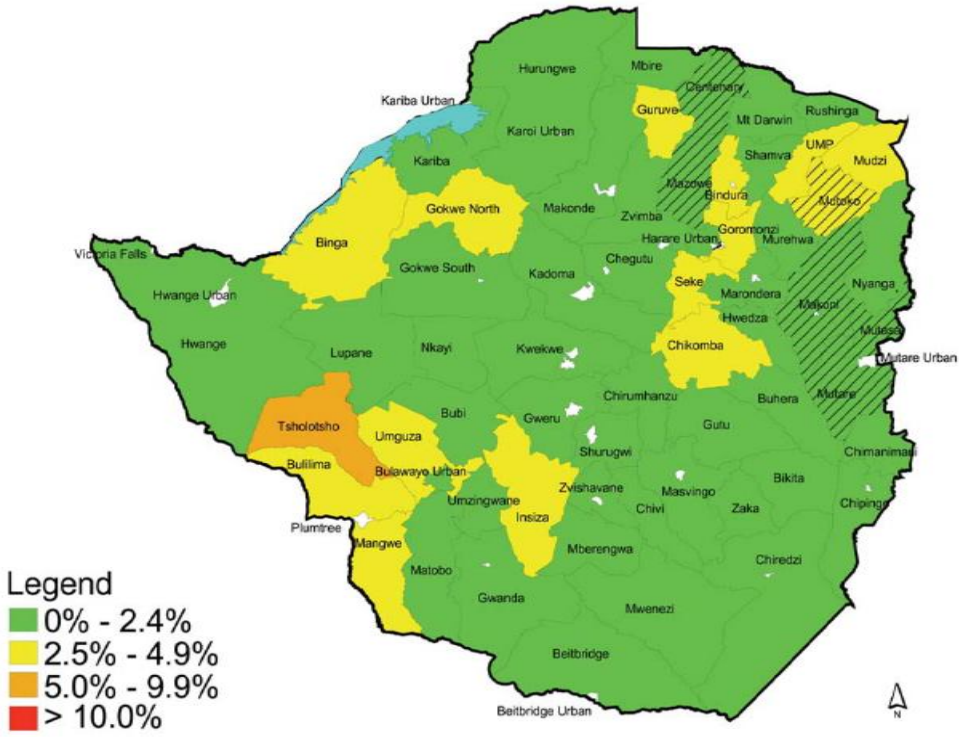


Fig 2: Percentage of children from 6 to 59 months of age having a Weight for Height (WHO Standard) indicator below -2 SD in Zimbabwe. Source: National Nutrition Survey, January 2010.

In Zimbabwe, list of potential causes of malnutrition have been highlighted but evidences are few. To guide the development of appropriate recommendations to address malnutrition problem, we conducted NCA study in one District to establish statistical evidences and ranking the risk factors or group of risk factors of malnutrition.

c. Rational for NCA study for ACF

ACF mission opened in September 2002 with initial programmes focusing on short term nutrition, water and sanitation fields. From 2006, ACF combined targeted interventions with a short-term impact (rehabilitation of water points, vegetable gardens, seeds and tools distribution) with mid-term agricultural and water facility interventions. The strategy was further refined to aim at enhancing sustainable livelihoods through a coherent range of food security, WASH and nutrition focused interventions for food insecure vulnerable households. Simultaneously, the emergency response and preparedness capacity were developed in longer term projects. Considering high HIV prevalence, ACF has started in 2008 efforts to improve HIV mainstreaming.

Internally, the NCA study represented a great opportunity for ACF Zimbabwe to reorient and fine in tune its programme in country. Existing links between nutrition, food security, water and sanitation programmes needed to be strengthen and supported by evidences justifying each aspect of the intervention. In a more external point of view, the NCA study was going to facilitate ACF recognition among partners as technical key player having skills to conduct such research and being a potential partner for coming study in country.

4. Objectives and localisation of the study

a. General Objective

Test a methodology for analyzing the causes of malnutrition applicable in different countries and to different types of malnutrition.

Justification
There is a lack of standardized method among the partners and countries that affects the finding in terms of completeness and pertinence. Having a tested available methodology will help the professional to identify the deep causes of malnutrition in a given context and give them the keys to improve the relevance and effectiveness of the organization's programming.
By involving multi-sector partners, humanitarian response will reflect an appropriate contextualized understanding of malnutrition's complex multi-causality.

b. Specific Objectives

Objective 1: To get a better understanding of the multi-sector causes of malnutrition in Chivi District.

Justification
Hypothesis on the causes to malnutrition exist but evidences remained limited. Identifying the main factors linked to malnutrition, statistical links between factors, ranking the contribution of each factor or group of factors to malnutrition will improve the relevance and effectiveness of the response provided by government as well as the support given by local and international organisations.

Objective 2: To recommend interventions to mainstream nutrition problem in all the programmes.

Justification
Some existing interventions are based on pre-defined packages but are not necessarily locally adapted. ACF comprehensive approach will be guided by the intervention aiming to reduce malnutrition. Factors contributing to malnutrition will be better taken in consideration by each department to ensure that each sector of intervention will not harm but actively participate to reduce malnutrition in the Zimbabwean context.

Objective 3 (intern ACF): To recommend methodological modifications

Justification
As for any pilot study, one objective is to draw conclusions on the success or failure of the proposed methodology and to propose recommendations for improvements.

c. Study questions

1. What are the significant risk factors associated with stunting (and wasting) among the infants and young children from birth to 2 years in Chivi District?

2. What are the causal pathways linked to malnutrition by which certain infants and young children from birth to 2 years in Chivi District have become stunted (and wasted)?

3. How has the stunting (and wasting) in this population and its causes changed
    a) Over time due to historical trends,
    b) Seasonally due to cyclical trends,
    c) Due to recent shocks?

4. Are there clusters of factors and pathways associated with stunting (and wasting) that can be expressed as malnutrition profiles? What household or community characteristics are associated with these clusters that can be useful for targeting?

5. Which factors, clusters of factors and pathways explain most of the malnutrition observed for the infants and young children from birth to 2 years in Chivi District?

6. Which sets of factors and pathways are likely to be the most modifiable by ACF and other stakeholders within a given context? What type of action can be taken in response to these findings?

7. To what extent does the method developed to answer questions 1-6 above produce plausible results? To what extent is it feasible to implement? In what ways can it be improved?

d. Study location

According to the capacity constraints, one District has been chosen to implement the NCA study.

Chivi District in Masvingo Province has been identified as the study location, based on different criteria: high malnutrition rates, homogeneity of the area, similarity of the area with the neighbouring Districts, accessibility, presence of ACF and extended existing interventions in the area.

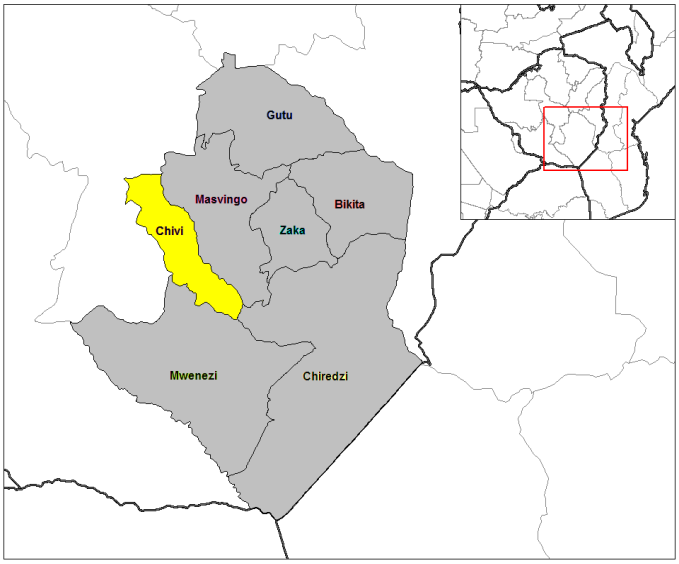


Fig 3 :Chivi District, part of Masvingo Province.

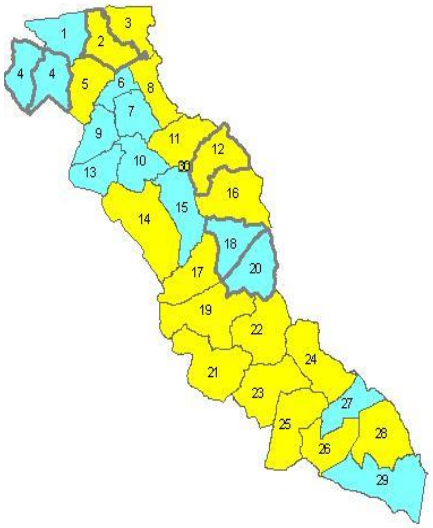


Fig 4 : Ward distribution in Chivi District

- **High malnutrition rates level** with the stunting prevalence of 32% and acute malnutrition prevalence of 1.6%[7].

- **Homogeneity of the area** in terms of relief, climate, livelihood, religious belief and rural/urban area. In all over the rural area, own production is the most important source of household food consumption.

- **Similarity of Chivi District characteristics** with the neighbouring Districts. Findings on Chivi study could provide information on malnutrition context in the neighbouring areas. Chivi District is located in the Nord of Mwenzi District, West of Masvingo and North West of Chiredzi (Masvingo Province) and it has borderlines with 3 Districts of Midlands Province: in the East with Mberengwa and Zvishavane and in the Nord with Shurugwi.

- **Accessible area:** The villages close to Chivi Growth Point have better accessibility with good road conditions and existing bridges. Roads in remote areas are less accessible and rivers level (especially during the current rainy season) may disturb the access to some parts of the area.

[7] National Nutrition Survey done in Zimbabwe, 2010.

- **Presence of ACF** in Chivi District with an integrated approach including food security, water and sanitation and nutrition programmes.

Table 1: ACF interventions in Chivi District.

Sector	Interventions	Targeted wards	Starting period	Ending period
Nutrition	Community Management of Acute Malnutrition (CMAM) – 14 OTP and 2 SCs.	14 health facilities/18	March 2009	January 2011
Water & sanitation	Borehole drilling and rehabilitation, construction of VIP latrines at household, school and clinics, well sinking, capacity building activities, income generating activities for WASH facility maintenance, reinforcement of local network of community-based stakeholders.	2, 4, 12, 18, 20.	Oct. 2007	February 2011
Food security	Garden for Improved Nutrition (GIN) including : Nutrition gardens / training and education on nutrition / irrigation / latrines Food and seed distribution, conservation farming	2, 4, 18, 20 4, 20	April 2010	April 2011

- **NGO interventions** are limited in Chivi District so additional data collection is needed to better understand the given malnutrition context ;

Table 2: NGO interventions in Chivi District.

NGO	Sector	Activities
Heifer International	Agriculture, Animal Husbandry	Veterinary capacity building, livestock disease control and livestock restocking
Zvishavane Water Project	Agriculture, WASH	Livestock restocking and borehole repairing. Ward 11, 12, 15 and 16.
Lutheran Development Services (LDS)	Agriculture, WASH	Dip tank rehabilitation, livestock restocking, Borehole drilling and repairs. Ward 25, 26, 28.
CARE Zimbabwe	Food security WASH	Food distribution in all wards from July to March. Micro-finance, low input gardens, food and seed distribution, conservation farming. Dam construction and rehabilitation, borehole drilling and rehabilitation, Ward 1, 22, 26, 29.
World Vision	WASH, HIV Agriculture	Borehole drilling and rehabilitation, HIV/AIDS, BC , HBC, Animal husbandry Ward 1, 9, 13, 14.
Zimbabwe Red Cross	WASH Health	Borehole drilling and rehabilitation, Nutrition Education, VTC, ART Ward 1
Minnenoti Church of God Christ	WASH	Borehole drilling and repairing.
Regai Dzive Shiri	Health	HIV/AIDS
FACT	Health	VTC
New Start Masvingo	Health	VTC

- Chivi District has been especially recommended by the Nutrition Department /MOHCW.

e. Study population

Infants and young children from birth to 2 years have been defined as the target population.
According to the National Nutrition Survey done in 2010 in Zimbabwe, malnutrition occurs often during the first 2 years of life. Stunting tends to begin prior to the age of 6 months and peaks at 24 months whereas wasting is higher in young children (estimation of 4% of wasted children before 1 year), decreases over time and plateaus at 24 months. Infants and young children less than 24 months of age respond much more rapidly to the improvement than older children. Collecting and analyzing data on this targeted group will provide accurate and focused information to recommend adequate and effective interventions.

f. Temporal boundary

Before 1999, the country had produced surplus and maintained a strategic grain reserve that covered six-nine months. Years of economic decline and balance of payment problems reduced the capacity to produce outputs such as food crops and exportable commodities to earn foreign currency. The prevailing political and economic factors constrained the government's ability to respond promptly and effectively to the unfolding food security crisis. In 2008, after facing a peak of the economic crisis, Zimbawe proceeded to the dollarisation of his currency
2008 – 2011 has been chosen as the temporay boudary in respect to the deteriorated situation from 2008, recent and worst period still in mind for most of people.

g. Nature and scope of the undernutrition problem

From the National Nutrition Survey – 2010, malnutrition rates among the children from 6 to 59 months in Chivi District are presented in the above table (WHO standard).

Table 3: Malnutrition rates in Chivi District, January 2010.

Malnutrition classification	%	CI
Wasting		
Wasting[8]	1.6	[0.6 -2.6]
Severe wasting[9]	0.0	[0.0 – 0.0]
Stunting		
Stunting[10]	32.0	[28.2 – 35.8]
Severe Stunting[11]	7.5	[5.4 – 9.6]
Underweight		
Underweight[12]	10.0	[7.5 – 12.4]
Severe Underweight[13]	1.0	[0.2 – 1.9]
Bilateral Pitting Oedema[14]		
Presence of bilateral pitting oedema	2.7	[1.4 – 4.0]
Acute Malnutrition		
Global Acute Malnutrition (GAM)[15]	4.3	[2.6 – 5.9]
Severe Acute Malnutrition (SAM)[16]	2.7	[1.4 – 4.1]

[8] Children 6-59 months <-2SD Weight for Height.
[9] Children 6-59 months <-3SD Weight for Height.
[10] Children 6-59 months <-2SD Height for Age.
[11] Children 6-59 months <-3SD Height for Age.
[12] Children 6-59 months <-2SD Weight for Age.
[13] Children 6-59 months <-3SD Weight for Age.
[14] Children 6-59 months with bilateral pitting oedema.
[15] Children 6-59 months <-2SD Weight for Height or with the presence of bilateral pitting oedema.
[16] Children 6-59 months <-3SD Weight for Height or with the presence of bilateral pitting oedema.

According to the NNS 2010, children living in rural areas are more likely to be stunted than those living in urban area. Nutrition information[17] on children between 6-23 months in Chivi District revealed poor feeding practices and insufficient intakes with only 24.4% who received the minimum number of meals recommended for their age, only 25.4% the minimum number of food group recommended for their age and 6.8% a minimum acceptable diet (according to the age and breastfeeding status). Breastfeeding practices were poor as well in Chivi District with a percentage of 71.7% early breastfeeding and 2.6% of exclusively breastfeeding. Percentage of children with continue breastfeeding decreased from 84.4% up to 12 months to 23.1% up to 2 year with a median breastfeeding duration of 18 months.

Seasonal calendar in Zimbabwe can be resumed as below.

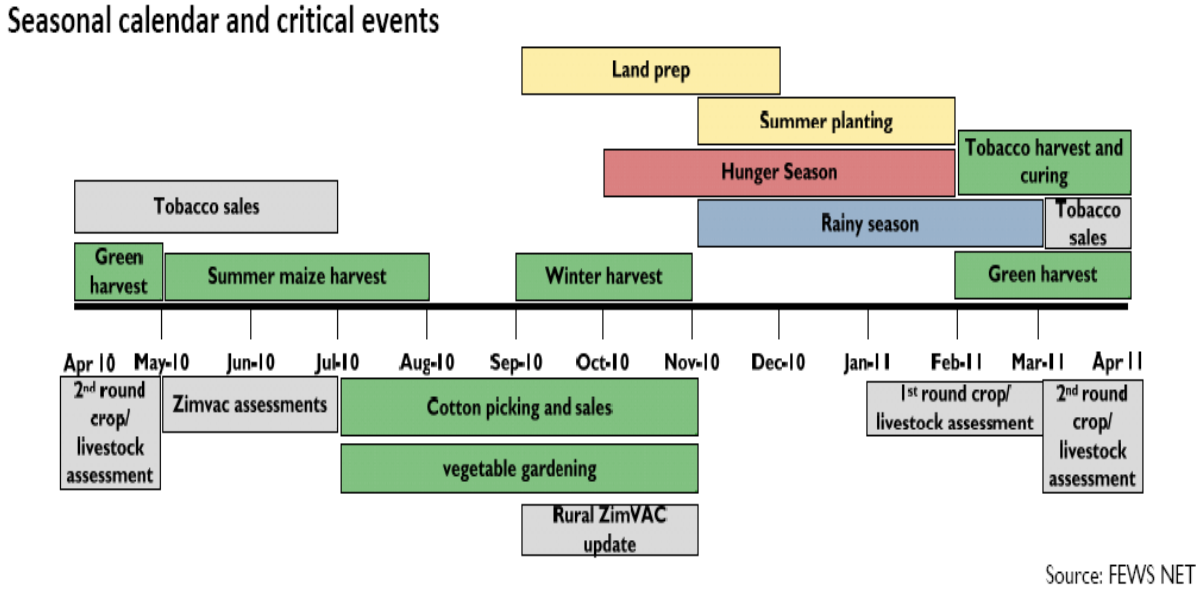


Fig 5 : Zimbabwe seasonal calendar, Fewsnet.
According to the seasonal calendar, it could be assumed that period with high level of acute malnutrition start from October to February called "hunger season".

h. Shocks and hazards in Chivi District

- **Climates changes**

According to Bildeng et al, (2008)[18], Zimbabwe is facing and experiencing the adverse impacts of climate changes as the increased recurrence of natural disasters in the form of droughts, cyclones and floods. Past natural disasters affecting Chivi District included :

- The drought in 1991-1992 described as the worst.
- Repetitive severe droughts in 1987, 1982 and 1994/95.
- Cyclone Eline in February 2000 causing severe flooding;
- Early terminaison of rain in 2002 causing a severe crop failure.

Rainfall during the 10 past years are represented in the below graph.

[17] National Nutrition Survey done in Zimbabwe, 2010.
[18] Ignatius 2 Gutsa, European Report on Development Conference.

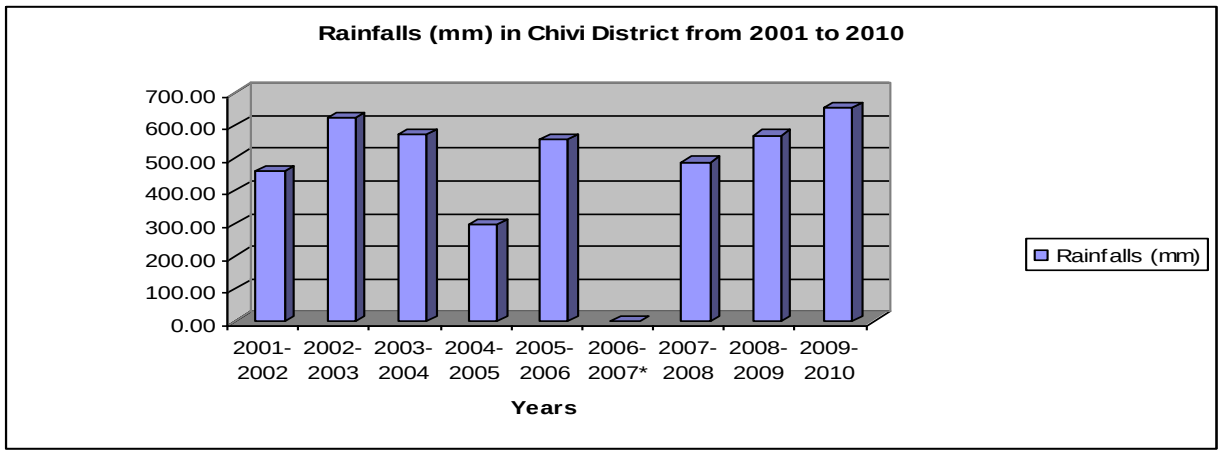


Fig 6: Variations of annuals rainfalls in Chivi District from 2001/2002 to 2009/2010
* Data from 2006/2007 were not available.

Last annual rainfalls are represented in the below graph.

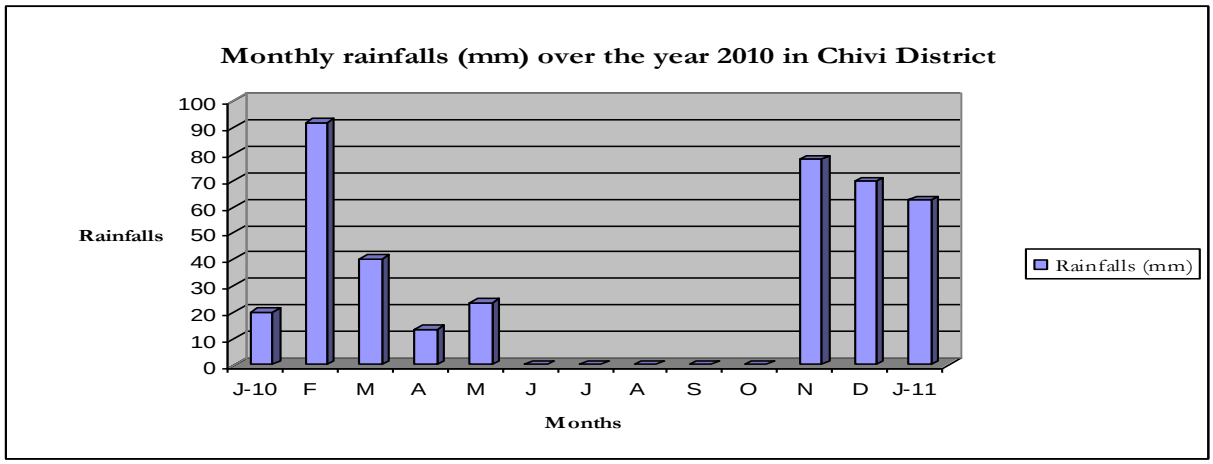


Fig 7: Annual rainfalls in Chivi District, January 2010 to January 2011.

The average annual rainfall in Chivi is 530 mm[19]. One-third of the Chivi District lies in Agro-ecological Region IV and is prone to mid-season dry spells. The rest lies in Region V. Chivi District is a semi-arid area characterised by unpredictable variability of rainfalls. Region IV and V offer limited scope for crop agriculture but are suitable for livestock raising on a large scale.

[19] CHIVI FOOD SECURITY PROJECT: A PROCESS APPROACH, Thematic Area: Sustainable Agriculture, Food Safety and Food Security, The Southern Alliance for Indigenous Resources (SAFIRE), July 2002.

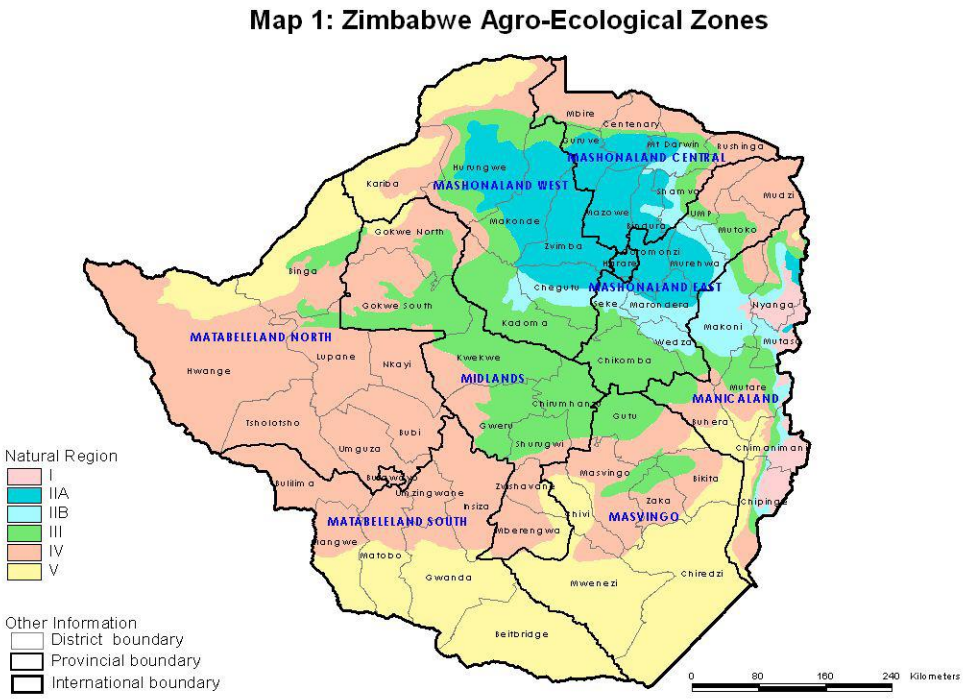


Fig 8: Agro-ecological zones in Zimbabwe. Source: FAO, WFP.

Climate changes has a direct impact on the production and consequently on food availability.

According to Fews net, from October 2010 (beginning of the lean period), cereal stocks from own production have run out for most rural households in the southern of the country due to the mid-term dry spells during the 2009/10 agricultural season that compromised crop production and reduced cereal harvests.

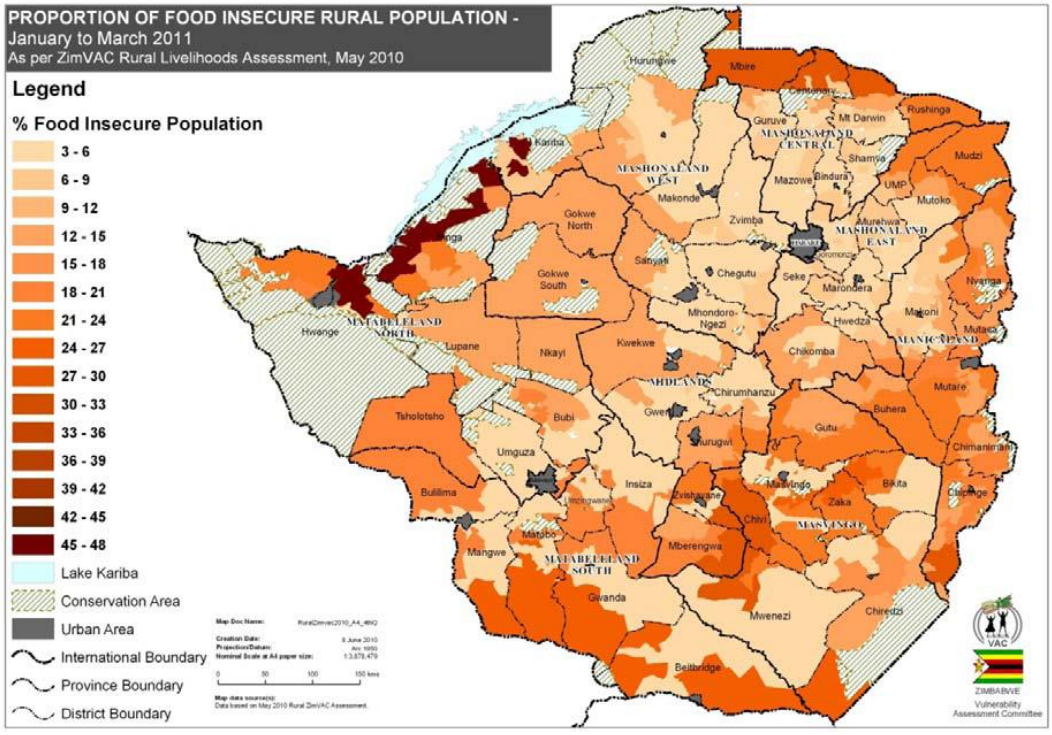


Fig 9: Food Insecure Population January to March – 2011 (Source ZimVAC)

Chivi District is included in the worst areas with high food insecure percentage, especially Chivi District Central including wards 14, 15, 16, 17, 18, 20, 21, 24, 25, and 27.

By comparing the proportion of food insecure among the rural population between 2009/2010 and 2010/2011 (based on the yearly consumption), food security situation has deteriorated in Chivi District.

- **HIV/AIDS problematic**

According to USAID, the first reported case of AIDS in Zimbabwe occurred in 1985. By the end of the 1980s, approximately 10% of the adult population was infected by HIV virus. This figure rose in the first half of the 1990s, peaking at more than 36% between 1995 and 1997. Since the late 1990s, HIV prevalence among people from 15 to 49 years has been consistently declining with 24.6% in 2004[20] according to the MOHCW, 15.3% at the end of 2007 and 13.6% percent in 2010[21]. The plateau in prevalence does not mean that the epidemic has been brought under control but that the number of people who become newly infected each year is about equal to the number who dies annually from AIDS. HIV/AIDS have an impact on different sectors such as health (high expenses for opportunist infections treatment, mortality and sickness among health workers, increase of tuberculosis cases, etc), agriculture and food security (depletion of household assets, reduction of labour that lead to the reduction of crop production, loss of traditional knowledge of agricultural practices, etc), education (absenteism increasing, poor quality of instruction, training costs for new teachers, etc.), economy (impact on household poverty, productivity and income, economic success of firms, governmental revenues and expenditures) and increase of the number of orphans (with the increased demand to provide health, education, and care for these children).

- **Epidemic diseases**

Over the past 3 years, Zimbabwe has been hit by 2 serious outbreaks. Cholera outbreak started mid 2008 and affected a total of almost 92,000 cases and caused over 4,000 deaths[22]. This outbreak has differed from previous outbreaks in being mainly urban and with a high case-fatality rate. Breakdown in the supply of clean water has been the main underlying cause with the lack of sewage facilities in some urban residential areas and low latrine coverage in many rural areas resulted in unhygienic conditions and practices that led to the contamination of water sources. Breakdown in health service delivery in Zimbabwe has also contributed to the magnitude and severity of the outbreak.

In 2009-2010, Zimbabwe faced a measles epidemic spreading all over the country with from September 2009 to June 2010, a number of almost 8,000 suspected cases reported and more than 500 deaths[23] attributed in part to socio-economic challenges faced during 2008-2009 which resulted in high attrition of health workers, closed health facilities, shortages in gas supply, lack of fuel and vehicles directly resulting in challenges in carrying out outreaches. A national measles campaign was implemented in May – June 2010 to fill the gap of low measles coverage. Almost all the affected children were belonging to apostolic faith.

5. Methodology

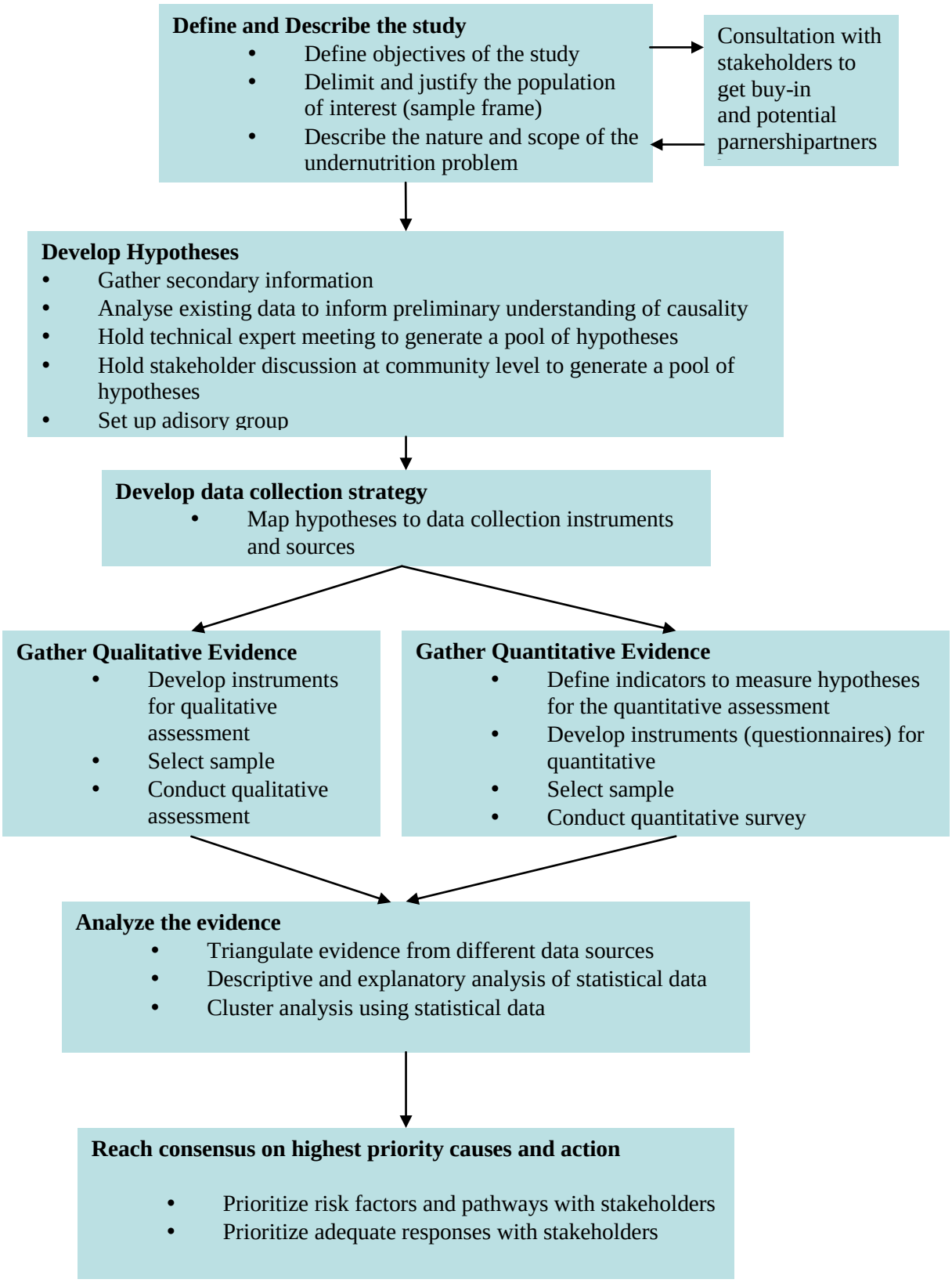
The methodology proposed is based on a research protocol that has been elaborated from a workshop held in ACF Paris with the scientific committee of the NCA research project[24]. The research protocol has then been peer-reviewed and validated.
This research protocol is being implemented in 2 pilot studies: Zimbabwe and Bangladesh.

The results from these pilot studies are used to improve the methodology.

[20] The HIV and AIDS Epidemic in Zimbabwe; MOHCW, USAID, National AIDS Council. May 2004.
[21] HIV/AIDS Health Profile, September 2010. UDAID Zimbabwe.
[22] Zimbabwe experiences the worst epidemic of cholera in Africa, Peter R. Mason, Biomedical Research & Training Institute and the University of Zimbabwe College of Health Sciences, Harare, Zimbabwe.
[23] Zimbabwe Measles Immunization and Child Health Days Campaign 2010 (24 May to 2 June), OCHA Zimbabwe.
[24] The scientific committee includes Pr Helen Young and Dr Jennifer Coates (TUFTS University)- Dr Yves Martin-Prevel (IRD) – Susanne Jaspars (consultant) - Kate Ogden (WFP)

Data collection strategy was based on the definition of the priority pathways linked to malnutrition and valided hypothesis. (cf the 3 local causal models and list of the 16 hypothesis – P22-24).

Study Sequence



a. Defining and Describing the study

- Definition of the NCA rational and objectives

NCA study rational and preliminary objectives have been discussed during the individual partner meetings and within ACF team. Then, objectives have been presented and discussed during the Expert Meeting and Stakeholders Meeting. Formulation of the objectives has been finalized in collaboration with the Nutrition Department of the MOHCW. The process took an average of 3 weeks (2 weeks to meet different key partners and 1 week to conduct expert and stakeholders meeting, meeting with the MOHCW).

- Delimitation and justification of the population of interest

Area of interest for this study has been discussed among ACF team, with some key partners and the MOHCW team based on key criteria aiming to optimize the outcomes and facilitating the process of this pilot study. Chivi District identification and validation took around 2 weeks.

During the key partners meetings, population of interest was as well discussed on either targeting the children from 6 to 59 months (usual population chosen during the nutrition assessments) or focusing on the infants and young children from birth to 24 months. After debating during the Expert Meeting, decision was taken to concentrate the NCA study on the younger children to get more specific data.. Delimitation and justification process of the population of interest took around 3 weeks.

Data have been gathering to better understand the situation of Zimbabwe over the past year. This NCA study focused more on the period from 2008 to 2011. Identification of the most suitable temporal boundary to focus on took around 3 weeks.

- Description of the nature and scope of the undernutrition problem

The National Nutrition Survey conducted by the MOHCW last January 2010 has given a consistent background to the NCA study with recent acute and chronic malnutrition rate and the main potential causes of malnutrition in country. Additional documents (non exhaustive list) as the multi-sector studies has been consulted such as the MIMS[25] and ZDHS[26], report from the key partners as Zimvac assessments (done by FNC and SIRDC), Fewnews, FAO, WFP and USAID . The process took around 3 weeks.

- Partners meetings

Some individuals and team meetings took place among ACF team with the presence of the Country Director, technical coordinators, technical managers and field managers. Then, key nutrition partners were met to get their feedbacks and inputs on the implementation of the NCA study in the given context of Zimbabwe. The process took around 3 weeks.

b. Developing candidate hypothesis

- Gather secondary information

Reports, studies and articles on the targeted components (nutrition, health, food security and WASH) written by diverse partners (government, UN agencies, local and international NGOs) in Zimbabwe and abroad have enlarged the spectrum of malnutrition. The process for reviewing the literature and meeting some partners to access additional information sources took around 3 weeks.

- Analyse existing data to inform preliminary understanding of causality

During the literature reading, notes have been taken on the potential associations, groups of factors, shock, hazards previously identified as having a negative impact or influence on heath, nutrition, food security or WASH situation. Based on these findings, a problem tree has been drafted in the purpose to be

[25] Multiple Indicators Monitoring Survey (MIMS) 2009.
[26] Zimbabwe Demographic and Health Survey (ZDHS). 2005-2006.

reviewed and discussed per expertise area during the Expert Meeting and Stakeholder Meeting. This process took around one month.

- Hold technical Expert Meeting to generate a pool of candidate hypothesis

The Expert Meeting took place on 13th of December at ACF office in Harare for an half-day with the presence of governmental bodies, NGOs and UN agencies such as CARE International, Fews Net, Food and Nutrition Council, GRM International, IMC, Save The Children and UNICEF. During the meeting, the NCA approach was first presented. As participative approach, NCA objectives and targeted population were discussed and debated to get inputs from the participants and validation. Additional discussions took place on the positioning of HIV/AIDS impact, either as part of the pathways from the different components or as a shock having an influence on the overall situation. Then, the second part of the meeting was made up of working groups set per expertise to define detailed pathways linked to malnutrition per sector. After a couple of hours, each group presented and explained his amended problem tree per expertise and the prioritised pathways linked to malnutrition. Regarding the time constraints, the participants requested additional time to provide more comprehensive inputs and send their feedbacks. Few days has been added for the participants to update the NCA pathways. After few days, partner amendments were compiled and a second local causal model was established based on inputs and opinions from partners at country level.

- Hold stakeholder discussion at community level to generate a pool of candidate hypothesis

Several individuals or small group meetings were organised at Provincial (Masvingo) and District (Chivi) level to review in depth and adapt the proposed pathways drawn during the expert meeting. Local specificities, problematic and priority axis have been highlighted.
Partners involved in the stakeholder meeting in Masvingo were the Head of the Provincial Nutrition Department - MOHCW, AGRITEX, CARE International, the Department of Infrastructure Development- DID. In Chivi District, a meeting was hold with the District Nutritionist, AGRITEX, the Environmental Health Officer and the assistant DA.
At this stage of the NCA study, community data have not been yet collected due to the delay in receiving the approval letter for the NCA study at household level.
This process took around 3 days.

Following these two partner meetings, a local causal model (presented by the 3 following local causal modelss) has been drawn according to the hold discussion and highlighted priorities.
Summary of the information and evidence supporting the pathways are gathered in the Annex.

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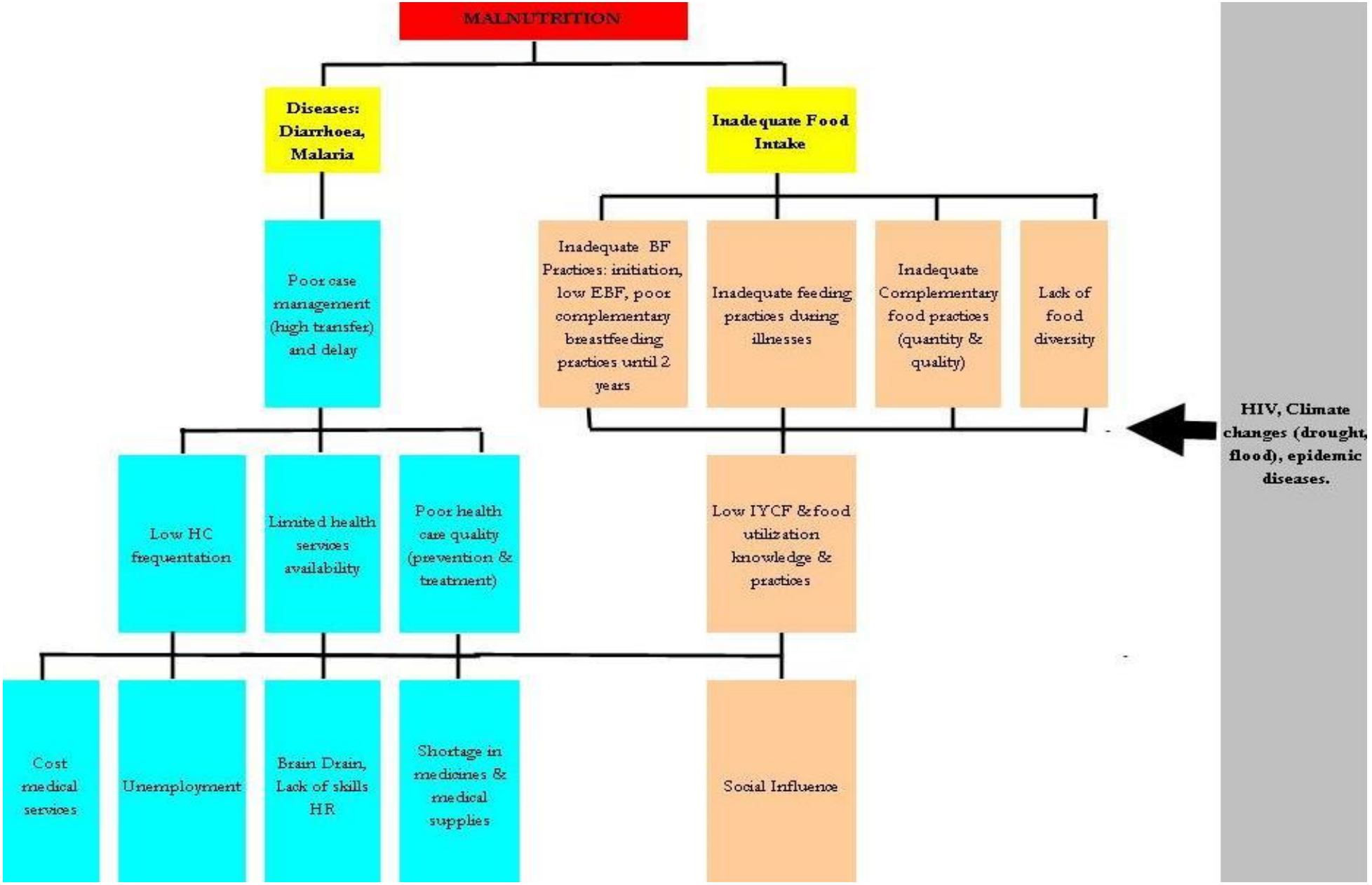
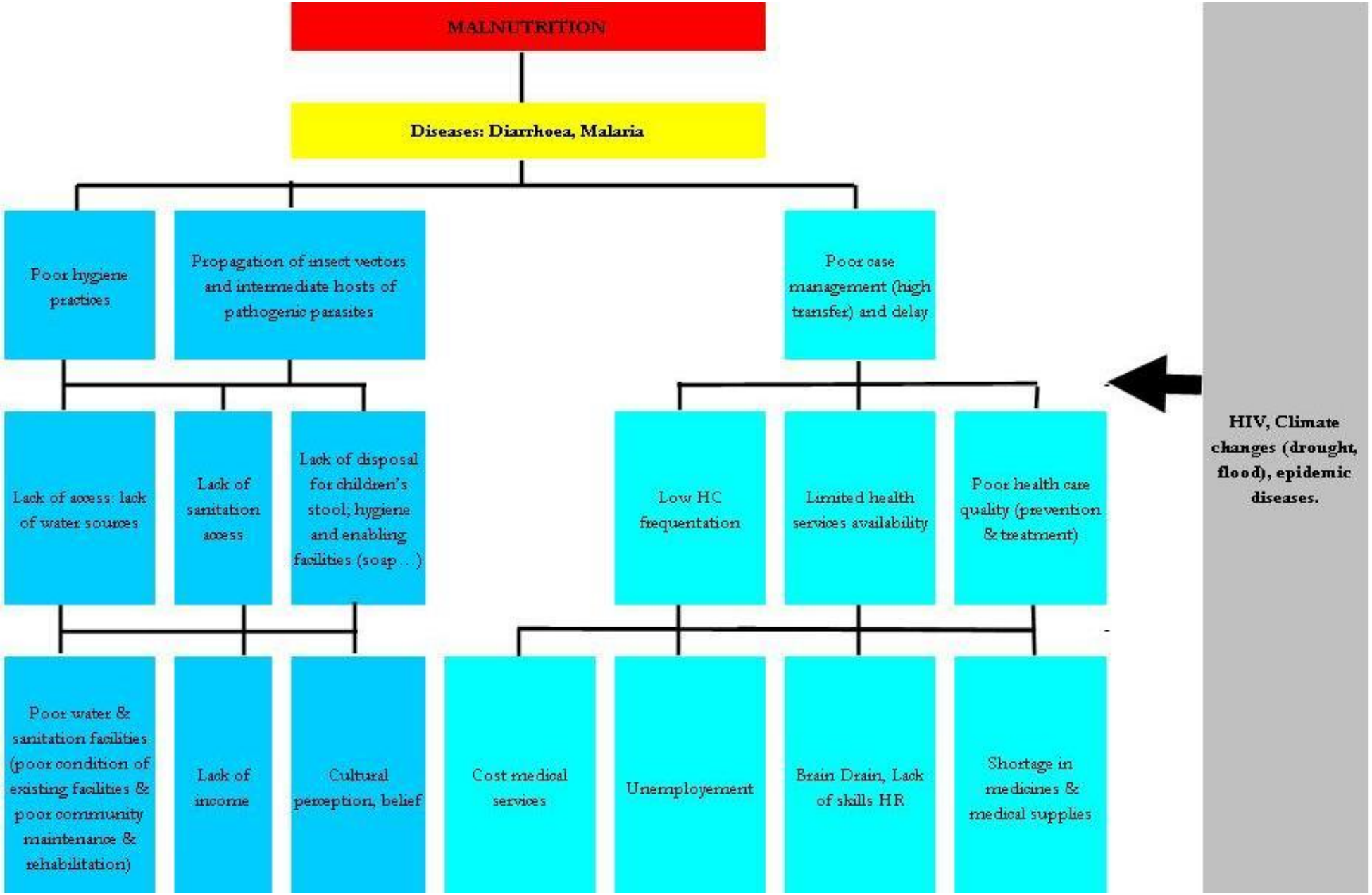
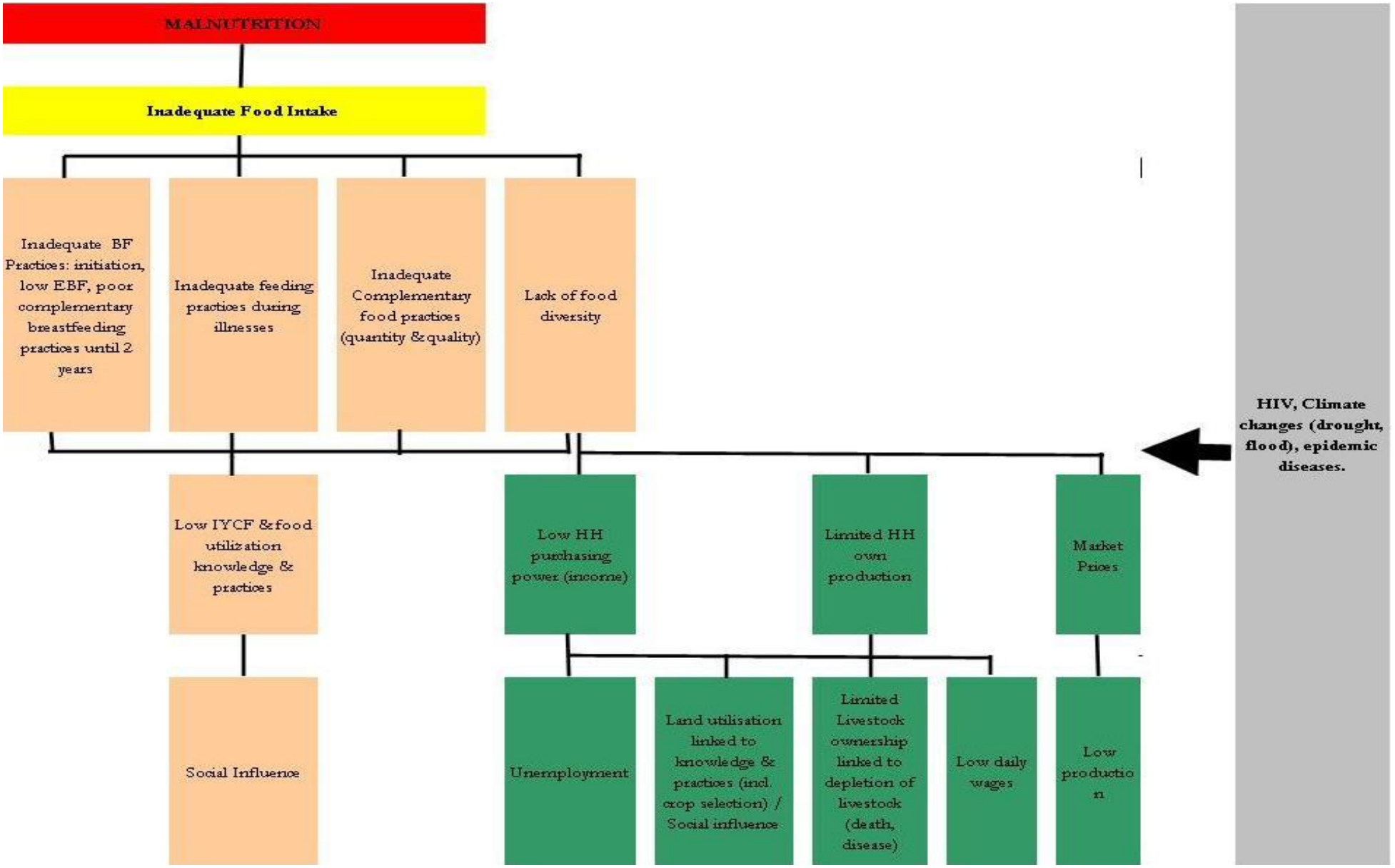

MALNUTRITION
Diseases: Diarrhoea, Malaria
Inadequate Food Intake
Poor case management (high transfer) and delay
Inadequate BF Practices: initiation, low EBF, poor complementary breastfeeding practices until 2 years
Inadequate feeding practices during illnesses
Inadequate Complementary food practices (quantity & quality)
Lack of food diversity
HIV, Climate changes (drought, flood), epidemic diseases.
Low HC frequentation
Limited health services availability
Poor health care quality (prevention & treatment)
Low IYCF &food utilization knowledge & practices
Cost medical services
Unemployment
Brain Drain, Lack of skills HR
Shortage in medicines & medical supplies
Social Influence


MALNUTRITION
Diseases: Diarrhoea, Malaria
Poor hygiene practices
Propagation of insect vectors and intermediate hosts of pathogenic parasites
Poor case management (high transfer) and delay
Lack of access: lack of water sources
Lack of sanitation access
Lack of disposal for children's stool; hygiene and enabling facilities (soap . .)
Low HC frequentation
Limited health services availability
Poor health care quality (prevention & treatment)
Poor water & sanitation facilities (poor condition of existing facilities & poor community maintenance & rehabilitation)
Lack of income
Cultural perception, belief
Cost medical services
Unemployement
Brain Drain, Lack of skills HR
Shortage in medicines & medical supplies
HIV, Climate changes (drought, flood), epidemic diseases.


MALNUTRITION
Inadequate Food Intake
Inadequate BF Practices: initiation, low EBF, poor complementary breastfeeding practices until 2 years
Inadequate feeding practices during illnesses
Inadequate Complementary food practices (quantity & quality)
Lack of food diversity
HIV, Climate changes (drought, flood), epidemic diseases.
Low IYCF & food utilization knowledge & practices
Low HH purchasing power (income)
Limited HH own production
Market Prices
Social Influence
Unemployment
Land utilisation linked to knowledge & practices (incl. crop selection) / Social influence
Limited Livestock ownership linked to depletion of livestock (death, disease)
Low daily wages
Low productio n

From the valid local causal model, hypotheses were formulated as hypothesis. The following 16 hypothesis has been developed according to 7 main topics.

IYCF & Food utilization knowledge and practices	
1	Inadequate breastfeeding practices: late initiation, low exclusive breastfeeding level, poor complementary breastfeeding practices until 2 years expose the child to malnutrition.
2	Inadequate feeding practices during illnesses with maintenance or decrease of the amount of food and drinks contributing to child weight loss.
3	Complementary food practices in quantity & quality don't meet food minimum standards needed for child development.
Social influence and traditional belief	
4	Family influences on the breastfeeding practices have negative impact on the nutrition status of the child.
5	Traditional habits have influence on the utilisation of food items (preparation, conservation) which causes the loss of essential nutrients needed for child development.
6	Social influence on crop selection and land utilization limits HH food production and contributes to inadequate food intake by lack of diversity.
7	Water issues are not culturally perceived as a priority (in terms of HH budget, community facilities maintenance), contributing to disease occurrence.
Financial resources	
8	Low or absent financial resources (unemployment) limit household purchasing power for additional food items needed to diversify and balance diet.
9	Low or absent financial resources (unemployment) limit health facility access and contribute to case management delay and occurrence of malnutrition as disease complication.
10	Low or absent financial resources (unemployment) limit the purchase of enabling facilities and contribute to poor hygiene practices, one of the factor of disease transmission.
Food access & availability	
11	Limited or reduced livestock ownership linked to livestock depletion (diseases and death including food needs during lean times) reduces household own production and purchasing power and consequently food intake
12	Low local production causes an increase of market prices, then food products become financially inaccessible for the household.
Deficiency of health system	
13	Brain-drain and shortage of skilled health professionals limit the availability of services and quality of health care, contributing to disease.
14	Shortages in drugs and medical supplies reduce the quality of health care and contribute to the low utilization of health facilities, increasing the risk of health status degradation.
Water access	
15	Poor water facilities (poor condition or non-functioning existing facilities) reduce the availability of water for household, with negative consequences on hygiene practices and increase in the risk of diseases.
Sanitation access	
16	Poor sanitation facilities (poor condition or non-functioning existing facilities) facilitate the propagation of insect vectors and intermediate hosts of pathogenic parasites, responsible for diseases.

- Set up advisory group (selection process)

During the Expert Meeting, country advisory group has been selected. First, NCA overview has been presented as well as the advisory group expectation and requirement:
The advisory group is a **technical group** set up to work with the NCA expert in **technical and methodological areas.** The Advisory Group can be asked for specific inputs during the course of the NCA such as:

- Validating hypotheses,
- Validating data collection strategy,
- Potential specific question at the time of the analysis,

- Available and motivated,
- Know the local context.

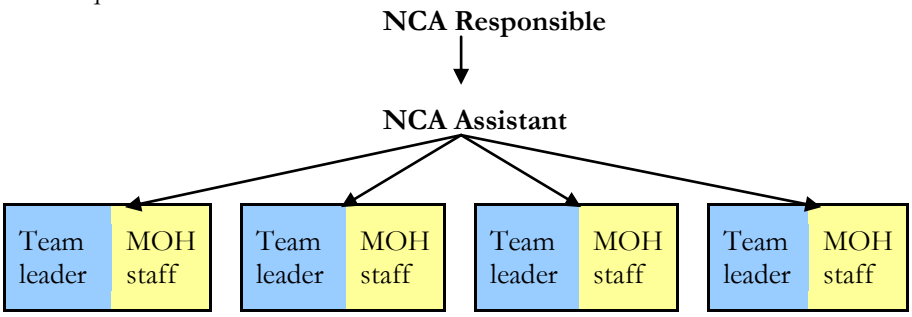
Selection of advisory group member has been done on voluntary way. Zimbabwe advisory group was composed by the FNC, Save The Children and UNICEF. Additional key people were solicited and gave constructive feedbacks: from ACF team Mr Karl Riber (food security coordinator in ACF Zimbabwe) and Mrs Beatrice Mounier (nutrition adviser in ACF – Paris). At international level, additional key person provided solid inputs on the data collection strategy as Mr Yves Martin Prevel from IRD based in France and Mrs Emilie Crozet from the European Union based in Gabon having an experience on nutrition causal analysis.

c. Develop data collection strategy

Cross sectional study on infants and young children (from birth to 2 years) has been conducted between January 17, 2011, and February 5, 2011, in Chivi District, Masvingo Province. Participative approach has been used from the definition of the study (objectives, population of intesrest, geographic targeted area) through key partner meetings, expert and stakeholder meetings. Advisory group at global and country level has been established to give inputs on the data collection strategy and tools. Based on the definition of priority pathways linked to malnutrition in the given context, 360 questionnaires have been conducted to assess multi-sector aspects (nutrition, heath, food security, water and sanitation) with the mothers having a young child, associated to 30 community focus groups.

A multi-stage cluster sample method has been applied to select the 18 clusters (wards and villages level) using SMART Software. At village level, households have been randomly selected by choosing a double random direction and by using random table. Focus group discussions have been conducted with community members (groups of women and men).

4 NCA teams were constituted with 1 ACF team leader and 1 MOH staff (selected by the District) to collect quantitative data.



1 data entry officer and 1 data analyst have been hired during the NCA study.
To ensure the quality of collected data, staff training was conducted for 4 days including a half day for anthropometrics measurement practices and half day for pre-testing the tools. Pre and post tests have been completed by the team prior and at the end of the training. The average of the quotations for the pre-test was 32.3% and those for post test 80.6%. The progress of the trainees was estimated at 48.3%. NCA study pre-test has been conducted in 3 different villages in Ward 7 (NCA unselected ward). Average time to conduct a questionnaire was 1 hour (with the respective time for each team: 1 hour, 1 hour, 50 minutes and 1 hour and 25 minutes - team that has interrupted the interview for 20 minutes due to the return of the father from the field). Following the study pre-test some adjustments in the frame of questionnaire have been done. Local specificities have been added (for instance the use of paraffin or the classification of additional local food products) as well as specific answers (for instance, the use of transportation rather than a single answer based on the way "by foot" to go to the closest health facility, the possibility to detail the 2 main water sources the household have access to) to improve the feasibility and facilitate the further analysis. Time for taking anthropometrics measurement was delayed to the end of the interview, time when the mothers and children feel more confident with the NCA team. Method facilitating communication have been reviewed especially to tackle topics perceived by the mothers as

sensitive such as early breastfeeding and period of low/high income resources level. It was decided to speak about breastfeeding by using the comparison with the cow and its practices to avoid considering the subject as an intimated personal matter and ensure better cultural acceptation of the topics. Concerning income level, it was decided to begin by the period with lowest income followed by the highest income period.

"Cognitive debriefing" with the interviewed mothers highlighted that some questions were difficult to understand such as those on colostrum and changes of feedings during illness. Details and key words translated in local language were added for a better understanding.

- Linking hypothesis and data collection instruments and sources (process tracing)

Qualitative and quantitative matrix has been developed during the data collection strategy. Question allocated to respective hypothesis ensured that the NCA expert should be able to completely verify each hypothesis. In the case additional subjects were modified during the focus groups, the matrix helped to keep in the track the main axis of the study. The creation of the matrix was done during the definition of the data collection strategy and updated until the end of the field work, especially the qualitative part. This process took around 7 weeks.
Matrix summarizing the qualitative and quantitative data collection. (cf Annexe: Matrix).

d. Gathering Evidence quantitatively & qualitatively

- Define indicators to measure hypothesis for the quantitative assessment

The definition of indicators has been based on the WHO Guidelines on Indicators for Assessing Infant and Young Child Feeding Practices[27]. In addition, prior the present NCA, ACF gathered around 46 different studies done all over the world by different organizations on the causes of malnutrition. These reports have been reviewed to provide examples on different methodologies and indicators to measure hypotheses. This process took around 3 weeks.

- Develop instruments (questionnaires and discussion guides) for quantitative assessment

Following the phase of the definition of qualitative and quantitative data collection strategy, tools have been developed. First, the questionnaires adressed to the mother having a child from birth to 2 years have been elaborated. Then, with the inputs of international and local advisory group, some topics have been kept for the qualitative part. Basically, the collected data chosen for the face to face quantitative interview was composed by systematic and simple questions that request a minimum of reflexion (short recall period, questions based on the daily life and current habits of the household). In order to facilitate the analysis of household questionnaires and compare the answers between the mothers, most of the questions were closed and codified with only an option to have a different opinion with the category "Other" and its specification. It is important to mention that questions were asked without suggesting potential answers. According to the mother responses, NCA team members were ticking the most appropriate answers according to the identified possibilities.

The choice of the Focus Group Discussion as qualitative method was made on the purpose to obtain in-depth information on concepts, perceptions and ideas on a group living in the targeted District through not only question-answer interaction but discussion, interpretation for a better understanding of the complex reality of the given situation, phenomenon that can be revealed through the quantitative questionnaires. Discussion guides were developed during the preparation phase of the study. Following topics were tackled such as feeding practices, malnutrition knowledge, health access, water access, water shortage consequences, household expenses with the women; then topics on farming practices, state of the past harvest, livestock situation were discussed with the men. Others topics were discussed in both groups such as social influences, HIV/AIDS perception, sanitation situation, income sources, daily planning and general faced problems in the community. Qualitative data collection included as well interviews with key actors as health staff and animal health services.

[27] Indicators for assessing infant and young child feeding practices. WHO in collaboration with USAID, AED, Food and Nutrition Technical Assistance, UC Davis, IFPRI, UNICEF. 2008.

Key informant interviews have been conducted but field constraints have dramatically limited the number done. The objective of conducting interviews with the heads of health facilities from the selected villages and from the Animal Health and veterinary services in Chivi growth point was to gather focused information, ideas, and insights on a particular subject from professional.

This process to define the data collection strategy took around 3 weeks.

- Sample selection

Two degree selection have been done (ward then village level) using SMART software based on the population figure. The first selection stage has been done by selecting 18 clusters among the 32 existing wards of Chivi District. Population data were taken from the last Census of 2002. Then, from these 18 clusters, population figures for each selected wards have been compiled and 18 clusters (villages) have been selected. Here, population for each village were taken from CARE database.
The selected wards were: ward 2, 3, 5, 8, 11, 12, 14, 16, 17, 19, 21, 22, 23, 24, 25, 26, 28 and 30.
List of the selected villages is attached in the Annexe.

- Conduct Quantitative & Qualitative assessment

Field work took place from the 17th January to 5th February 2011 for a period of 18 full days.
Each team was responsible to conduct 5 household questionnaires per day. For logistic issue, 2 teams were working in the same village so each village was completed after 2 days (20 households). After meeting the village head, asking the geographical limits of the village and its centre, household were randomly selected using the double selection of a direction and the random table. Each questionnaire was lasting for around one hour.
The team in charge of the qualitative data collection was requesting to the village head to gather 6 to 12 women and the same number of men to constitute at least 2 groups for discussion. Focus groups were guided by the NCA researcher and translated in shona by the NCA assistant to ensure free talk and spontaneously discussion about topics. Each focus group was lasting around 45 minutes to one hour. Participants were gathered at the head of village compound. Small chairs, benches and mates were arranged in a circle to facilitate communication and interactions. We ensured that no observers or additional people were listening the discussions.

- Data entry

Data from the household questionnaire were entered on daily basis on Sphinx software by a data entry especially recruited for this task. Data cleaning was done, outliers were noted and removed. Suspicious values were also cross-checked with the actual questionnaires by using QUES ID's in the digging process.

- Data analysis

Data analysis was done on SPSS software and anthropometrics indicators calculated on SMART software. Variables were created using the WHO guidelines. 32 variables were created for the analysis. Frequency tables were produced for each variable to get picture on demographics, attitudes and perceptions of respondents. All nominal and ordinal variables were described as mentioned. Some descriptive statistics were made to explain the distribution of numeric variables (eg average age for child caretakers, average age of the children in the survey) and their standard deviations were obtained. The next step was to establish different associations between nutrition measures (wasting and stunting) with social, financial and employment status of the household. Chi-square tests were used to determine these different associations). A p-value of 5% was used to demarcate between rejecting and accepting the null hypotheses. A p-value less than 5% implied there is an association between the two variables of interest and a p-value more or equal to 5% meant there was no association. Correlation analysis was also used to establish the relationship between numeric variables, the Pearson's correlation coefficients were noted as well as p-values signifying whether the relationship is significant was also noted.
Regression analysis (in particular, multiple linear regression analysis) was then employed partially to describe the noted relationships. Some variables were noted to positively affect stunting/wasting whilst others were noted to negatively affect stunting/wasting. This exploration is and will still continue in a bid to find the causal aspects of the different risk factors for stunting and wasting.

- NCA study planning

NCA Planning November 2010 to March 2011	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
	November		December					January	
Weeks	*15 to 21*	*22 to 28*	*29 to 5*	*6 to 12*	*13 to 19*	*20 to 26*	*27 to 2*	*3 to 9*	*10 to 16*
NCA expert training	X								
NCA Approval	X	X	X	X	X	X	X	X	X
Partner meetings	X	X							
Rationale definition	X	X							
Ojectives elaboration	X	X							
Target area selection	X	X							
Target population selection	X	X			X				
Secondary data gathering		X	X	X					
Analysis of secondary data		X	X	X	X				
NCA presentation in ACF PM Meeting			X						
NCA objectives validation					X				
NCA team recuitment process			X	X	X	X	X	X	
Candidate hypothesis formulation			X	X	X	X			
Expert Meeting					X				
Stakeholder Meeting					X				
Hypothesis validation						X			
Data collection strategy definition						X	X	X	
Process tracking						X	X	X	X
NCA Training									X

NCA Planning November 2010 to March 2011	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19
	January		February				March			
Weeks	*17 to 23*	*24 to 30*	*31 to 6*	*7 to 13*	*14 to 20*	*21 to 27*	*28 to 6*	*7 to 12*	*28 to 6*	*7 to 12*
NCA Field work	X	X	X							
Process tracking	X	X	X							
Qualitative data analysis				X	X					
Quantitative data cleaning				X						
Quantitative data analysis					X	X				
Analysis, interpretation & reporting							X	X	X	X

e. Limitations of the methodology

The NCA methodology used for this survey is interpreting evidence from different sources of information in order to reach a consensus on main causes of undernutrition.

One could argue that the only reliable source of information would be to statistically prove the link between undernutrition and causal factors. Looking a bit more into the UNICEF framework will acknowledge the limitations of a pure 'statistical' approach:

- Risk factors in populations studied have often a limited variability.

A typical example is the level of education of women. More than 90% of women in the Bangladesh study had no education. While this can be an important risk factor, bivariate and multivariate analysis does not have the power to detect associations with such limited variability.

- Some causes are very difficult or impossible to capture with a quantitative cross-sectional approach.

For example, there is no existing tool to estimate Birth Weight of children a posteriori. Currently, the only reliable measure of Low Birth Weight is to actually measure it at birth. This would require a longitudinal research tracking children from birth to 5 years old which is not within the scope of an NCA.

- Linear regression models predicting nutrition outcomes typically result in low R2 based on statistical standards (20-25% of the undernutrition variance explained).

This is common even in surveys such as the Demographic and Health Surveys that have much larger samples (typically yielding an R2 below 20%). This is partly due to the fact that R2 depends on idiosyncratic cross-observation variance: if the outcome variable has a high variability, or if the independent variables have low variability, R2 tends to be low. This is especially true when stunting (HAZ) is the outcome.

- The accuracy of the causal factors measured can be challenged.

For example, measuring quality of child food intake is very commonly done by using IDDS. It is an internationally recognised indicator. Nevertheless, this indicator is a proxy indicator and does not measure directly the actual food intake of children. Some biases exist. For example, it can depend of how precise the respondent remember what has been given to the child and how truthfully the respondent would answer. This is inherent to any study using such indicator but one has to keep in mind that therefore the results are measuring the link between IDDS and undernutrition and not the link between exact food intake and undernutrition.

Given the scope of an NCA study, which cannot be a multi-year longitudinal study, one has to acknowledge these limitations of the pure statistical approach. Understanding these limitations, the NCA methodology is not dismissing the quantitative survey but rather emphasizes the necessity for a comprehensive approach where the quantitative survey is just one of the components of the methodology. The NCA methodology is capturing different sources of information to build a case for causality. We have enumerated the limitations of the quantitative survey but each other sources of information have their own limitations:

- The hypotheses developped are based on existing knowledge (academics, experts, review, and community) and therefore some undernutrition causes might not be captured if the level of knowledge is limited or not well captured by this study.

- Qualitiative information can be contradictory in some places.

This NCA is not providing statistically exact relative importance of causes but rather builds a case for causality based on different and coherent sources of informations.

6. Descriptive analysis by hypothesis

This section is presenting the main results from the study including:

- presentation of the sampled population
- main nutrition results
- results, hypothesis by hypothesis

360 mothers having an infant or young child from birth to 2 years have been surveyed in a total of 18 clusters representing 42 villages[28].

17 focus groups with in average of 8 women were conduct in wards 2, 3, 5, 6, 8, 11, 12, 14, 17, 19, 22, 24, 25, 26, 28, 30. 3 groups have been completely composed by women with children under 2, otherwise other focus groups were conduct with mother having the responsibility of a child. One group of old women has been met to have an overview of the perceptions from the grandmothers. 13 Focus groups with in average of 8 men were conduct in Wards 2, 3, 5, 8, 11, 12, 14, 16, 17, 19, 24, 26 and 28. Uncovered wards with focus groups. Out of the 18 clusters, only ward 21 and 23 have not been covered by the focus groups.

5 key informant interviews have been conducted with the head of the following health facilities : Chivi Mission Clinic (ward 12), Mlandamabwe Rural Health Centre (ward 5, 7, 8 and one part of Ward 2), Madomonbwe Rural Health Centre (ward 2, 3), Shindi Clinic (ward 26, 28) and Ngundu Clinic (ward 26, 28).

Household sample demographics characteristics

- **Household head**

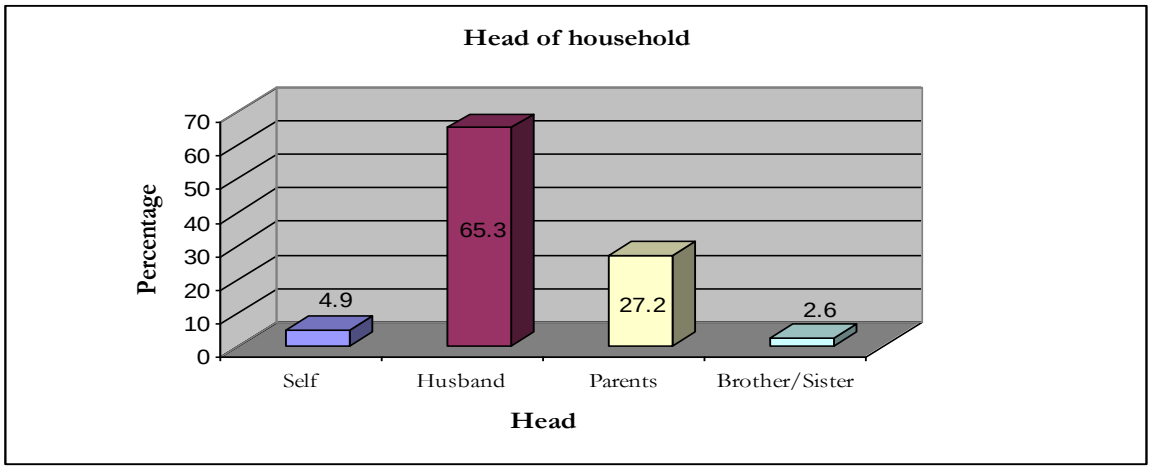


Fig 10: Head of household distribution, NCA study in Chivi District, January 2011.

Most of the assessed households are headed by the husbands (65.3% of the respondents). "Parents" was considered as the parents of the mother / father of the child, the child grand parents.

- **Age distribution by household**

[28] 18 villages have been initially selected but then, when the number of surveyed targeted children was not reach in the selected village, the closest one was visited to complete the cluster. Assessed villages: Bati, Chekai, Chibhebhe, Chiorese, Chirairo, Chitekedza, Chopa, Elia,Giri, Jawa, Kutsira, Macheka, Madziva, Magwana, Makuvire, Mangwana, Manika, Maringire, Masinire, Matayaya, Maurawa, Mawadze, Mawarire, Mharadzano, Monde, Muchochomi, Mudanigwa, Mugovozhengwa, Munangari, Murevesi, Musenderi, Musvita, Mudzvidziwa 1, Mudzvidziwa 2, Nziyo, Runhare, Taruvinga, Tichagwa, Vutete, Zifudzi, Zivurawa, Zivuruwa.

Average of household members is 6.29 including at least 2.73 adults (>18 years), 1.14 child from 5 to 11 years and 1.12 child under 24.

NUTRITION RESULTS

Nutrition indicators for the child's sample are summarized in the below table.

Table 5: Percentage of malnourished children (from 6 to 24 months) according to the type of malnutrition.

NUTRITION INDICATORS	Number	Percentage
WASTING		
Global wasting[29]	5	1.9
Moderate wasting[30]	3	1.2
Severe wasting[31]	2	0.8
NUTRITION INDICATORS	**Number**	**Percentage**
STUNTING		
Global stunting[32]	83	32.2
Moderate stunting[33]	48	18.6
Severe stunting[34]	35	13.6
OEDEMA		
Presence of bilateral pitting oedema	9	2.7
GAM / SAM / MAM		
Global Acute Malnutrition (including MUAC)[35]	7	6.3
Moderate Acute Malnutrition (including MUAC)[36]	6	2.3
Severe Acute Malnutrition (including MUAC)[37]	1	4

Associations and relationship with wasting have been researched and transcript in the Findings part. However, children affected by wasting represented a small sample (n=5), consequently no statistical association could be strongly demonstrated. Others associations and relationships are below detailed.

According to the collected qualitative data, most of the people met have « hear about malnutrition ». The main signs mentioned were « swelling of the body » characteristic of « Kwashiorkor », « weight loss », skin affection (dermatia, smooth skin) and changes of hairs state (become weaker, lost of hairs). The main known causes of malnutrition were related to the lack of food quantity and the conditions of eaten food (eating cold food increases the risk of malnutrition as well as eating without washing hands).

[29] Children 6-59 months <-2SD Weight for Height.
[30] Children 6-59 months -3SD < Weight for Height < -2SD.
[31] Children 6-59 months <-3SD Weight for Height.
[32] Children 6-59 months <-2SD Height for Age.
[33] Children 6-59 months -3 SD < Height for Age <-2SD
[34] Children 6-59 months <-3SD Height for Age.
[35] Children 6-59 months <-2SD Weight for Height and/or presence of bilateral pitting oedema and/or MUAC<125mm.
[36] Children 6-59 months -3SD < Weight for Height < -2SD and/or 115 mm < MUAC<125mm.
[37]Children 6-59 months <-3SD Weight for Height and/or presence of bilateral pitting oedema and/or MUAC<115mm.

INFANT AND YOUNG CHILD FEEDING & FOOD UTILIZATION KNOWLEDGE AND PRACTICES

<u>Hypothesis 1</u>: Inadequate breastfeeding practices: late initiation, low exclusive breastfeeding, poor complementary breastfeeding practices until 2 years expose the child to malnutrition.

a. Child caretaker sample demographics characteristics

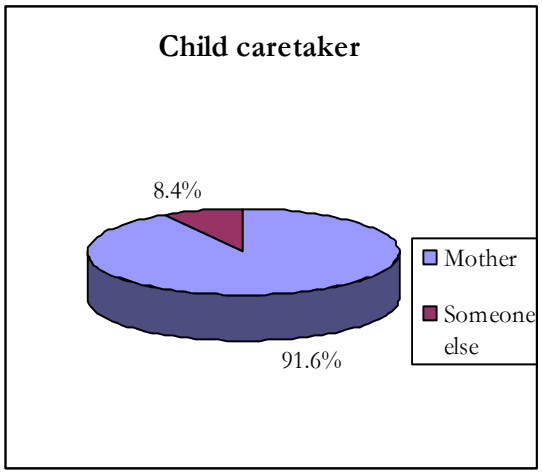


Fig 11: Mother child caretaker.

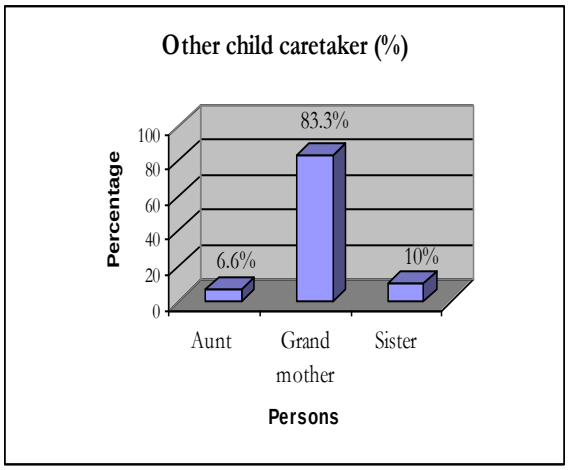


Fig 12: Other types of child caretaker.

91.6% of the child's sample has as caretaker their mothers. Among the 8% of other caretakers, grand mothers represented the higher proportion (83.3%).

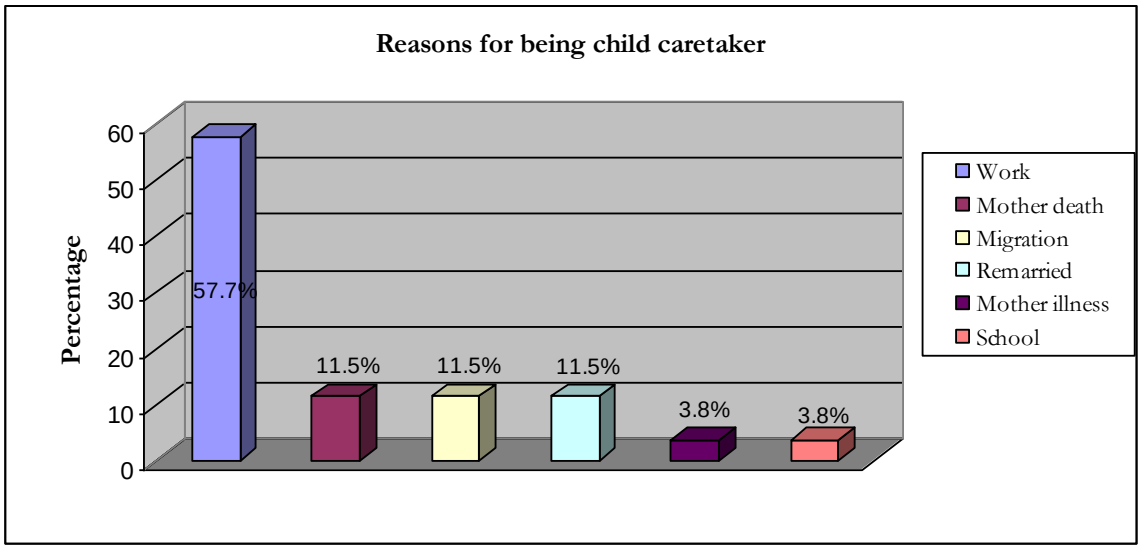


Fig 13: Reasons explaining that a person different from the mother became the childcaretaker.

In the majority of the cases, when the mother was not the caretakers, the main reasons was related to the working activities, followed by social situation (migration, mariage of the mother), mother health degradation (sickness, death) and studying.

The average age of the child caretaker was 28.63 years with a minimum of 16 years and a maximum of 75 years.

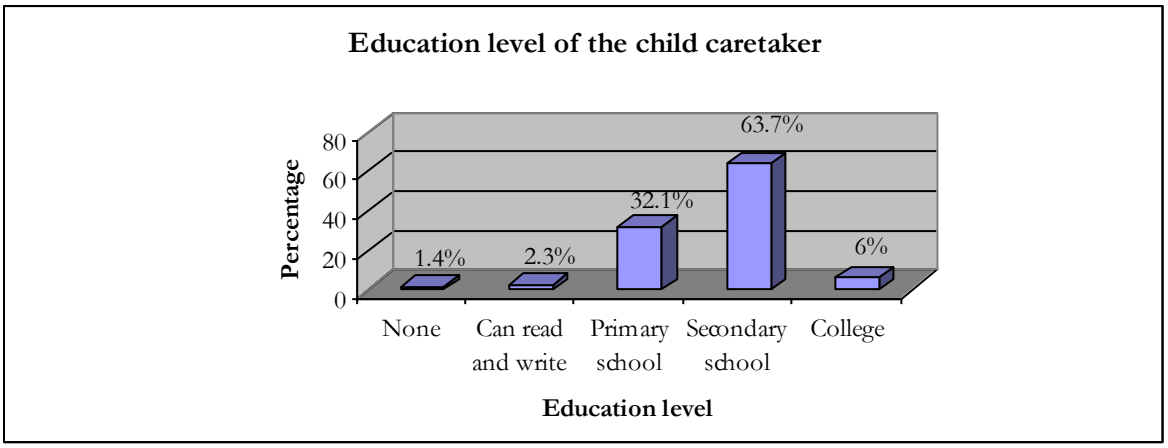


Fig 14: Education level of the child caretaker.

The majority of surveyed child caretakers had more than basic education.

b. Child sample demographics characteristics

Child sample was composed by 51.9% of female and 48.1% of males. Ratio female / male was 1.08.

Table 4: Age characteristics of the sample.

Age	Frequency	Valid Percent
0 to < 6 months	94	27.1
6 to < 8 months	32	9.2
8 to < 12 months	61	17.6
12 to < 15 months	43	12.4
15 to < 24 months	117	33.7
Total	347	100.0
TOTAL	360	

*13 missing data

c. Caretaker knowledge on child feeding

Among the caretakers, 97.2% had access to antenatal care in their living area and 81.3% of them attended ANC consultations during their last pregnancy. According to the qualitative data collected, ANC visit are well followed because first, it is free and then it gives information on baby health, his development and contribute to prevent complications during the delivery. Distance to reach the health facility and the lack of knowledge on the exact expected delivery date contribute to home delivery or delivery on the way. At village level, women were often helped by midwives who worked in collaboration with the health facilities. Delivering at the health facility has a cost as some requested materials (gloves, cotton wool, spirit, dressing, umbilicus clip, candles, matches…) are requested which come in addition to the cost for needed mother's caretakers.

- **Early breastfeeding**

Table 6: Percentage of early breastfeeding initiation.

Nutrition indicators	N	%
Early initiation of breastfeeding[38]	360	73.1

[38] Children born in the last 24 months who were put to the breast within one hour of birth / Children born in the last 24 months

According to the qualitative collected data, early breastfeeding is usually initiated when the mother and the infant are gathered in the same room. Reasons mentioned by the mothers who did not practise early breasfeeding are detailled in the following graph.

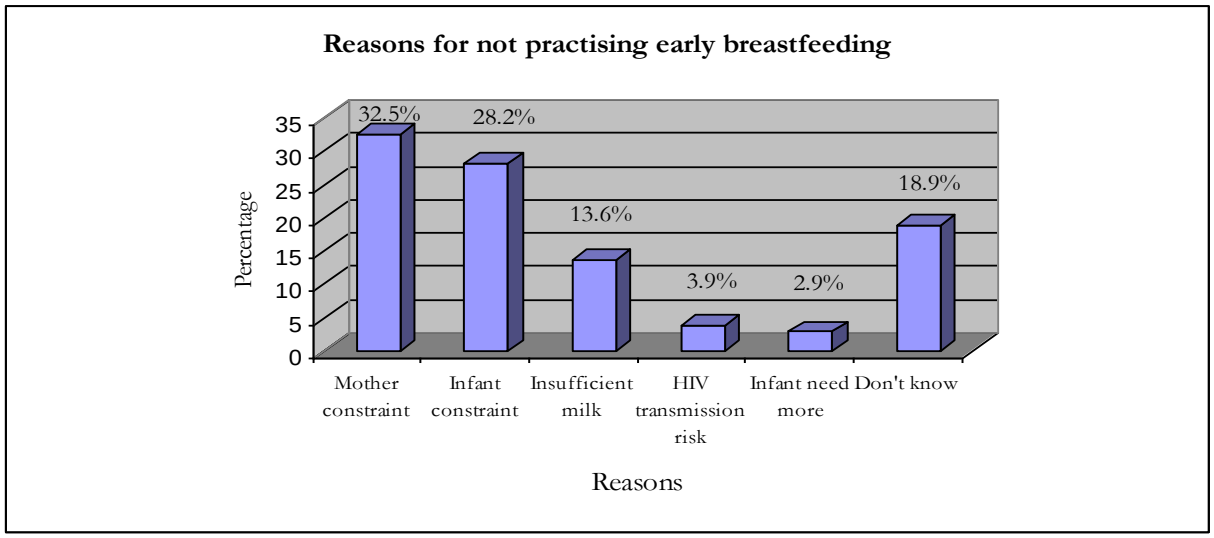


Fig 15: Reasons for not practising early breastfeeding.
« Mothers constraints » include delivery complications and the need for the mother to have rest after delivery ; « infant constraints » include infant sleeping, milk refusal, absence of crying, prematurity or the need for infant observation.

According to the qualitative collected data, delay of breastfeeding initiation is often linked to the delivery progress (case of cesarean, complicated or abnormal delivery, the mothers needed specific cares or rest or the infant clinical status needed to be observed). Few cases did not give breastfeeding during the 2 first days as they were considering not having enought milk. In the case of mother death during the delivery, goat milk was first introduced followed by small amounts of porridge or peanut butter.

Among the interviewed mother, 65.5% « have hear about colostrum ». Mentioned colostrum advantages[39] are represented in the below graph.

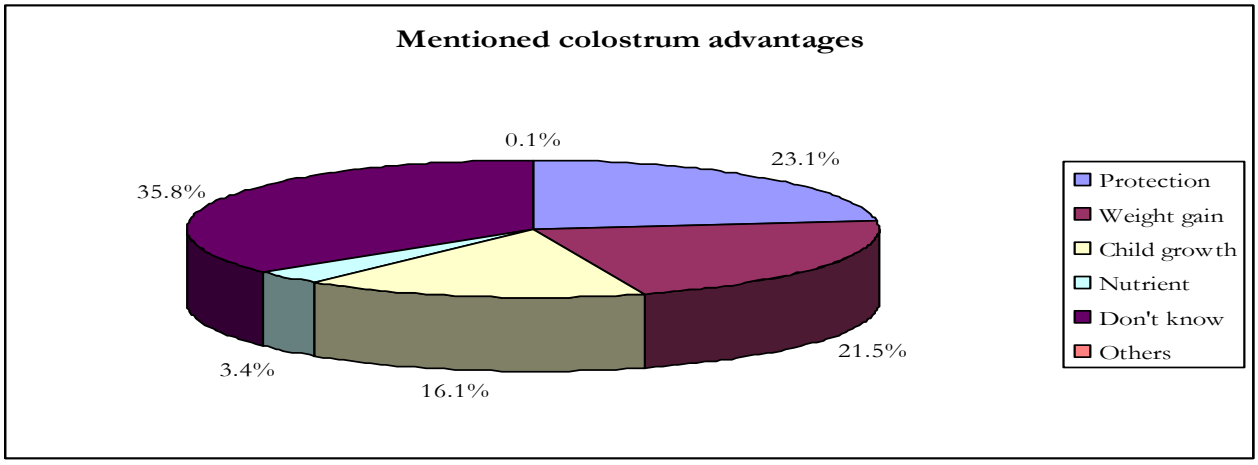


Fig 16: Colostrum advantages mentioned by the interviewed mothers.

According to the qualitative collected data, colostrum was defined as "clear as water" that protect infant health, « helps the opening of infant eyes and nose » or contributes to the « cleaning of infant stomach ». After few days, when the production of « mother milk » (considered when the colostrum production ends)

[39] Some mothers gave more than 1 advantage.

gaves an indication on mother ability to produce breastmilk. In the case of the mother did not have enough milk, supplementary feeding support was provided by the health facility.

❖ **Child feeding sample**

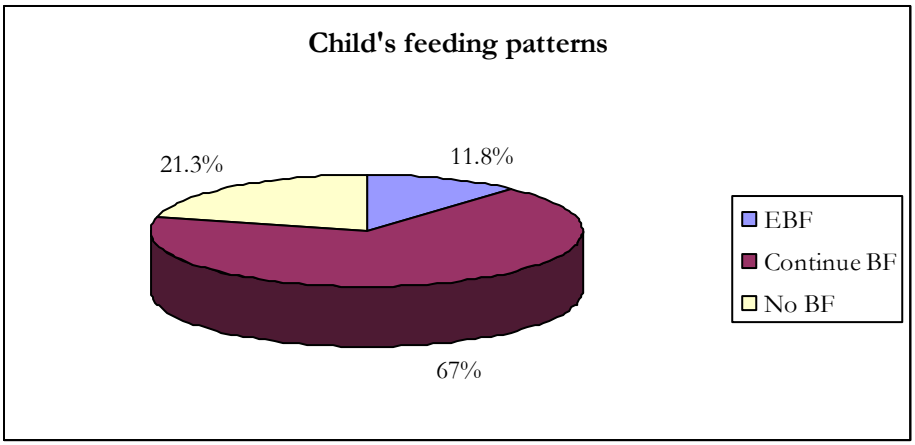


Fig 17: Child's feeding patterns of the children assessed during the NCA study.

Around 1/5 of the children from birth to 24 months were not receiving breastfeeding during the study.

❖ **Exclusive breastfeeding**

Table 7: Percentage of exclusive breastfeeding.

Nutrition indicators	N	%
Exclusive breastfeeding under 6 months[40]	67	43.3

According to the qualitative data collected, most of the women introduced water or food items (mainly porridge) before the 6th month. Water is considered as "important for the baby" as it "facilitates the infant digestion". The main expected purpose of giving porridge and water to the infant is to facilitate his sleeping. No side effects have been observed by the mothers when porridge was early introduced. Infant colic was noted in some communities but directly linked to the weather condition (clouds presence increase colic) and traditional drinks were given as treatment.

The main reason motivating the mothers to early practice food introduction was related to the infant crying assimilated to hunger and mother milk insufficiency. « Sucking his fingers » was an additional mentioned sign meaning that the infant was hungry. The association between insufficient breastfeeding and the need to give early porridge and water (with sometimes peanut butter) from the first few days after birth was strongly supported by the family members, especially the grandmothers. In most of the cases, single mother milk was considered insuficient in quantity and quality to ensure adequate infant and child growth. The second reason limiting exclusive breastfeeding practice was the mother working condition starting soon after birth.

❖ **Continue breastfeeding**

Table 8: Percentage of continue breastfeeding up to 1 year.

Nutrition indicators	N	%
Continued breastfeeding at 1 year[41]	43	97.7

[40] Infants 0–5 months of age who received only breast milk during the previous day / Infants 0–5 months of age
[41] Children 12–15 months of age who received breast milk during the previous day / Children 12–15 months of age

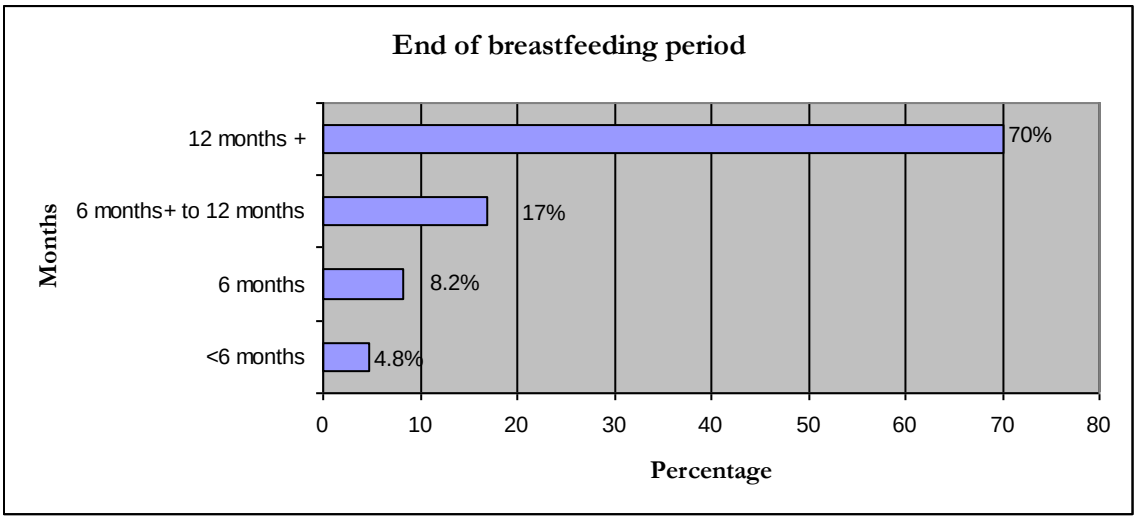


Fig 17: End of breastfeeding period mentioned by the interviewed mothers.

13% of the mothers ended the breastfeeding before the 6 months of the child.
According to the qualitative data collected, breastfeeding was commonly continued until 1 to 1 year and half.

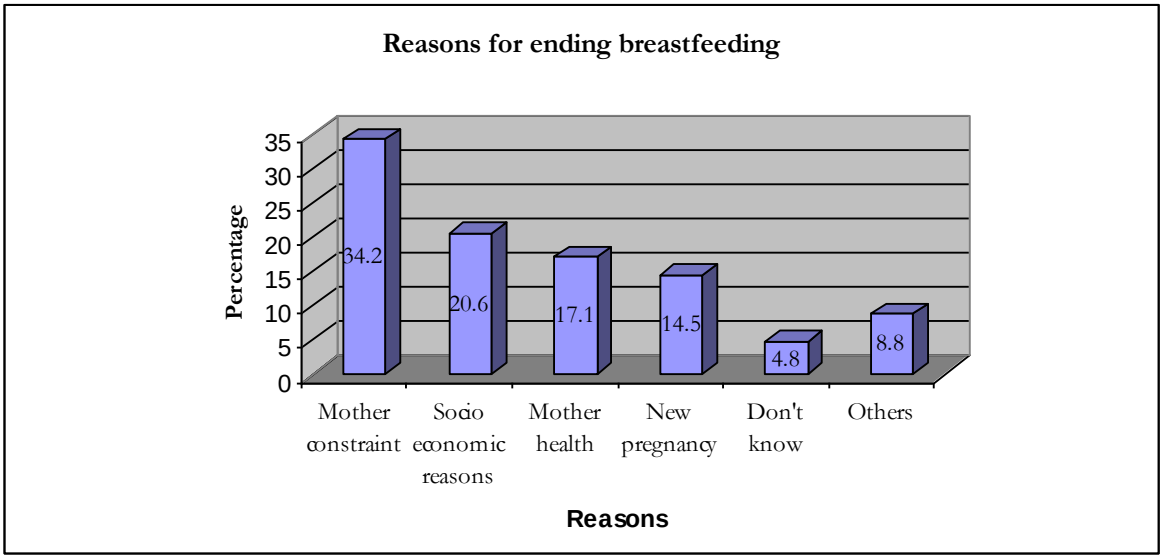


Fig 18: Reasons for ending breastfeeding.

Mother constraints are related to the ability of the mother to produce sufficient breastmilk in quality and quantity. Socio economic reasons include working condition and migration.
Culturally, a pregnant woman cannot continue to breastfeed in the meantime an other child (the breastfed child risks to become sick, weak or died). During the focus group discussion, additional reasons were mentioned as the mother decision (lack of time to breastfeed the child linked to household activities) or child choice (being more interested by food than mother milk).

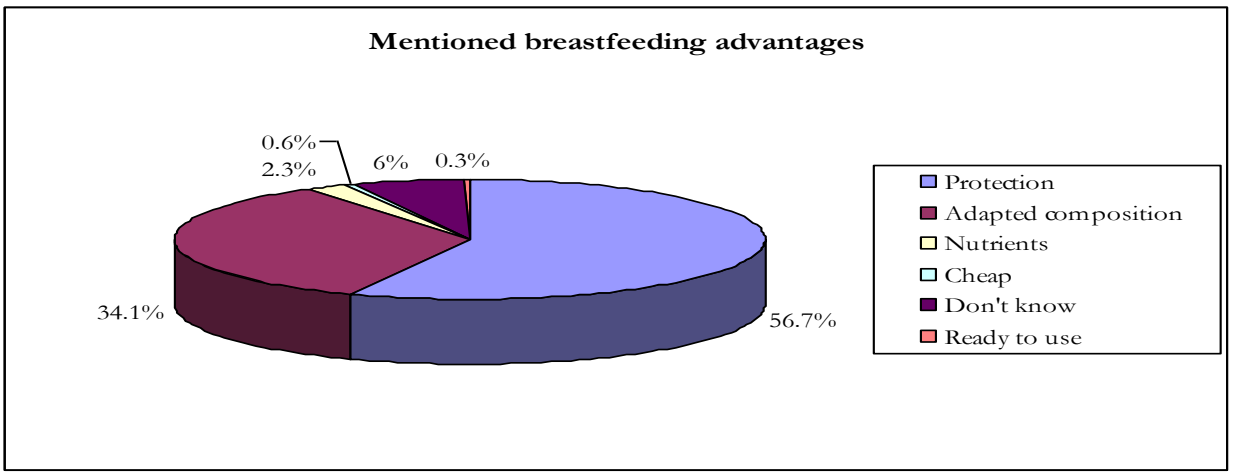


Fig 19: Advantages of the breastfeeding mentioned by the interviewed mothers.

Protective effect and adapted composition of breastfeeding were the two major advantages higlighted by the mothers.

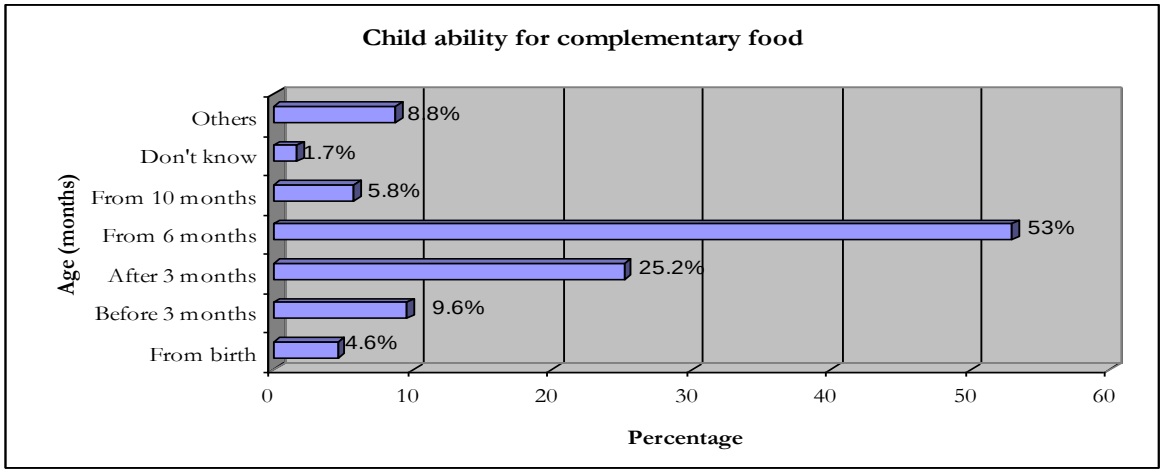


Fig 20: Child age ability for eating and drinking.

39.4% of the mothers thought that an infant under 6 could be able to eat additional food and drink.
Table 9: Percentage of the complementary food introduced.

Nutrition indicators	N	%*
Introduction of complementary foods[42]	30	26.7

*According to the low sample of infants aged 6-8 months, this result has to be taken with caution.

Hypothesis 2: Inadequate feeding practices during illnesses with maintenance or decrease of the amount of food and drinks contributing to child weight loss.

55.7% of the surveyed children have been sick during the 2 weeks preceding the study. Most of them were complaining about cough (37%), diarrhea (29.2%) and fever (22.4%).

During sickness period, 57.7% of the mothers reduced the amount of food, 17.4% the amount of drinks and 13.5% the breastfeeding whereas 23.5% maintained the same amount of food, 32.6% of drinks and 46.8% of breastfeeding. According to the mothers, increasing food, drinks and breastfeeding amount during sickness contribute to child recovery, provide heat and energy and prevent weight loss. According

[42] Infants 6–8 months of age who received solid, semi-solid or soft foods during the previous day / Infants 6–8 months of age

to the qualitative data collected, different feeding practices were followed during child illness. Usually, infants who were under exclusive breastfeeding continued breastfeeding, children under food with continue breastfeeding kept breastfeeding but stopped or reduced food amount. It has been noted that it is better to propose regular small food amount as during illness the child had tendency to lost appetite and refused food.

Hypothesis 3: Complementary food practices in quantity & quality don't meet food minimum standards needed for child development.

Table 14: Nutrition indicators.

Nutrition indicators		N	%
Minimum dietary index[43]		231	34.2
Minimum meal frequency for the 6-23 months age group	Breastfed[44]	128	61.7
	Non-breastfed[45]	50	58
Minimum acceptable diet for the 6-23 months age group	Breastfed[46]	86	44.2
	Non-breastfed[47]	49	2
Consumption of Iron-rich foods[48]		186	29

Table 15: Dietary Diversity Index[49]

Variable	Minimum	Maximum	Mean	Std. deviation
Dietary Diversity Index	0.00	7	1.85	1.82

According to the qualitative data collected, "balanced food items" in the community are composed by porridge or sadza (mainly maize base) with peanut butter and /or cow peas or milk, vegetable (as pumpkin and green vegetables), salt, tea, cooking oil, fruits and sometimes fish.

Composition of yesterday-meals for a child of 1 year and ½ age was detailled as followed :

- In the morning : porridge with cooking oil or sugar, or sadza in case of sugar unavailability.
- At midday : sadza with green vegetables or leaves and cooking oil, or porridge with pumpkins.
- In the evening, most of the time the meal composition were similar to the midday meal and more frequently composed by sadza with vegetables.

The number and composition of daily meals eaten by children and adults were the same from the 1st year of the child with as main food staple sadza and vegetables. No food taboo were identifyied in Chivi District.

Most of the mothers perceived the given meals as unbalanced due to the lack of important food items in the daily child diet (for instance peanut, potatoes, meat and cooking oil), similar daily composition, unadapted consistency that should be smoother. Sugar availability depended on the money availability

[43]Children 6–23 months of age who received foods from ≥4 food groups during the previous day / Children 6–23 months of age

[44] Breastfed children 6–23 months of age who received solid, semi-solid or soft foods the minimum number of times or more during the previous day / Breastfed children 6–23 months of age.

[45] Non-breastfed children 6–23 months of age who received solid, semi-solid or soft foods or milk feeds the minimum number of times or more during the previous day / Non-breastfed children 6–23 months of age.

[46] Breastfed children 6–23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day / Breastfed children 6–23 months of age

[47] Non-breastfed children 6–23 months of age who received at least 2 milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day / Non-breastfed children 6–23 months of age

[48] Children 6–23 months of age who received an iron-rich foodor a food that was specially designed for infants and young children and was fortified with iron,or a food that was fortified in the home with a product that included iron during the previous day / Children 6–23 months of age

[49] Children 6–23 months of age who received foods from ≥4 food groups during the previous day / Children 6–23 months of age

(sugar was seen as essential to prepare child porridge), fruits and vegetables consumption depended on seasonality and availability at field level (for instance, mangoes from December to middle February, black berry and indigens fruits in August) as people did not buying them. Concerning animal proteins consumption, meat was not frequently consumed (only for special occasion, average of 0 to 2 times per month), fish was accessible only for those living close to river and eggs were not part of the feeding habits, people preferring to growth chicken.

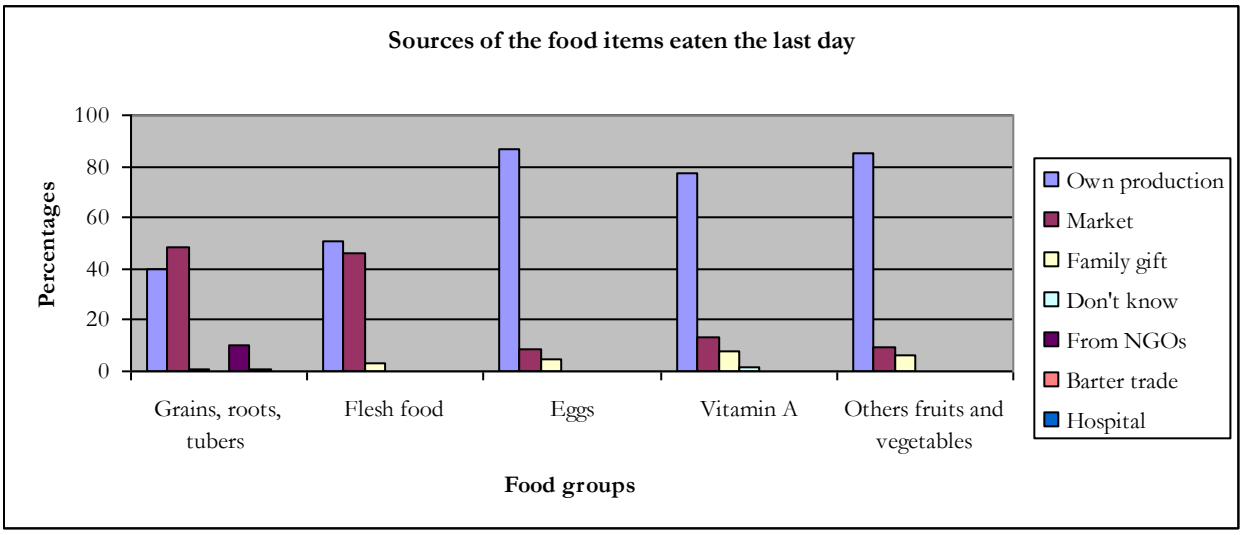


Fig 20: Sources of food items yesterday eaten by the child.

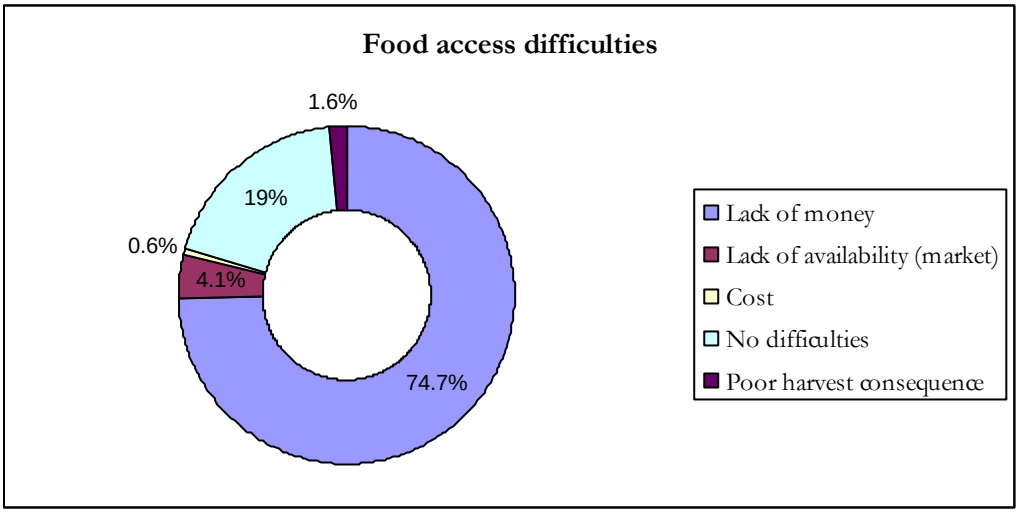


Fig 21: Main faced difficulties to have access to food items.
Less than 1/5 estimated they did not face difficulties to access food for child feedings.

According to the qualitative data collected, the worst food access period was considered to be from November to January (lean period) and the best food access period from April to August.

SOCIAL INFLUENCE AND TRADITIONAL BELIEF

Hypothesis 4 : Family influences on the breastfeeding practices have negative impact on the nutrition status of the child.

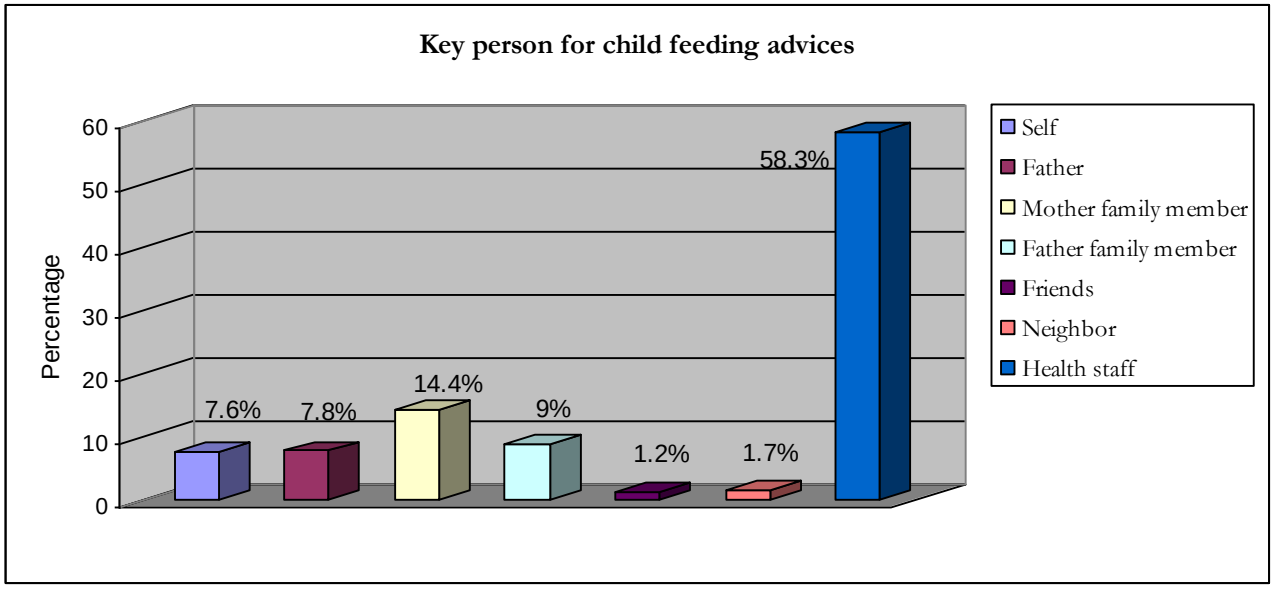


Fig 22: Key influent persons giving advices on child feeding practices.

Health staff is the most important advicer key actor for child feeding. According to the collected data too, health professionals and elderly people were the most influent. Health professionals promoted exclusive breastfeeding practices during the first 6 months then the introduction of porridge and later, sadza with continue breastfeeding until 2 years. However, it seems that in practice, few of the mothers followed the recommendations on exclusive breastfeeding. Met grand mothers did not believe exclusive breastfeeding benefits but knew that an "infant needs porridge to fill his stomach". They use the arguments of being caretakers of the curent child father and others grand children to support the quality of their feeding practices.

Main decision makers on child feeding are the mothers (44.4%), the father (28.3%) then health staff (14.3%). According to the qualitative data collected, decision maker depended on the situation and the proximity between the mother and mother in law. If the mother lived far from her mother in law, she was the one who decided the child feeding practices. If the mother in law is the child caretaker during the mother working hours, only the child father could refuse the mother in law feeding practices. The main divergent points concerned porridge and vegetables preparation. Young mothers had tendency to follow the advices given by nurses on exclusive breastfeeding but could not refuse porridge from mothers in law. Elderly have tendency to overcook vegetables causing the lost of vitamins. Cooking procedures were teached by the grandmothers to the new mothers.

Hypothesis 5 : Traditional habits have influence on the utilisation of food items (preparation, conservation) which causes the loss of essential nutrients needed for child development.

96.5% of the interview mothers use firewood to cook food, 2.7% use coal and 0.8% kerosene. For most of the mothers (66.1%), preparing meal takes between 30 minutes and one hour.
Main decision on cooking, preparation and conservation are done by the mothers (69%), fathers (16%) and mother family member (10.4%).

Hypothesis 6 : Social influences on crop selection and land utilization limits HH food production and contributes to inadequate food intake by lack of diversity.

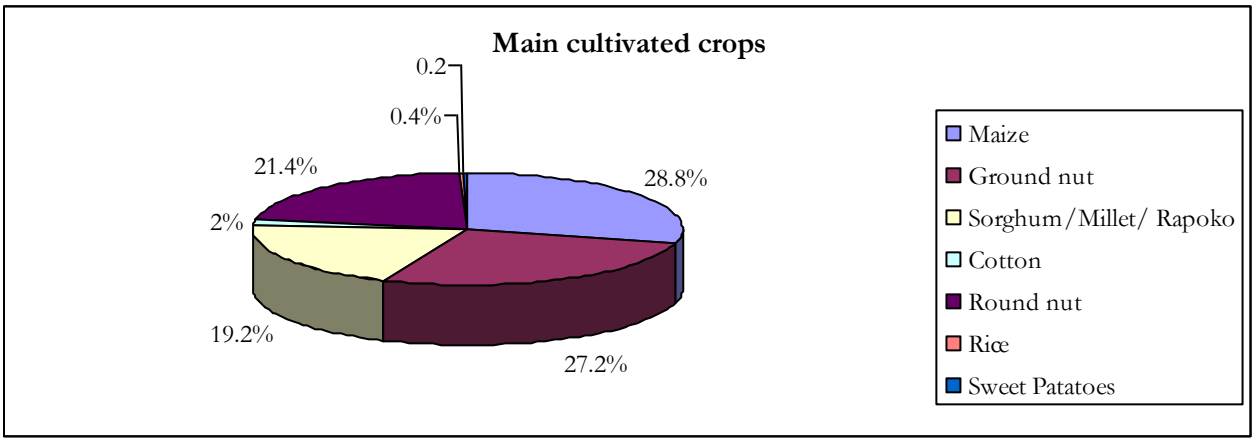


Fig 23: Main cultivated crops in the household field.

Sorghum and rapoko are cultivated mainly due to their good climate and soil adaptation. Rapoko had early maturation advantage too, it could be stored for a long period and used for bier purpose as income resources. Additional crop have been mentioned during the focus group discussion as pumpkin and peas. In individual and community garden, green vegetables, tomatoes, cow peas and sometimes carrot, onions, sugar beans and cabbage were cultivated. Few of the met households had a garden depending on water access.

Decision maker on cultivated crop are mainly the fathers (53.7%), mothers (27.3%), mother family members (9.5%), father family members (9.3%) and neighbour (0.2%). According to the collected qualitative data, decisions on farming activities were based on field experiences over the past years, transmitted from generation to generation. Production optimization and population demand were the targets. Yearly planting and harvest timing were decided at household level.

Some farmers faced difficulties to cultivate their entire field due to the lack of animal and human resources, lack of seeds and fertilizers access. In some case, working only a field part was a choice or sometimes, through community cooperative, manpower was organized to optimize the size of farming fields.

Hypothesis 7: Water and sanitation issues are not culturally perceived as a priority (in terms of HH budget, community facilities maintenance), contributing to disease occurrence.

61.4% of the household perceived difficulties on water access with 39.3% complaining about the quality: bad color of the water; and 39.8% about water shortage.

No community management to solve watsan community problem as it is too expensive.

FINANCIAL RESOURCES

Hypothesis 8 : Low or absent financial resources (unemployment) limit household purchasing power for additional food items needed to diversify and balance diet

In 62% of the assessed household the child father was working, in 8.4% the mother, in 18.8% none and 10.8% other household members.

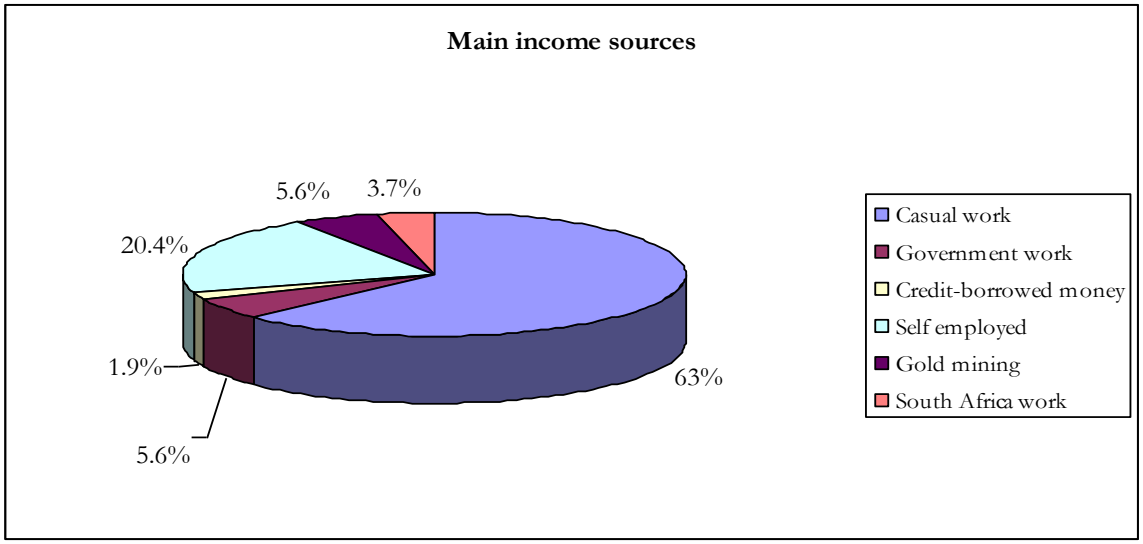


Fig 24: Main income sources.

According to the qualitative collected data, most of the food items came from the household field or garden. However, during the current period, households had to buy sadza (average of 3 buckets of maize grain for 1 month that cost 21 $ or mealie meal for 3 days: 5$ for 10kg), then the cooking oil at 4$ for 2 liter for a duration between 15 days to 1 month and sugar at 2$ for 2 kg. Taking in consideration that household consumption and consequently household expenses depended on the amount of available food, size of the family and habits, discussions with mothers took place and weekly current food expenses were estimate at 16.5$.
In the case of production surplus, farmers sold a part of production to be able to buy additional needs.

Most of the men felt affected by high unemployment in Zimbabwe.Having a formal work ensured a sufficient amount of money and the possibility to continue farming activities. Some of the men were working as driver, for different types of companies (biscuits, sugar, cotton, steel...) and came back to farm after losing their job due to economic context or because of war. There was no long term working opportunity in the neighboring areas but if they had the choice, they prefered a formal work than farming. Their children faced the same challenge and most of them either worked in the same farm or travel to South Africa.

Table 27: Associations and established relationship on hypothesis 8.

Associations	**Yes**	**No**	**P**	**Value**
Minimum Diet Diversity AND				
Household employment	**X**		**0.049**	
Household sources of income		X		
Established relationship	***Yes***	***No***	***P***	***Value***

Table 28: Statistical association between household employment and minimum dietary diversity.

Who is employed in your household * Minimum dietary diversity				
		Minimum dietary diversity		Total
		Meets minimum dietary diversity	Does not meet minimum dietary diversity	
Who is employed in your household	None	21	22	43
	Husband	46	108	154
	Self	3	11	14
	Oldest child(1)	3	0	3
	Grandparents	2	3	5
	Parents	1	2	3
	Last born	1	0	1
	Brother	0	2	2
	Uncle	1	0	1
	Brother in law	1	1	2
	Mother in law	0	2	2
Total		79	151	230

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.348[a]	10	.049
Likelihood Ratio	20.662	10	.024
Linear-by-Linear Association	.113	1	.736
N of Valid Cases	230		
a. 17 cells (77.3%) have expected count less than 5. The minimum expected count is .34.			

There is a statistical association between who is employed in the household and if the minimum dietary diversity is met, p-value = 0.049.

Hypothesis 9 : Low or absent financial resources (unemployment) limit health facility access and contribute to case management delay and occurrence of malnutrition as disease complication.

During the last child sickness, 85.7% of the mothers went to the health centre, 3.7% to the traditional healer or gave directly traditional drinks, 1.7% went to the apostolic prophete and 8.8% did nothing. Among the mother who did not go to the health facility. According to the qualitative collected data, households prefered to go first to the traditional healer for economical reasons. Consultation is "free" in terms of money but the household had to give a poultry head or agricultural products in exchange of child care. Those are not considered as money and deadline to pay is flexible. Other people consulted apostolic faith traditional healer, bought directly drugs for common illness, gave traditional drinks (for instance made from lemon and guava leaves). In the case of diarrhea, the mothers were familiar with the home

preparation of ORS or traditional drinks with roots and in the case of fever, some mothers used to put the child in the hot water, covered by a blanket to make him sweat. After, if the clinical state did not improve, they went to the health facility.

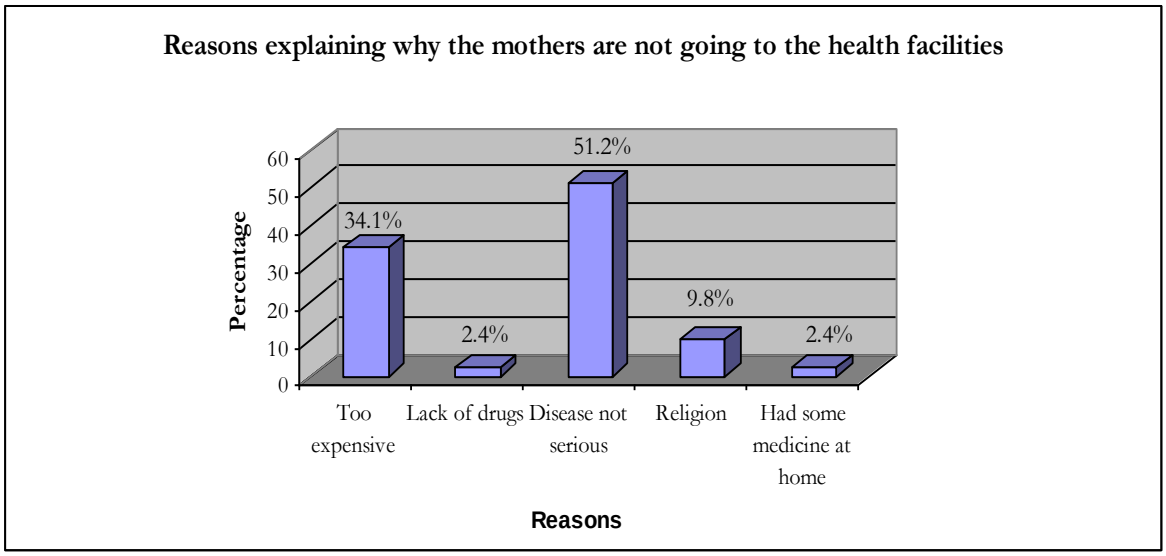


Fig 25: Reasons for not going to the health facility for child health.

According to the qualitative data collected, health access depend on different factors : the distance (people walked or took transportation but the more far the health facility was, the lower access people will have), cost (few dollars for council health facility or free for governmental ones) and then, the quality of care. Free consultations had a direct impact on the attendance rate and consequently on the waiting time and availability of common medicines. District Hospital access is considered as easier but often written prescriptions includ more drugs (3- 4 different types of medicines) that was unaffordable due to the lack of financial resources.
Decision maker on allocation of economics resources are mainly the fathers (53.2%), mothers (33.7%), mother family members (8.3%) and father family members (4.8%).

Table 28: Associations on hypothesis 9.

Associations	**Yes**	**No**	**P**	**Value**
Household employment AND				
Health access.	**X**		**0.000**	

Table 29: Statistical association between who is employed in the household and where the mother goes for child sickness..

Who is employed in your household * What did you do when your child fell sick?						
		What did you do when your child fell sick?				Total
		Go to the health centre	See the traditional healer/give traditional food, drinks	Nothing	Go to prophet	
Who is employed in your household	None	59	0	3	1	63
	Husband	160	8	21	3	192
	Self	10	2	1	0	13
	Oldest child(1)	6	0	0	0	6
	Grandparents	3	0	1	0	4
	Parents	6	0	0	0	6
	Last born	1	0	0	0	1
	Brother	4	1	0	0	5
	Uncle	0	0	0	1	1
	Brother in law	3	0	0	0	3
Total		252	11	26	5	294

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	76.270[a]	27	.000
Likelihood Ratio	28.093	27	.406
Linear-by-Linear Association	.385	1	.535
N of Valid Cases	294		
a. 32 cells (80.0%) have expected count less than 5. The minimum expected count is .02.			

There is a statistical association between who is employed in the household and where the mother go in case of child sickness, p-value = 0.000.

Hypothesis 10: Low or absent financial resources (unemployment) limit the purchase of enabling facilities and contribute to poor hygiene practices, one of the factor of disease transmission.

According to the qualitative data collected, enabling facilities were available in the market but people had limited financial access to due to the lack of income. Most of people had access to soap, towels (or use sack), rubbish pits, pot rack and broom but did not use toothpaste. Toothbrushs were made from trees. The duration of the bar of soap depended on the size of the family (from 2 days to 1 week) as they used it for bathing, washing plates and clothes. In the case the family did not have money to buy soap, they sold maize and vegetable to get dollars. When soap was not available, it is replaced with ashes to wash plates and frequency for washing clothes and bath are reduced and done only with water.

Table 30: Associations on hypothesis 10.

Associations	Yes	No	P	Value
Household employment AND				
Use of soap for hand washing		X		
Presence of soap		X		
Presence of toothbrush		X		
Presence of toothpaste		X		
Presence of shampoo		X		
Presence of towel	**X**		**0.000**	
Presence of washing powder		X		
Presence of washing point		X		
Presence of broom	**X**		**0.001**	
Presence of garbage pit		X		
Presence of pot track		X		
Disease occurrence		X		

Hypothesis 11 : Limited or reduced livestock ownership linked to livestock depletion (diseases and death including food needs during lean times) reduces household own production and purchasing power and consequently food intake

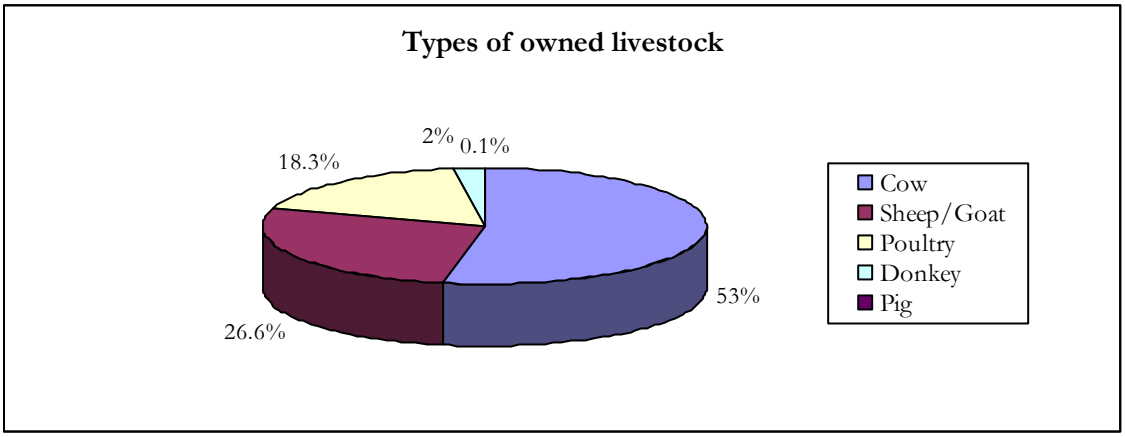


Fig 26: Type of livestock own by the household met.

According to the hold focus group discussion, livestock owned by household decreased due to the drought, livestock diseases and livestock selling when the household needed money (selling average: 250-300$ for a cattle, 25-30$ for a goat and 4-7$ for a poultry). From the Animal Health Service for Chivi District, cattle deaths record show the following graph :

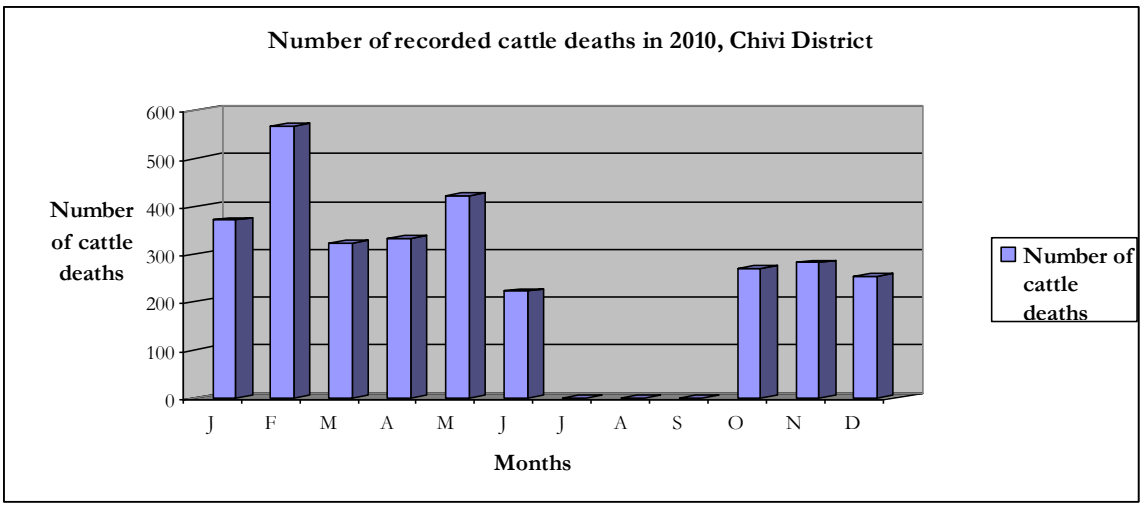


Fig 27: Cattle death in 2010, Chivi District*
*July, august and september data were not available.

If we look at the updated livestock census done on regular basis (once or twice a week) through the DIP Tank (cattle treatment against ticks) and knowing that this preventive activity is compulsory, we can have an overview on the evolution of the livestock over the past ten years.

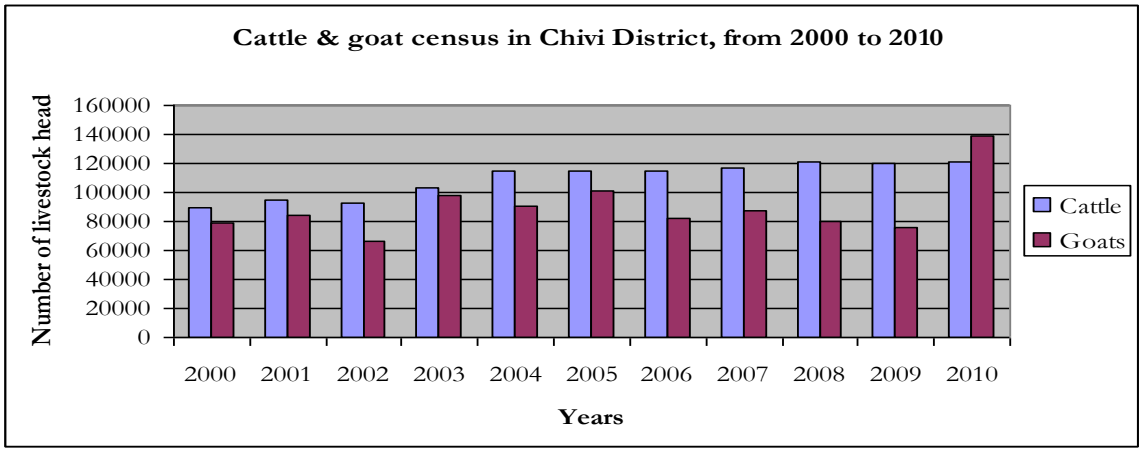


Fig 28: Census of cattle and goat owned by household in Chivi District, from 2000 to 2010.

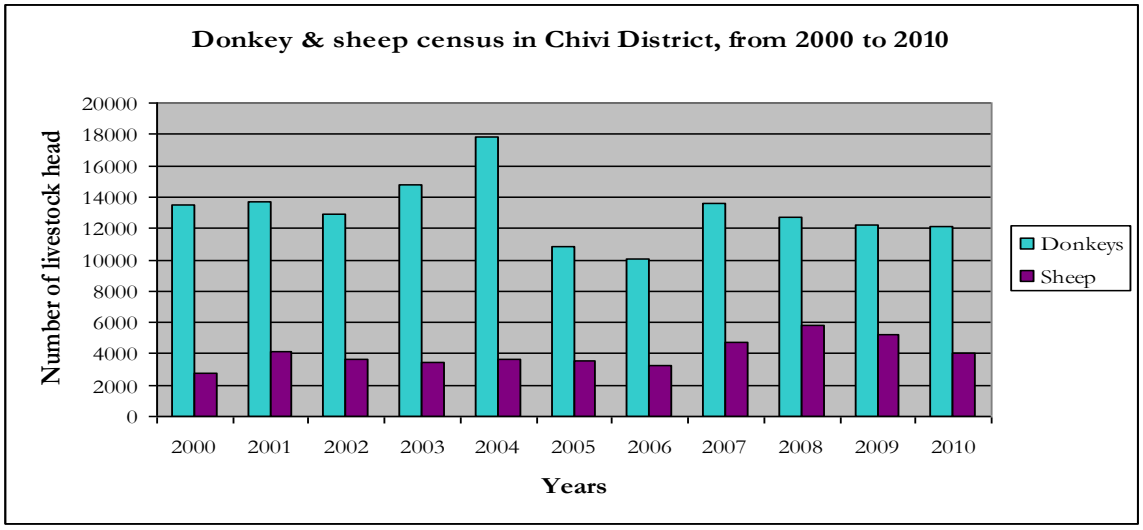


Fig 29: Census of donkey and sheep owned by household in Chivi District, from 2000 to 2010.

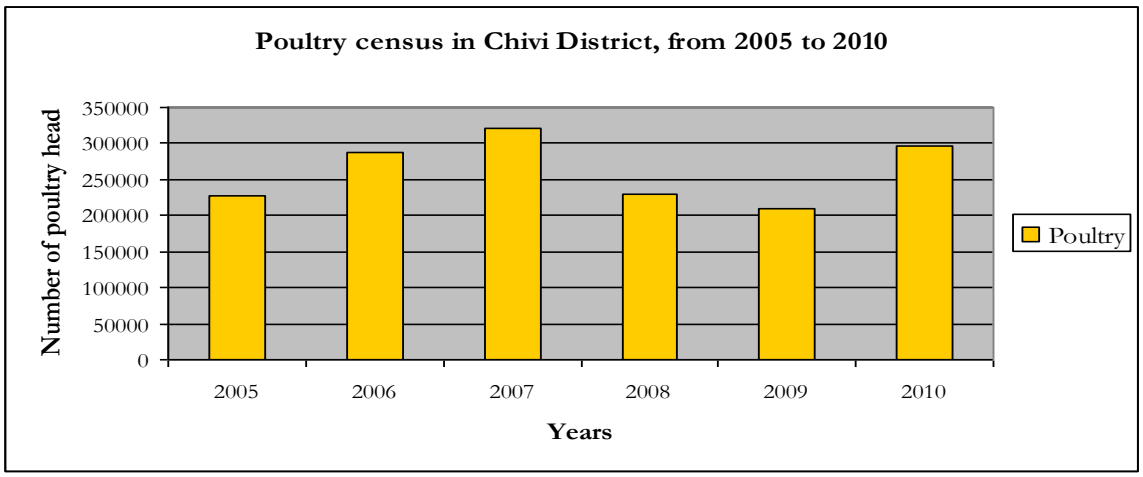


Fig 30: Census of poultry owned by household in Chivi District, from 2000 to 2010.

Table 31:Associations and established relationship on hypothesis 11.

Associations	Yes	No	P	Value
Type of livestock owned by the household AND				
Number of meals		X		
Frequency of grains, roots and tuber eaten	**X**		**0.047**	
Frequency of food made from legumes and nuts	**X**		**0.045**	
Frequency of food from dairy		X		
Frequency of flesh food		X		
Frequency of eggs		X		
Frequency of fruits & vegetables rich in Vitamin A		X		
Frequency of other fruits & vegetables		X		

Table 32 : Statistical association between the frequency of solid food eaten by the child and type of HH livestock

Any food made from grains, roots and tubers? * Types of livestock owned by HH					
		Types of livestock owned by HH			
		cow	**Sheep/goat**	**Poultry**	**Total**
Any bread, rice noodles, biscuits, foods made from maize, rice, millet, sorghum, wheat, or other grains? Any potatoes, yams, manioc, cassava or any other foods made from roots and tubers?	Yes	164	48	87	299
	No	11	9	12	32
Total		175	57	99	331

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.420[a]	2	.047
Likelihood Ratio	5.314	2	.070
Linear-by-Linear Association	1.950	1	.163

Chi-Square Tests

N of Valid Cases	331		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.51.

There is a significant association between the food eaten made from grain, tuber or roots and the types of livestock own by the household, p-value=0.047.

Table 33: Statistical associations between food eaten, made from legumes and nuts eaten and type of HH livestock

		Types of livestock owned by HH			Total
		cow	Sheep/goat	Poultry	
Food made from legumes and nuts	Yes	63	14	25	102
	No	81	35	59	175
Total		144	49	84	277

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.205[a]	2	.045
Likelihood Ratio	6.251	2	.044
Linear-by-Linear Association	3.850	1	.050
N of Valid Cases	277		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.04.

There is a significant association between the food made from legumes and nuts and the types of livestock own by the household, p-value=0.045.

Hypothesis 12 : Low local production causes an increase of market prices, then food products become financially inaccessible for the household

According to the qualitative data collected, 2008 was considered as the worst year. Harvest was low, people had to find money to complete their basic food needs. Chivi District was affected by repetitive drought (from November to January) that had an impact on crop growth and production amount. For instance, maize and sorghum harvest provided around 500 - 1,000kg per household in spite of around 3,000kg during a good harvest time. The main climate change challenges were unpredictable weather variations (rainfall amounts and timing, temperatures) over the year and between the years. However, the situation seems to improve since 2008.
This year, current rainfalls seem to be sufficient but it is too early to confirm the state of the coming harvest.

Rainfalls have been mentioned as the main cause of poor harvests, characterized by its irregularities in terms of rainfall amount (drought or high rainfall level) and occurrence period (delay or variability of the rainy period). Both low and high rainfalls affected the crops respectively by drying or burning (combination of flood with hard sun). The second mentioned factor was soil degradation. Farmers needed fertilizers to increase their production but seeds and fertilizers access was limited. Through the formal market, seeds cost was around 25$ / 10kg of maize seeds and fertilizer cost around 28-30$ / 50kg. Through GMB (Grain Marketing Board) with the provision of subsidies, costs were reduced with respectively seeds cost around 5$ / 20kg for maize and fertilizer cost around 15$ / 50kg. However available seeds and fertilizers at this low price were not enough to cover the entire needed household. Seeds provided by NGOs and Agritex were distributed for specific targeted people and targeted villages.

The feedbacks on these distributions were the problem of low household coverage and the late delivery of seeds regarding the agricultural calendar. Additional factors have been mentioned as the lack of labor means (draught power and worker) particularly important in this sandy area, presence of damaging animals (rodens, bird, insects) that affect field or stock.

Poor harvest main consequence was the reduction of food access (available food quantity and income). Available food amount was reduced, only used for household consumption so stock ended earlier (around October) and households had to earn money from product selling that exacerbated their situation. Pot size and daily meal numbers were reduced. For instance, from March to August 2010, household were taking 3 meals a day then since September to February, households reduced the meals at twice a day. In the case of sadza was unavailable or unaffordable, meals remained composed by vegetables and tea. Poor harvest affected children education too as without paying school fees, children were evicted from school. Additional consequences had been mentioned as the increase of tensions within the households, couple instability and the tentation to become thiefs.
When households faced exceptional expenses (death, wedding) they sold goats or poultry.
Face to this situation, copying mechanism are the selling of household belongings: part of the livestock as cow, goat or part of their garden products or in case of extreme situation part of their field. Others people found local casual labor (farming or irrigation work), workers were paid with food items (average of 1 or 2 buckets of maize per day) or cash (2$ / day). Others people tried to go farer to work in gold mine sector or migrate to South Africa to find farming job opportunity (peach, tomatoes, onions…). Going to South Africa was associated to additional challenge linked to passport issue, river dangers (drowning, wildlife). Few people looked for new food sources as fish from the nearest river or wild fruits.
Cooperative provided community job opportunities and food protection in case of poor harvest. Usually, it included a group of people (10-20), farmers informed and requested workers support to cultivate their entire field. Permissions were given by the authorities then, invitations were sending through household. Workers were usually paid through a meal (food and bier).

Household priorities were first food items, followed by school fees (10$ for primary school, 30$ for secondary school - Usually children went to school from 8 -12 years to 16 years – from grade 5 to 7), then seeds and fertilizers and then the others expenses including health care, soap and clothes.

Prices varied mainly according to product availability. There was no existing market setting in the main villages but farmers sold their products to the nearest houses. Based on the formal price tendency, final prices were negotiated between the seller and the clients.

Table 34: Summary of the main 2010 price variations:

Items	Price (before)	Price (now)
Sorghum (/ 1 bucket)	4$	6$
Maize grain (/ 1 bucket)	2.5$	5-8$
Cooking oil (/ 2 liters)	2.5$	4$
Bar of soap	1$	1.8$
Sugar (/2Kg)	1.8$	2$
Loaf of bread	0.5$	1$
Goat	20$	35 – 40$

DEFICIENCY OF HEALTH SYSTEM

Hypothesis 13 : Brain-drain and shortage of skilled health professionals limit the availability of services and quality of health care, contributing to disease.

Diarrhoeas are mainly linked to WASH component with food and water contamination (41.9%), poor sanitation (25.7%) and poor hygiene (0.8%). Diarrhea could be part of child development such as during the teeth growth or related to religious belief (0.8%) or to the sun (2.2%).
58.7% of mother received advices from the health staff and decision maker on child health is the mothers (36.6%), father (30.6%) and health staff (18.3%).

According to the qualitative collected data, it seems that some people knew the VHW responsible of their village but they did not see him since a long time (usually as the VHW lives in an other village). Known activities are related to condom distribution and activities targeting orphans.

Table 35: Presence of the main health staff in Chivi District.

Qualification	In post	Vacant posts	Coverage percentage
District Medical Officer	1	0	100%
District Nursing Officer	1	0	100%
District Environmental Health Officer	1	0	100%
Government Medical Officer	**0**	**3**	**0%**
Sister General/Senior (Midwives)	**73**	**22**	**76.8%**
Matron III	1	0	100%
Assistant Nutritionist	1	0	100%
Nutritionist	1	0	100%
State Certified Nurse	**5**	**16**	**23.8%**
Auxiliary (Primary Health Care) Nurse	32	0	100%
Clinical Nursing Officer	**0**	**1**	**0%**
Nurse Aid	**31**	**8**	**79.5%**
Environmental Health Officer	**0**	**2**	**0%**
Environmental Health Technician	**14**	**16**	**46.7%**
Health Promotion Officer	1	0	100%
Medical Laboratory Scientist/ Senior/Principal	2	0	100%
Pharmacist	**0**	**1**	**0%**
Pharmaceutical technician	2	0	100%
Sister Community	**1**	**1**	**50%**
Sister in Charge	7	0	100%
Sister in Charge Community	**0**	**1**	**0%**
Village Health Workers	**136**	**NA**	**NA**

Table 36: Associations on hypothesis 13.

Associations	Yes	No	P	Value
Disease occurence AND				
Distance to the sanitation facility and diseases occurrence		X		

Hypothesis 14 : Shortages in drugs and medical supplies reduce the quality of health care and contribute to the low utilization of health facilities, increasing the risk of health status degradation.

Health data not available

Through the quantitative questionnaire, 2.4% of household that did not go to the health facility during the last child sickness mentioned the lack of drugs.

WATER ACCESS

Hypothesis 15 : Poor water facilities (poor condition or non-functioning existing facilities) reduce the availability of water for household, with negative consequences on hygiene practices and increase in the risk of diseases.

Among the household met, 52.1% had access to a borehole, 21.7% to unprotected well, 10.9% to protected well, 9.2% to lack/dam/canal/river and 6.1% to others (protected-unprotected spring, taps).

According to the qualitative data collected, women were in charge to carry the water. Usually, they went to the water source around 2 to 5 times a day, which took between 15 minutes and 1 hour ½. Needed time could increase in case the borehole pump is not working. Each time, they carried around 1 and 2 buckets of 20 liters or bring a wheelbarrow to carry 60 liters.
Water was mainly use for drinking, cooking, bathing, washing clothes, cleaning.

Water access was different according to the assessed communities, some household have access to well and/or, borehole. River was another alternative water source or the main one in some villages without water facilities. Water aspects from the river changed according to the season. During the rainy season, it contained more dust, stick and the color varies (become browner). So some household let rest the water for sometimes in a bucket then where sedimentation ended, they put the water in a clean bucket. Sometimes when people take water from the river, they can see floated soap, stools, dust from an upstream village. Indeed, river is use for multi purposes: bathing, washing clothes, defecating and taking drinking water. In ward 24, women mentioned a difficult issue to get water linked to the presence of crocodiles. Since the 25 first day of 2011, 3 people have been killed.

Concerning water treatment, before Aquatabs were distributed and household were using it. In some villages, the stock ended at the end of 2009 or 2010. Now, most of the people were drinking directly the water from the borehole, well or river because they were "tired" to boiled it, "people drink fast"., due to the lack of time (need time to prepare food), lack firewood to boil the water. Most of the people did not like the taste of boiled water and thought that their stomach was used to the local water, even if they recognized that for instance water from the river could cause diseases. Some of them justified not boiling water because it was not efficient, « children passed through the river and drank the water directly ». For some of them, water treatment had to be done to prevent cholera. Without boiling water, there were risks of cholera and getting some worms but those were considered as not dangerous. Additional diseases could be transmitted through water such as bilharziose, diarrhea and typhoid.

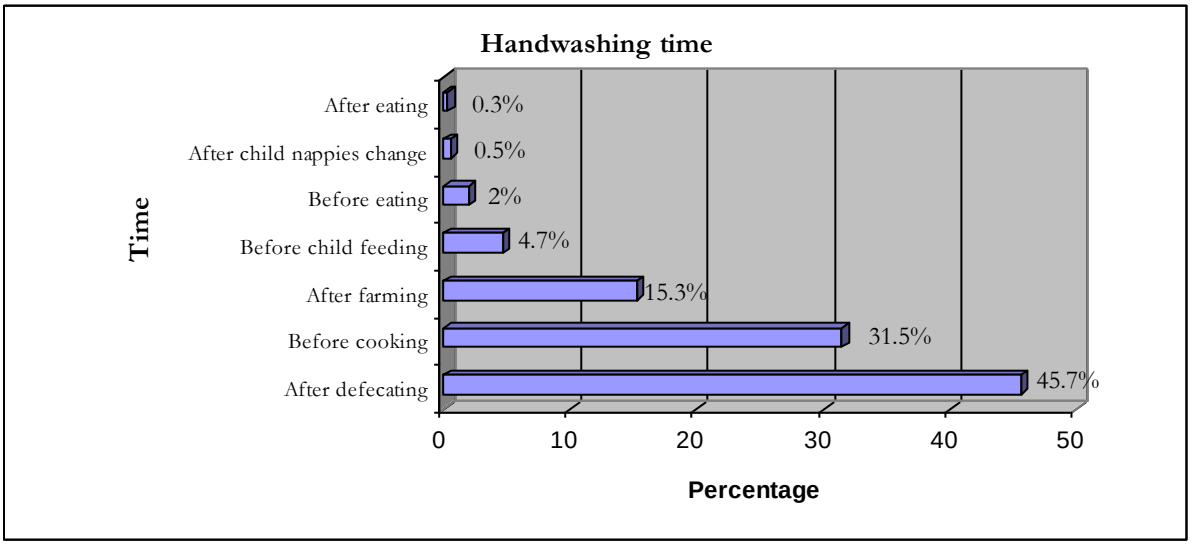


Fig 30: Household handwashing time.

66.6% of the interviewed mothers said that they used « sometimes » soap to wash their hands, 28.7% always and 4.7% never.
96.6% of mothers admitted that diseases can be transmiited by dirty hand and 97.8% by unsafe water.
Table 37: Associations and established relationship on hypothesis 15

Associations	Yes	No	P	Value
Disease occurrence AND				
Type of used water facility		X		
When do you wash your hand		X		
Estimation of daily water used AND				
Type of used water facility		X		
Distance to the nearest water facility AND				

Use of water for hygiene purpose		X		
Use of water for drinking purpose		X		
Use of water for cooking purpose		X		
Use of water for cleaning clothes purpose		X		
General cleanliness of the house		X		
General cleanliness of the kitchen		X		
General cleanliness of the environment		X		
General hygiene of household sanitation	**X**		**0.032**	
General hygiene of household water situation.		X		
When do you wash your hand	**X**		**0.033**	
Type of collected water facility	**X**		**0.000**	

Table 38 : Statistical association between the distance to the nearest water facility and general hygiene of the household sanitation situation

Distance to the nearest facility * general hygiene of the HH sanitation						
		General hygiene of the HH sanitation				**Total**
		Good	**Middle**	**Poor**	**None**	
What is the distance between your HH and the nearest functioning water point	Less than 250m	36	35	14	44	129
	Between 250m to 500m	24	25	20	29	98
	More than 500m	33	40	26	18	117
	Don't know	0	1	0	0	1
Total		93	101	60	91	345

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	18.311[a]	9	.032
Likelihood Ratio	19.363	9	.022
Linear-by-Linear Association	3.251	1	.071
N of Valid Cases	345		

a. 4 cells (25.0%) have expected count less than 5. The minimum expected count is .17.

There is a significant association between the distance to the nearest water facility and general hygiene of the household sanitation situation, p-value=0.032.

Table 39 : Statistical association between the distance to the nearest water facility and handwashing

		What is the distance between your HH and the nearest functioning water point				**Total**
		Less than 250m	Between 250m to 500m	More than 500m	Don't know	
When do you wash your hand at home	After agriculture work	43	29	34	0	106
	After defecating	87	69	69	1	226

	Before cooking	0	0	10	0	10
	Before feeding the children	1	0	2	0	3
	Before eating	3	2	5	0	10
	After eating	0	0	1	0	1
Total		134	100	121	1	356

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.544[a]	15	.033
Likelihood Ratio	29.812	15	.013
Linear-by-Linear Association	5.221	1	.022
N of Valid Cases	356		

a. 18 cells (75.0%) have expected count less than 5. The minimum expected count is .00.

There is an association between the distance to the nearest water facility and when do you wash your hand, p-value = 0.033.

Table 40: Statistical association between the distance to the nearest water facility and the type of water source collected.

		What is the distance between your HH and the nearest functioning water point				**Total**
		Less than 250m	Between 250m to 500m	More than 500m	Don't know	
From which type of water source do you collect water	Protected well	22	12	5	0	39
	Protected spring	0	1	0	0	1
	Tap	6	3	2	1	12
	Unprotected well	42	19	17	0	78
	Unprotected spring	3	4	1	0	8
	Dam/Lake/Canal/river	9	9	12	0	30
	Borehole	52	52	83	0	187
Total		134	100	120	1	355

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	64.929[a]	18	.000
Likelihood Ratio	44.323	18	.001
Linear-by-Linear Association	26.453	1	.000
N of Valid Cases	355		

a. 16 cells (57.1%) have expected count less than 5. The minimum expected count is .00.

There is an association between the distance to the nearest water facility and the type of water source collected., p-value = 0.000.

SANITATION ACCESS

Hypothesis 16 : Poor sanitation facilities (poor condition or non-functioning existing facilities) facilitate the propagation of insect vectors and intermediate hosts of pathogenic parasites, responsible for diseases.

Among the household met, 59.8% had access to improved sanitation facility, 37.6% to unimproved sanitation facility and 2.6% to none.
For destroying /evacuating garbage, majority of met household used a pit (63.8%), left in the open (16.4%), let it as compost (6.7%), buried (6.7%) or burn it (6.4%).
For the child stools, 48.6% buried it, 36.6% throw it in the latrines, 9.8% left it in the open and 5.1 throw it in a pit or with the garbage.
91.4% of mothers think that child stools can transmit diseases.
People who do not have access to sanitation facility, go to the bush, river, shared with the neighboring toilet or buried their stools. The main reason of not having latrine was linked to the sandy area where sustainable latrines could be done only with cement that was financially unavailable (cost average of 14$ / 50kg). Without cement, people could not built latrine because there was a risk to fall into the toilet. Hygiene problem was a consequence of this situation. When it rained, stools slided down to the village and flies number was increasing around the houses.

Table 41:Associations and established relationship on hypothesis 16.

Associations	**Yes**	**No**	**P**	**Value**
Absence of flies AND				
Type of sanitation facility	**X**		**0.046**	
Distance to sanitation facility	**X**		**0.001**	
Way to evacuate and destroy garbage		X		
Way to evacuate child stool		X		
Disease occurence AND				
Evacuation/ destruction of garbage		X		
Destruction of child stools		X		

Table 42: Statistical association between the type of sanitation facility and presence/absence of flies

Used sanitation facility type * presence/absence of flies				
		Absence of flies		**Total**
		Yes	**No**	
Which type of sanitation facility are you using	None	5	4	9
	Improved sanitation facilities	55	142	197
	Unimproved sanitation facilities	49	78	127
Total		109	224	333

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**

Chi-Square Tests

Pearson Chi-Square	6.176[a]	2	.046
Likelihood Ratio	6.027	2	.049
Linear-by-Linear Association	1.389	1	.239
N of Valid Cases	333		
a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.95.			

There is an association between the used sanitation facility and the presence/absence of flies, p-value = 0.046.

Table 43: Statistical association between the distance to sanitation facility and presence/absence of flies

Distance of HH sanitation facility * presence/absence of flies				
		Absence of flies		**Total**
		Yes	**No**	
Distance from the HH to the sanitation facility	Less than 250m	88	114	202
	Between 250m to 500m	4	31	35
	More than 500m	0	4	4
	Don't know	1	1	2
Total		93	150	243

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	15.667[a]	3	.001
Likelihood Ratio	19.049	3	.000
Linear-by-Linear Association	9.850	1	.002
N of Valid Cases	243		
a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .77.			

There is an association between the distance to sanitation facility and presence/absence of flies, p-value = 0.001.

Table 44: Relationship between HFA and the distance from the HH to the sanitation facility and HFA and Which type of sanitation facility are you using.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	103.296	17	6.076	1.699	.048[a]
	Residual	540.053	151	3.577		
	Total	643.350	168			
a. Predictors: (Constant), Distance from the HH to the sanitation facility, Which type of sanitation facility are you using						
b. Dependent Variable: Height for age						

Coefficients[a]				
Model	Unstandardized	Standardized	t	Sig.

		Coefficients		Coefficients		
		B	Std. Error	Beta		
1	(Constant)	7.012	2.347		2.987	.003
	Distance from the HH to the sanitation facility	-.715	.341	-.177	-2.094	.038
	Which type of sanitation facility are you using	-.931	.454	-.255	-2.048	.042
a. Dependent Variable: **Height for age**						

There is a statistical relationship between HFA and the distance from the HH to the sanitation facility, p-value = 0.038 and a a statistical relationship between association between HFA and Which type of sanitation facility are you using? P.value = 0.042

Feeding changes over the year

Feeding composition and amount depended on farm product availability. In the case of good harvest, part of the farm products was sell and additional food items were bought.
Sadza prepared mainly with maize represented the main food staple. Maize was harvested from March to May so usually the household could use its stock until August. Then, as sadza was available all over the year in the shop, the household bought it with the available money earn from casual work, selling of green vegetable or use to exchange food items. Household who farmed as well roundnuts, groundnuts (used to prepare butter nut), cow peas or sweet patatoes replaced evening sadza during this period to reduce the food expenses.
Cooking oil and sugar were the 2 main products that represented an additional value within household meal, on of the priority expense when the money was available.

Water access over the time

Water shortage were noted higher from September to December. Every year, water shortage happened during the same period of time but acute shortage was noticed in 2008. In case of shortage: drinking and cooking then washing plate were prioritized. In the case of high shortage, people tried to find casual work and took the opportunity to bath and wash clothes there. Water shortages had an impact on the daily life of women (they had to wake up around 2-4 am to get water) as the first women coming to the source take first the water. If water shortage persisted, bucket restriction per household may be decided. Long queue, increase of time spent to take water increased the tension among the villagers.

HIV Perception / HIV Impact

HIV was seen as a chronic disease (with skin effects and weight loss) responsible of a lot of deaths and orphans who were taken in charge by the grand mothers. Usually, HIV+ living conditions deteriorated as they were often constraint to interrupt their work due to their health degradation. HIV+ people could mainly find support within their own household, but could not expect much from the community, excepted in some ward with the presence of discussion group support.
.
Opinions diverged on HIV/AIDS stigmatization. Respondents had tendency to claim that there was no stigmatization. However, speaking about real situation, the results seem to be different. For instance, when it was asked "if you learn that a person became HIV+, will you have the same behavior as previously ?", the response was negative. People mentioned that interactions changed such as sharing plates and cups for a meal, sometimes they did not even not accept to eat together. Women seem to be more opened mind than men. HIV/AIDS subject could be discussed among friends but not within the

couple. For some men, being HIV+ had become an insult, a joke means. Most of people admitted that HIV positivity was hided to the community to avoid discrimination. Similarly, in the case of a person died due to HIV/AIDS, community members tried to find traditional explanation. Beliefs and traditional explanations concerning HIV/AIDS were present. The main HIV prevention means mentioned were the use of condoms distributed by the Villages Health Workers, abstinence and ART distributed through health facility.

7. Results of associations with undernutrition outcomes

Bivariate and multivariate analyses have been done to analyse and interprete the strength of associations between certain risk factors and the undernutrition outcomes.
Before that, some variables and scores have been created or transformed from the original indicators collected during the household survey. The details are informed in appendix 5.

LINEAR REGRESSION MODELS

Numerical, Ordinal and Dichotomous (Yes/No) variables have been analysed by linear regression. Previously divided into three groups corresponding of the immediate, underlying and basic causes (Conceptual framework of malnutrition, UNICEF 1992). Every ordinal or dichotomous variable is numerical and lowest score correspond to worst condition for all factors included in the regressions analysis.

Each three nutrition index have been analysed with each three group of causes for a total of 9 linear regressions. Also, each linear regression is realised by two models, the classical presented in the above tables of results. And the step wise model which consist of excluding all the non-significant variable present in the regression. It finally raised the variables with significant importance in the regression result presented in the same tables by a star (*). Both techniques permit to detect significant association between factors and indicators.

Immediate Causes linear regression model:

Linear regressions of nutrition indexes compared with basic causes					
WHZ		**MUAC**		**HAZ**	
R^2	p value	R^2	p value	R^2	p value
	0,26	5.7%	0,01*		0,40

NB: only models with p.value<0.05* are considered

Linear Regression of MUAC vs Underlying factors		
General Model	R^2 =5.7%	p= 0,014
Underlying Factors	**Beta Standart**	**p value**
Age of the Child	0,18	0,00**
Gender of child	-0,03	0,54
If no to breastfeeding in 1st hour how long after birth did child start breastfeeding	-0,03	0,58
IYCF Breastfeeding Practices Score	-0,04	0,51
When did you stop to breastfeed your child?	-0,02	0,75

Complementary feeding Practices Score	-0,01	0,82
Increase Food during ILL	-0,12	0,02*
Increase Drinks during ILL	0,10	0,07
Increase BreastFeeding during ILL	0,03	0,62

Underlying Causes linear regression model:

Linear regressions of nutrition indexes compared with underlying causes					
WHZ		**MUAC**		**HAZ**	
R^2	p value	R^2	p value	R^2	p value
	0,49	19%	0,02		0,54

NB: only models with p.value<0.05* are considered

Linear Regression of MUAC vs Underlying factors		
General Model	R^2 =0,185	p= 0,021
Underlying Factors	**Beta Standart**	**p value**
Age of the Child	0,08	0,28
Gender of child	-0,07	0,32
Total number of people in the household	-0,13	0,15
Education level of caretaker	0,08	0,30
Advantage colostrum perception Score	0,08	0,27
Advantage breastfeeding perception Score	0,10	0,22
Complementary feeding knowledge Score	0,05	0,46
Difficulties for food access	0,04	0,61
Cause of Diarrhea knowledge Score	0,07	0,37
People Employed in the Household Score	-0,10	0,20
Number of different crop cultivated by household	0,04	0,63
Number of different livestock owned by household	0,06	0,47
Daily meal expenses	-0,07	0,32
Daily water expenses	-0,13	0,09
Water source type quality Score	0,07	0,42
What is the estimation of the total quantity of water used daily by your household?	0,14	0,11
Number of different situation of handwashing	0,06	0,44
Do you use soap to wash your hands?	-0,12	0,10
General hygene of the HH sanitation situation	-0,14	0,09
General household water sanitation	0,16	0,08
Dietary diversity index	-0,06	0,43

Basic Causes linear regression model:

Linear regressions of nutrition indexes compared with basic causes					
WHZ		**MUAC**		**HAZ**	
R^2	p value	R^2	p value	R^2	p value
	0,31	11%	0,00**		0,14

NB: only models with p.value<0.05* are considered

Linear Regression of MUAC vs Underlying factors		
General Model	R^2 =0,108	p= 0,000
Underlying Factors	**Beta Standart**	**p value**
Age of the Child	0,24	0,00
Gender of child	-0,04	0,55
How long does it take to walk from your home to this health centre?	0,12	0,05
Has your livestock increased or decreased compared to the previous year?	0,13	0,04
What is the distance between your HH and the nearest functioning water point?	-0,01	0,93
Which type of sanitation facility are you using?	0,06	0,55
Details of sanitation	-0,08	0,45

8. Discussions and operational recommendations

Preliminary results found in this study present both similarities and differences when compared with those from the National Nutrition Survey. Comparison has to be taken with caution, in particular with respect to the sample size used for the 2 assessments. However, some preliminary findings can be highlighted.

Looking at the malnutrition rates, it can be noted that the NCA conducted in Chivi District showed a slight increase of global wasting percentage (from 1.6% to 1.9%) with a severe wasting of 0.8% (0.0% in te NNS 2010). Global stunting remained similar with 32.0% in January 2010 and 32.2% in January 2011, with an increase of 6.1% of severe stunting noted during the NCA study compared with the previous year. GAM percentages showed an increase of 2% in the NCA study (from 4.3% in January 2010 to 6.3% in January 2011), mainly due to the increase of SAM of 1.3% (from 2.7% to 4%). Percentage of bilateral pitting oedema remained stable at 2.7%.

In the following part, the preliminary findings are discussed per hypothesis.

Hyp 1: Inadequate breastfeeding practices: late initiation, low exclusive breastfeeding, poor complementary breastfeeding practices until 2 years expose the child to malnutrition.

Most of the surveyed households (91.6%) had the mother as the main child caretaker. In case the mother was not available, the grandmother was responsible for the child. The median of the caretaker age was 28.63 years, and the majority of them received beyond basic education (69.7% followed secondary school or college and 32.1% primary school). Unavailability or absence of the mother as a caretaker was mainly related to the working conditions and in a minor proportion due to social or family reasons, or to mother's

health. These details could provide information on the target for education sessions on Infant and Young Child Feeding. By better identifying the target (type of targeted person, age, education and availability), message design could be better adapted, understandable by caretakers and consequently more efficient.

Early initation of breasfeeding was practiced in 73.1% of the cases, percentage closed to the 71.7% found during the NNS 2010 for Chivi District. Mothers seem to have the willingness to give breastfeeding after birth, but usually initiation timing dependeds on the progress of the delivery (mother or infant complications, need for observation that may cause a delay in breastfeeding initiation). In term of knowledge, the majority of the mothers (65.5%) had heard about "colostrum" with the main known advantages being related to protection, its contribution to infant weight gain and growth.

Preliminary results on exclusive breastfeeding were quite unexpected, with 43.3% compared with the 2.6% from the NNS 2010 in Chivi District. This present percentage may have been exaggerated due to the smaller sample size, as by cross-checking with qualitative data it seems common for mothers to introduce porridge and water in the first few months to soothe the crying of infants and "*make them sleep*". In addition, exclusive breastfeeding seems to be not well perceived or difficult to follow with the pressure of family members convinced that porridge and water are the most adequate infant feeding practices. Mothers' working conditions are as well considered as limiting factors for practising exclusive breastfeeding.

Preliminary results on continued breastfeeding up to 1 year showed higher percentage with 97.7% during the NCA study and 84.4% during the NNS 2010. Interruption of breastfeeding was mainly linked to mothers' perception that breastmilk was not sufficient in quantity or quality for the child growth or related to the mothers' working conditions. Insufficient mother milk and unavailability of the mother seem to be part of a cycle, in the sense that when the child cries or stays at home during mother's working hours, food is introduced and consequently sucking time decreases. This in turns affects the production of breastmilk. The known breastfeeding advantages mentioned by interviews were mainly related to health protection and appropriate composition for the infant feeding needs. Around half of the mothers (53%) thought that child organism was ready for food and drinks in addition to the breastfeeding at 6 months of age, whereas 39.4% thought an infant less than 6 months could receive additional food and drinks.

Associations and established relationships for hypothesis 1 highlight some points:

- A positive association between the weight and height of the child;

  As most of the surveyed children were well nourished, this association was expected, meaning that the child developed, his height proprotionaly increases in association with his weight.

- An association between child age group and global / no stunting and a second negative relationship between Height for Age indicator and the child age: the older the child, the lower the HFA indicator.

  This provides information on the higher prevalence of stunting for the older children.

  According to the above statistical links, additional aspects need to be analyzed:

  - With the preliminary results, we knew that HFA has no relationship with the age of the caretaker; being stunting or not is not either associated with the type of caretaker (mother or another person), her age or education level, if she attent or not the ANC, the child gender, the time of breastfeeding initiation, the introduction of complementary food and the child pattern.
    - ⇨ Information need to be investigated on a potential cut off between "younger" and "older" children to better target the most vulnerable population.
    - ⇨ It may be interesting to compare as well the feeding information between the younger and older children by including for each comparison the "age" to confirm if the feeding practices have no impact on the child nutrition status in this area.

- A positive relationship between Height for Age indicator and length of breastfeeding: the earlier breastfeeding ending period, the lower is the HFA indicator.

This provides information on the higher prevalence of stunting for the children for whom breastfeeding has been ended earlier.
This relationship underlines the known advantages of continue breastfeeding for the children and highlight the risk of stunting for the children who will have an early weaning. This association support the promotion of breastfeeding practices as prevention means for stunting.

Hypothesis 2: Inadequate feeding practices during illnesses with maintenance or decrease of the amount of food and drinks contributing to child weight loss.

During child sickness, most mothers (57.7%) reduced the amount of food, 50% reduced or maintained the amount of water and 60.3% reduced or maintained the time of breasfeeding. However, increasing food, drink and breasfeeding amount seems to be known for its contribution to child recovery and avoidance of complications.

No assosciation has been highlighted by our analysis between the amount of intake during illness and malnutrition. These results may be link to the fact that increase/decrease/maintenance of the amount were requested without mentioning a precised amount or estimation. Responses were maybe not enough detailled to validate such hypothesis.

⇨ It may be suggested to use additional analysis method to confirm that this hypothesis is not valid.

Hypothesis 3: Complementary food practices in quantity & quality don't meet food minimum standards needed for child development.

More than 1/3 (34.2%) of the children from 6 to 23 months living in Chivi received 4 or more food groups daily. In terms of minimum meal frequency, 61.7% of the breasfed children from 6 to 23 months and 58% of those not breastfed received the minimum suggested meal frequency. NNS 2010 results for those 2 merged groups were at 24.4%. In terms of minimum acceptable diet, 44.2% of the breasfeed children from 6 to 23 months and 2% of those not breastfed received the minimum acceptable diet. NNS 2010 results of those 2 merged groups were 6.8%. Preliminary results on the consumption of iron-rich foods were estimated at 29% and DDI mean at 1.85 among children 6 to 23 months.
Concerning mothers' knowledge, it seems that mothers have some notions on balanced diet but child feeding seems to depend on household production and money availability. Household feedings are mainly composed by sadza and vegetables and are not enough diversified. The frequency of meals depended on the houehold's resources. Lack of money for food access was mentioned by 74.7% of the interviewed mothers.

Associations and established relationships for hypothesis 3 highlighted the following points:

- A positive association between Diatery Diversity Index and child weight: the lower the DDI, the lower the weight of the child
- A positive association between Diatery Diversity Index and child height: the lower the DDI, the lower the height of the child.

These associations confirm the importance to promote diversify food intake for the child development and the risks for the children who did not receive diversified food.
=> It could be interesting to identifying the type of food groups that are more associated with malnutrition to be able to better design the message for nutrition education.

The last association for this hypothesis need deeper investigation as the result shown an unexpected links:

- A negative relationship between Diatery Diversity Index and Height for Age indicator: the lower the DDI, the higher HFA is.
    ⇨ There is a need for more investigation on this relationship to either identify the potential existing bias that contribute to this relationship or in the case this links is confirmed, additional links are needed to explain such fact.

Hypothesis 4: Family influences on the breastfeeding practices have negative impact on the nutrition status of the child.

Health staff is the major key actor giving advices on child feeding to the mothers (58.3%). According to the found preliminary on ANC access with 97.2% of the mothers having ANC access and 81.3% confirming the ANC follow-up during their last pregnancy, it seems that ANC consultation may representit a good opportunity to transmit education on infant and young children feeding practices. The second key advisers are family members (23.4%). The main categories of decision-makers for child feeding are the parents, with the mother (44.4%) and father (28.3%), follwed by the health staff (14.3%). It seems that the role of grandmothers in decision-making depended on the family organisation and her responsibility in the feeding of the child.

Associations and established relationships for hypothesis 4:

- An established relationship between Height for Age indicator and the category of decision-maker on the child feeding.
  This relationship informs us on the influence of the person who takes the decision on child feeding and the HFA whereas the adviser on child feeding does not play any role.
  - ⇨ There is a need for more investigations to understand which person has more influence on the HFA, what is the strength of the relationship and if there is a relationship between the type of decision maker and the child feeding practices. These additional informations will contribute to better understand the prelimiry found relationship and etablished adapted recommendations to improve the child nutrition status.

Hypothesis 5: Traditional habits have influence on the utilisation of food items (preparation, conservation) which causes the loss of essential nutrients needed for child development.

Most mothers (96.5%) use firewood for cooking and are the decision-makers in 69% of the surveyed households on cooking methods, food preparation and conservation. Fathers and other family members seem as well to play a role in the decisions, with the respective percentage of 16% and 10.4%.

Associations and established relationships for hypothesis 5 include:

- An association between Moderate / Severe / No stunting and the cooking methods used to prepare child meals.
- A relationship between Height for Age and the cooking methods used to prepare child meals.

These two statistical links confirm a relation between the used cooking method and being stunting or not whereas the person who gives advices or takes decision on food preparation, cooking and conservation does not play any role.

- ⇨ There is a need for more investigations to understand which cooking method has more influence on stunting and which cooking method tends to reduce stunting. Does the cooking method choice have a statistical linked with the time needed to prepare child meal? Needed time for cooking may reduced the available time for child care or may be cooking method may have a impact on the loss of nutrient? Those aspects may be search to better understand this link.

Hypothesis 6: Social influences on crop selection and land utilization limits HH food production and contributes to inadequate food intake by lack of diversity.

In Chivi District, the main cultivated crops were maize (28.8%), groundnut (27.2%), roundnut (21.4%) and grains such as sorghum, millet and rapoko (19.2%). In most households, the father was the decision-maker concerning crop selection (53.7%) followed by the mother (27.3%) and family members (18.8%).

These decisions were transmited by elders and based on the experiences of increased production. Difficulties to cultivate the entire field are linked to resources (human, livestock, seeds and fertilisers).

Different factors have been crossed such as the different types of malnutrition and the person who gives advices or takes decision on crop selection, the land size utilization, the crop selection but no associations and established relationships have been highlighted for hypothesis 6.

⇨ It may be suggested to use additional analysis method to confirm that this hypothesis is not valid.

Hypothesis 7: Water and sanitation issues are not culturally perceived as a priority (in terms of HH budget, community facilities maintenance), contributing to disease occurrence.

Majority of interviewed mother (61.4%) considered having a problem accessing good quality and quantity of water.

Different factors have been crossed such as the different types of malnutrition and the perception of collected water, the participation to the community self group or NGO activity then the disease occurrence and the type of used water facility, then the estimation of daily water used and the type of used water facility but no associations and established relationships have been highlighted for hypothesis 7.

⇨ It may be suggested to use additional analysis method to confirm that this hypothesis is not valid.

Hypothesis 8: Low or absent financial resources (unemployment) limit household purchasing power for additional food items needed to diversify and balance diet

Most households were practising farming and used their products for food intake or sell it to earn money essential to pay their additional needs. Casual work represented the main source of income for 63% of the interviewed households.

Association for hypothesis 8 highlight the following:

- An association between Minimum Diet Diversity and who is employed in the households.

⇨ There is a need to investigate more this association to better understand which employed persons in the household have more influence on the minimum diet diversity. Does it depend on specific person such as the father and/or the mother? Or it depends on the number of workers per household?

According to the checked association, the source of income does not have any influence.

One of the explanations may be in the household where the more members are working, the more income or food products are available. Consequently, in these households child feedings may be more frequently diversified.

Additional analyses are needed as well concerning the links between the period with highest and lowest incomes and the child nutrition status.

Hypothesis 9: Low or absent financial resources (unemployment) limit health facility access and contribute to case management delay and occurrence of malnutrition as disease complication.

During child illness, the majority of mothers (85.7%) confirmed that they went to the nearest health facility, other preferred consult first the traditional healer or apostolic healer (5.4%) for economic reasons. Child parents are the main decision-makers on child health with respectively 53.2% for the father and 33.7% for the mother, followed by other family members 13.1%.

Associations for hypothesis 9:

- An association between who is employed in the household and what decision is taken in the case of a child's sickness.

According to the factors crossed, there are no association between the different types of malnutrition and the action of the mother in case of child sickness as well as with the person taking the decision on child health.

⇨ The valid association needs more investigation to better understand the situation on which employed person has more influence on the action of the mother in case of child sickness. Does it means that more household member are working and more the money is available so it is more easy for the mother to go directly to the health centre?

Hypothesis 10: Low or absent financial resources (unemployment) limit the purchase of enabling facilities and contribute to poor hygiene practices, one of the factors of disease transmission.

Access to enabling facilities is perceived as limited due to the lack of income.

Associations for hypothesis 10 include two points:

- An association between who is employed within the household and the presence of a towel.
- An association between who is employed within the household and the presence of a broom.

⇨ These associations are quite surprising and there is a need for more investigation to understand which specific or types of employed persons have more influence on the enabling facility access, why the towel and broom are more accessible? Does it means that towel and brooms are considered as priority enabling facility when the household has available money? Why there is no association with the presence of soap, knowing that since more than 2 years, handwashing with soap was part of the main hygiene message transmitted for cholera prevention? Price of soap seems to have increase these last months, but could it be an explanation?

Hypothesis 11: Limited or reduced livestock ownership linked to livestock depletion (diseases and death including food needs during lean times) reduces household own production and purchasing power and consequently food intake

Owned livestock is composed for the majority of housholds by cows (53%), followed by sheeps and goats (26.6%) and poultry (18.3%). According to the interviews done, most of the people estimated that their livestock has decreased during the last past years. According to the data collected at the Animal Health Services in charge of regular livestock census, in 2010, cattle deaths have been recorded but over the last part years, the tendancy of the number of cattles has increased. After a regular decrease of the number of goat during the 5 past years, in 2010 this number has quickly increased linked to a large goat distribution in some wards. Number of sheeps and donkeys has decreased mainly during the last 3 past years similarly as the number of poultry that knew an increase in 2010.

Associations highlighted for hypothesis 11 are the following:

- An association between the type of livestock owned by the household and the frequency of food eaten based on grains, roots and tuber;
- An association between the type of livestock owned by the household and the frequency of food eaten based on legumes and nuts.

Others association between the type of livestock and the different groups of food have not been statistically associated as well as the variation of owned livestock and the type of malnutrition.

⇨ These associations need more investigation for a better understanding. Does it mean that having more cattles for farming allow the household to cultivate a larger size of the land and consequently to eat more food from these 2 groups? Which owned livestock has more influence on being stunted?

Hypothesis 12: Low local production causes an increase of market prices, then food products become financially inaccessible for the household

Chivi District has been affected by repetitive drought and irregular rainfalls these last past years that seems to have consequences on food and money availability and consequently on food intake (in quantity and quality). At present, fertilizers and additional seeds are essential to increase the needed production.
In 2010, some price increases have been mentioned such as for maize, sorghum, cooking oil and sugat.

No association underlining a significan link between low local production, increase of market prices and food access.
This result may be mainly linked to the type of asked questions, part of the qualitative data collection that does not allow to establish any statistical association.

⇨ It may be suggested to use additional analysis method to confirm that this hypothesis is not valid.

Hypothesis 13: Brain-drain and shortage of skilled health professionals limit the availability of services and quality of health care, contributing to disease.

Health staff is the main child health adivser for the household (58.7%) and the mother (36.6%) is the main decision maker followed by the father (30.6%) and the health staff (18.3%).

No association underlining a significant link the types of malnutrition and the advicer or decision maker on child health or distance to the health facility. Similarly, there is no association between disease occurence and the distance to the health facility.

⇨ It may be suggested to use additional analysis method to confirm that this hypothesis is not valid.

Hypothesis 14: Shortages in drugs and medical supplies reduce the quality of health care and contribute to the low utilization of health facilities, increasing the risk of health status degradation.

Expected health data were not accessible at District level. Mortality, morbidity data were requested at provincial and district level but never given. Interviews were conducted in the health facility but access became restricted by the District health autorities.

Hypothesis 15: Poor water facilities (poor condition or non-functioning existing facilities) reduce the availability of water for household, with negative consequences on hygiene practices and increase in the risk of diseases.

According to which village is dealt with in the same District, water access differs significantly. In general, half of the households (52.1%) haveing access to a borehole, 21.7% to unprotected wells, 10.9% to protected wells, 9.2% to natural waters (lake, river, dam, unprotected canals) and 6.1% to other types of sources.

Associations and established relationships highlighted for hypothesis 15 are the following:

- An association between the distance to the nearest water facility and the general hygiene of household sanitation.
  ⇨ This association needs more investigation to understand why the household sanitation is in better hygiene condition when the water point is closer (and not this other part of the house). For this hypothesis, one point has to be taken is consideration: information was based on team leader observations that could be considered as subjective.

⇨ It could be interesting to search if in the household, sanitation hygien may be a priority for the household.

- An association between the distance to the nearest water facility and when one washes her/his hands
  ⇨ This information needs more investigation to understand to understant from which distance hand washing is optimized? What could be the acceptable distance in this context for ensuring handwashing?

- An association between the distance to the nearest water facility and the type of water facility used.
  ⇨ This information needs more investigation to understand the link between the different cut off of distance and the type of water source. Doea it mean that there is more unimproved water facilities closest to the household and few umporved water facilities so more far from the household?

No association have been made between the type of malnutrition and the type of used water facility, then the disease occurrence and the type of used collected water or the frequency of hand washing then the estimation of daily water used and the type of used facility. Distance to the water facility has no association with the purpose of used water and general hygien of the house, kitchen, water situation and environement .

Hypothesis 16: Poor sanitation facilities (poor condition or non-functioning existing facilities) facilitate the propagation of insect vectors and intermediate hosts of pathogenic parasites, responsible for diseases.

Within a same village, sanitation access could be very different. 59.8% has access to improved sanitation facilities, 37.6% to unimproved sanitation facilities and 2.6% to none.

Associations and established relationships highlighted for hypothesis 15 include:

- An association between the absence of flies and the type of sanitation facility.
  ⇨ This association needs more investigation to understand statistically which type of sanitation facility could attract more flies and have hygiene consequences in the household.

- An association between the absence of flies and the distance to sanitation facility.
  ⇨ This association needs more investigation to understand statisticaly what is the link between the distance and the presence of flies. Does it mean statistically that more the sanitation facility is close to the household, more the flies are present?

- A negative established relationship with Height for Age indicator and the distance to sanitation facility: the farer sanitation facility, the lower HFA is.
  ⇨ This association needs more investigation to understand statistically the link. The explanation may be that having a far sanitation facility tend to increase the number of people defecating in the bush close to the household and became more vulnerable of hygiene problem and disease that cause malnutrition.

- An established relationship with Height for Age indicator and the type of sanitation facility.
  ⇨ This association needs more investigation to understand statistically between the type of sanitation facility and HFA. Which type of sanitation facility is linked with more malnutrition cases? And less malnutrition cases?

There is no association between the presence/absence of flies and the way to evacuate garbage and child stools, no association between disease occurrence and the evacuation of garbage, no relationship between HFA and the evacuation of garbage, child stools and general hygiene of household sanitation.

9. Recommendation on the methodology and update of the research project

The survey is providing a wealth of information on the prevalence of the main risk factors of undernutrition in Chivi district. It provides also a deep analysis of the causal pathways between nutrition risk factors and nutrition outcomes.
However the statistical analysis has not been the most relevant information to understand causes of undernutrition. We have been able to explain up to 19% of the variability of undernutrition identified by MUAC (similar to what is achieved with the analysis of a DHS survey. Due to the numerous constraints of the statistical approach (see limitation section in the presentation of the methodology), it is difficult to reach a higher rate.
Given the time and resources necessary to collect and analyse this range of information, we have decided not to pursue this strategy and to propose the following modifications:

- the quantitative survey will not try anymore to demonstrate associations that are difficult to inteprete; limited by essence and subject to relevant criticism
- the quantitative survey will rather try to identify the magnitude of certain risk factors in the area under study
- the strength of the association with undernutrition will be informed through a literature review (on going work). It is not necessary to demonstrate in every NCA what has been studied through long years of research
- we are strengthening the qualitative component of the NCA
- the revised methodology is also proposing a process to qualify the confidence stakeholders have in the results provided by the study. This is critical to ensure transparency and build a consenus among stakeholders to improve our interventions.

The revised methodology has been validated by the scientific group in may 2012 and will be detailed into guidelines by September 2012. The objective of this new method is not to statistically prove causality but rather to build a case for causality.

10. Conclusion

The present NCA study was part of the first pilot project based on the draft study protocol writen by ACF and TUFTS University. The first steps of the study were implemented in Zimbabwe in close collaboration with the MOHCW and key partners. Each step was respected and has been detailed above.
Preliminary analysis of collected data has been done but there is need for deeper research and analyses. Current preliminary findings remain large and need to be fine-tuned for a better understanding of the nutrition situation and verification of the hypotheses. At this stage, only the need for deeper analysis could be indentified, and findings do not allow making precise programmatic conclusions and recommendations. Additional analysis with more sophisticated epidemiological and statistical methods is necessary to help highlight detailed associations and relationships based on the data collected. For this purpose, it is recommended to hire an epidemiologist able to pursuit the work already done in order to find more relevant preliminary results.

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Factors	Available data & evidence	Reference
Inadequate Breastfeeding Practices: initation, low exclusive breastfeeding, poor complementary breastfeeding practices up to 2 years.	**In country evidences**	
	Delay in breastfeeding initiation (<1 hour): 71.7% of the infants are breastfeeded within the first hour in Chivi District.	NNS - 2010
	Low Exclusive Breastfeeding Practices: 2.6% in Chivi District.	
	Introduction of complementary food: nationally, 30% of the infants received complementary food by the age of 3 months and > 60% before 6 months.	
	Median duration of breastfeeding: 18 months in Chivi District.	
	Low continue BF until 1 year: 84.4% in Chivi District.	
	Low continue BF until 2 years: 23.1% in Chivi District.	
	Global level evidences	
	Children who did not receive colostrum were at higher risk of stunting.	Kumar D, Goel NK, Mittal PC, Misra P. Influence of infant-feeding practices on nutritional status of under-five children. Indian Journal of Pediatrics.2006;73(5):417-421
Inadequate feeding practices during illnesses	54.6% of the children in Masvingo Province eat less or none during child illness.	MICS 2009
	78.2% of the children in Masvingo Province drink the same or reduced the amount of water during child illness.	
Inadequate Complementary food practices	In Chivi District, 24.4% of children between 6-23 months of age received the minimum number of meals recommended for their age.	NNS - 2010
	In Chivi District, 25.4% of the children between 6-23 months of age received the minimum number of food groups recommended for their age.	
	In Chivi District, 6.8% of children between 6-23 months of age received a minimum acceptable diet (according to the age and breastfeeding status).	
Lack of food diversity	There has not been much diversification from maize as the dominant source of food security. Small grains (sorghum, millets) play very little role in household food security in the urban areas and rural areas.	ZIMBABWE FOOD SECURITY ISSUES PAPER for the Forum in Food Security in South Africa. 2003

Poor case management	**In country evidences**	

	Both the access and the quality of basic health care have been hindered by the lack of essential drugs at the health facilities level.	Consolidated Appeal 2011, Zimbabwe, Programme Sheet Nutrition, Agriculture, Food Assistance, Health. P15
	The Economic decline which resulted in a sharp decrease in funding for health continues to directly contribute to the deterioration of health infrastucture, the loss of experienced health professionnals, vital medicines shortages and the drastic decline in the quality of health services available for the population in the districts.The government contribution to public financing has significantly reduced and support from donors has not been adequate to substain the capacity of the health sector.	Consolidated Appeal 2011, Zimbabwe, Programme Sheet Nutrition, Agriculture, Food Assistance, Health. P15, 18.
	Global level evidences	
	Maternal & child health care has been shown as 1 factor of the improvement of stunting rate.	Child stunting in Brazil – Field exchange
Case Management delay	Lack of comprehensive Integrated Disease Surveillance and Response (IDSR) training contributes to poor data management, inability to detect disease outbreak early, delayed response and poor case management.	Consolidated Appeal 2011, Zimbabwe, Programme Sheet Nutrition, Agriculture, Food Assistance, Health. P22.
Shortage in medicines & medical supplies	Access to essential drugs and supplies has been reduced with the stock availability ranging between 29% and 58% for vital items and 22% to 36% for all the category of items on essential drug list in 2008.	Consolidated Appeal 2011, Zimbabwe, Programme Sheet Nutrition, Agriculture, Food Assistance, Health. P15, 18.
	Medical equipment, critical for diagnostic and treatment is old, obsolete and non functioning. Field M&E visits indicate the district and rural health facilities are not adequately equipped to have a functioning drug management information system.	
Low household purchasing power	**In country evidences**	
	Despite the fact that food is available on the market, the low purchasing power due to high unemployment and low productive capacity make food still inaccessible for most Zimbabweans, especially in the rural districts.	Consolidated Appeal 2011, Zimbabwe, Programme Sheet Nutrition, Agriculture, Food Assistance, Health. P13.
	Global level evidences	

	Family purchasing power has been shown as 1 factor of the improvement of stunting rate.	Child stunting in Brazil – Field exchange
Limited household own production	Vulnerability to food and income shocks, particularly due to drought, is endemic in Chivi district. Poor soils could not sustain reasonable crop returns without application of fertilizer or manure.	Participatory technology development, Masvingo, Zimbabwe. Reported in "A case documentation of the SARD Initiative implemented by Practical Action," available online at: SARD Initiative ftp://ftp.fao.org/docrep/fao/009/ag252e/ag252e00.pdf
Unemployement	Estimated at over 80% in Zimbabwe	WFP Website - Zimbabwe.
Market prices	Food crises have occurred most recently in 2002-03 as well as in 2008 which was exacerbated by the global food price crisis.	Eric S Anderson, The 2008 Global Food Price Spikes Superimposed upon Zimbabwe's Domestic Crisis. December 17, 2010
Poor Hygiene Practices	**In country evidences**	
	65% of the households have a pot rack in Masvingo Province.	Rural Livelihood Assessment – May 2010
	71,3% a rubbish pit in Masvingo P	
	30,5% rubbish around the yard in Masvingo P	
	10,4% water close by the nearest toilet in Masvingo P	
	Global level evidences	
	The burden of infectious disease is disproportionately borne by children under five due to their relatively immature immune systems and their dependence on caregivers to use appropriate feeding and hygiene practices to avoid infection.	(Martorell 1999; Martorell and Habicht 1986).
	Poor sanitation & hygiene are clearly associated with diarrhea, which has a long established inverse relationship with growth faltering.	Lanata & Black, Nutrition and Disease in Developing countries, 2001.
Propagation of insect vectors and intermediate hosts of pathogenic parasites	**Global level evidences**	
	Microbial contamination of foods is another major cause of childhood diarrhea.	Ref 17: PAHO/WHO. Guiding principles for complementary feeding of the breastfed child. Pan American Health Organization/World Health Organization. Division of health promotion and protection. Food and nutrition program. Celebrating 100 years of health. 20
Lack of disposal for children's stool	In Chivi District, 77.9% of the household have proper disposal of children's stool.	NNS 2010
Poor water facilities	**In country evidences**	

	60.9% of the household with improved water source in Chivi District.	NNS 2010
	Sources of drinking water: 62.85% of protected water sources in Masvingo Province.	Rural Livelihood Assessment – May 2010
	Treatment of water sources: 27% nationally including 70% water treatment via Aquatab, 10% jerikan of chlorine and 17% boiled it	
	Global level evidences	
	Coverage of water supply services as been shown as 1 factor of the improvement of stunting rate.	Child stunting in Brazil – Field exchange
	Consistent with studies from other countries, we found that older children living in a household with access to improved sanitation are less likely to be stunted, after controlling for other covariates including access to a protected water source, maternal education, and household wealth status.	Esrey, 1996 + Zimbabwe Working Paper, based on further analysis of Zimbabwe Demographic and Health Surveys – Biological, Social & Environmental Determinants of Low birth weightand stunting among IYC in Zimbabwe Mduduzi N.N.Mbuya, Memory Chidem, Bernard Ch
Poor sanitation facilities	**In country evidences**	
	42.7% of household with improved sanitation facilities in Chivi District.	NNS 2010
	41% of improved facility in Masvingo Province.	Rural Livelihood Assessment – May 2010
	Global level evidences	
	Coverage of sanitation services as been shown as 1 factor of the improvement of stunting rate.	Child stunting in Brazil – Field exchange
	Poor sanitation & hygiene are clearly associated with diarrhoe, which has a long established inverse relationship with growth faltering.	Lanata & Black, Nutrition and Disease in Developing countries, 2001.
Poor water & sanitation / malnutrition	Poor water and sanitation has been associated with increased risk of infections in children (Daniels et al, 1990; Huttly et al, 1990; Mertens et al, 1990) and increased malnutrition (Adair & Guilkey, 1997); improved water and sanitation was related to lower risk of malnutrition (Huttly et al, 1990; Daniels et al, 1991; Ricci & Becker, 1996).	
Inadequate Food Intake	Among the children 0-59 months: 16.1% have poor food consumption in Chivi District.	NNS 2010
	34.59% of the household receive food assistance in Chivi District.	
Diseases	**In country evidences**	

	Prevalence of diarrhoea: 22.8% in Chivi District.	NNS 2010
	Prevalence of cough: 22.5% in Chivi District.	
	Prevalence of fever: 29.2% in Chivi District.	
	In Zimbabwe, high rate of diarrhoea (13%), acute respiratory infections (16%) and fever (14%) are clearly associated with malnutrition – Children with diarrhoea or fever are nearly twice as likely to be acutely malnourished than their non sick counterpart.	NNS 2010
	Global level evidences	
	Estimated that sanitation and hygiene interventions implemented with 99% coverage could reduce diarrhoea incidence by 30%, which would in turn decrease the prevalence of stunting by only 2 4 %. => 4	The Lancet Maternal and Child Undernutrition Series
	Past literature has been quite consistent in showing a negative effect of diarrhea on growth.	(Adair et al. 1993, Black et al. 1982 and 1984).
	Diarrhea is the leading cause of morbidity and mortality in children. Diarrhea kills over 1 million children every year through dehydration and malnutrition. Consistent with the findings of other studies (15), incidence of diarrhea is negatively associated with stunting in West Gojam Zone.	Ref: 15 Samani EZ, Willett WC, Ware JH. Association of malnutrition and diarrhea in children aged under-five years: a prospective follow-up study in a rural Sudanese community. American journal of epidemiology. 1988;(128)1:93-105 (accessed at http://aje.o
Climate changes	Evidence is now overwhelmingly convincing that the earth's climate is changing, that it will become worse, and that the poorest and most vulnerable people will be affected first and most severely.	IPCC, 2008
HIV/AIDS	As early as 1998, MOHCW estimated that the costs of conventional care for HIV and AIDS-related illnesses would increase the budget by about 60 percent. MOHCW has reported that the number of TB cases increased by over 400 percent between 1990 and 1999.	The HIV and AIDS Epidemic in Zimbabwe, MOHCW, USAID, National Aids Council, May 2004.
	In Zimbabwe, one survey found that agricultural output declined by nearly 50 percent among households affected by AIDS illnesses and deaths.	
	Women-headed households are particularly vulnerable. This vulnerability is especially important because women in rural areas are 1.35 more times likely to be infected than men, and they constitute the majority of infections.	

	A Ministry of Education, Sports and Culture (MOESC) study in 2002 reported that four out of five school heads say that the epidemic is seriously undermining the provision of quality education. A study conducted in 2000 in commercial farming areas revealed that 48 percent of primary school orphans and nearly all secondary school orphans dropped out of school due to the illness of parents or after their deaths.	
	A 2003 study in eastern Zimbabwe looked at the consequences for households of adult terminal illnesses and death. About four out of five of those who died were primary household income earners, and three out of five lost their jobs during their illness. In addition, one in seven caregivers had to give up employment to provide care for the sick family member, and about one in four households had to relocate soon after the adult death.	
	Estimation of 36% of children aged 15 -17 years were orphaned,	Zimbabwe Demographic Health Survey, 2005-2006

APPENDIX 1 : Assignment of Clusters

Geographical unit	Population size	Assigned cluster	Selected village
WARD 1	5595		
WARD 2	5805	1	**VUTETE**
WARD 3	5212	2	**MUZVIDZIWA 1**
WARD 4	3717		
WARD 5	4568	3	**TARUVINGA**
WARD 6	2093		
WARD 7	3163		
WARD 8	4040	4	**NZVIYO**
WARD 9	3855		
WARD 10	3300		
WARD 11	4696	5	**MUREVEZI**
WARD 12	5068	6	**MACHEKA**
WARD 13	4101		
WARD 14	5501	7	**MASINIRE**
WARD 15	5031		
WARD 16	6862	8	**MAWARIRE**
WARD 17	4159	9	**MUGOVOZHENGWA**
WARD 18	3810		
WARD 19	7097	10	**GIRI**
WARD 20	5888		
WARD 21	6450	11	**BATI**
WARD 22	7450	12	**CHIRAIRO**
WARD 23	5413	13	**ZIVURAWA**
WARD 24	8708	14	**JAWA**
WARD 25	9040	15	**MAURAWA**
WARD 26	8671	16	**CHIOPA**
WARD 27	3134		
WARD 28	7609	17	**MUNANGARI**
WARD 29	3559		
WARD 30	2045	18	**MUZVIDZIWA 2**

APPENDIX 2 : Focus group discussion guide

A. Feeding practices.

1. What are the feeding practices in this area from birth to 2 years.
    a. What are the early breastfeeding, exclusive breastfeeding and continue breastfeeding practices in your community?
    b. What are the reasons supporting these practices?
    c. Which difficulties did you met to follow the recommended feeding practices?

2. What is the composition of a common meal for a child of 1 year ½ old in this area?
    a. Do you think the mentioned food items composed a balanced meal?
    b. Do you use to eat fruits? Animal proteins sources?
    c. What are the main difficulties faced to reach the food requirement?

3. What are the feeding changes over the year (pot size and meals number)?

4. What are the feeding practices during child illness?

5. Who are the influent key persons and the decision maker on child feeding practices?

6. What is the average of the daily food expenses?

B. Farming practices

1. What are the main farming crops in this area?
    a. What are the reasons explaining the selection of these crops?
    b. What are the difficulties faced for cultivating the entire field?
    c. Who is the decision maker on crop selection, planting and harvesting timing?

2. How was the situation of the past harvests?
    a. What are the main causes of a poor harvest?
    b. What are the main household consequences of a poor harvest?
    c. What are your main copying mechanisms?
    d. What are the main household priority in case of good harvest / more money?

3. Did you notice price variations of food and essential items over 2010?
    a. How much was the price variation?
    b. Do you know the reason of the increase?

4. Is high unemployment in Zimbabwe affecting you in this area?

C. Livestock situation

1. What is the current livestock situation compare with the previous year?
    a. What were the causes of livestock decrease?

2. How livestock head numbers are updated in your community to the District?

3. What do you do when one of your livestock head is sick?

D. Health access

1. When your child is sick what do you do?
    a. What do you do in priority?
    b. What do you do in case the disease persists?

2. Did you attend Antenatal Care and why ANC is important?

3. Did you hear about malnutrition?
    a. How do you recognize a malnourished child?
    b. What are the main causes of malnutrition in your area?

4. What are the perception and impacts of HIV/AIDS in your community?
    a. Are people with HIV/AIDS stigmatized in the community?
    b. Can people speak freely about HIV/AIDS with friend and with the couple?

5. Are you children fully immunized against recommended vaccinations?

6. Do you have regular contact with a Village Health Workers?
    a. Is the existing VHW active in your community?
    b. How often did you see him?
    c. For which type of community activity do you see him?

D. Water access

1. How do you have access to the water?
    a. What is the type of water facility you get water?
    b. How long it take for you to go and come back?
    c. How often do you go to take water?
    d. What are the quantities you carry per trip?

2. What are the consequences of water shortage at household level?
    a. What are the consequences in terms of water use?
    b. What are the consequences on the women daily planning?
    c. What are the variations of water availability over the year?

3. Do you treat the water before drinking?
    a. Which method are you using?
    b. Is your water can transmit diseases and which types?

4. Do you have access to enabling facilities in your community?

E. Sanitation access

1. How is the sanitation situation in your community?
    a. How many household have access to latrines?
    b. Where people without latrines go to defecate?
    c. Can child stools transmit diseases?
    d. Did you try to solve water & sanitation issues at community level?

F. General data

1. Could you describe your daily planning?
2. What are the main problems faced in your community?
    a. What are the main problems?
    b. Could you rank the mentioned problems?

APPENDIX 3 : Key informant interview guide

Interviews with health professionals

- Child health and nutrition knowledge of the mother;
  - → Exclusive breastfeeding practices;
  - → Continue breastfeeding practices;

- Feeding practices during child sickness;

- Malnutrition problematic in the area;

- Influences on feeding practices.

- HIV/AIDS access in the community, perception.

- Consequences of the shortage of skilled health staff in the District on the health access;

Interviews with animal health professional

- Main problematic affecting livestock in Chivi District;
  - → Trends over the past year, per type of livestock.
  - → Trends over the last year for cattle.

- Existing decentralized animal health services in the District.

APPENDIX 4 : Nutrition Causal Analysis (NCA) Questionnaire

Chivi District, Masvingo Province – Zimbabwe. **Date:** Cluster number: ……

Ward number: ….....
Village:…….**.....**

Names of the NCA team: .....…….....

HOUSEHOLD DETAILS

1. **Head of the Household**:
- ☐ 1. Self
- ☐ 2. Husband
- ☐ 3. Parents
- ☐ 4. Brother / Sister
- ☐ 5. Other (specify)……

2. **How many people are part of this HH** (regularly live and eat in the household)?

Age class	1. **Under 24 months**	2. **24 to 59 months**	3**. 5 to 11 years**	4. **12 to 18 years**	5. **Adults > 18 years**	6**.Total**
Number						

3.a. Is the mother the **child caretaker**? ☐ 1. Yes ☐ 2. No

3.b. If NOT, **who** is the child caretaker?
- ☐ 1. Aunt
- ☐ 2. Grand mother
- ☐ 3. Sister / Brother
- ☐ 4. Other (specify)……..

3.c. **Why** is this person responsible for the child?
- ☐ 1. Mother death
- ☐ 2. Work
- ☐ 3. Migration
- ☐ 4. Other (specify)……..

4. **How old** is the mother / child caretaker? 1. _____ years

5. **Education level** of the mother / child caretaker (Which certificate of education does she/he hold?)

- ☐ 1. None
- ☐ 2. Can read and write (3 years of primary and above)
- ☐ 3. Primary School
- ☐ 4. Secondary School
- ☐ 5. College
- ☐ 6. University
- ☐ 7. Other (specify)……

NUTRITION

6. Anthropometrics information

1. Birth Date	2. Sex (1. F /2. M)	3. Weight (kg)	4. Height (cm)	5.Oedema (1. Yes/ 2. No)	6. MUAC (mm)	W/H	H/A

7.a. Is there **antenatal care** (pregnancy care) available in your area?

- ☐ 1. Yes
- ☐ 2. No
- ☐ 3. Don't know

7.b. If YES, did you (or do you currently) **attend a session** during your last pregnancy?

- ☐ 1. Yes
- ☐ 2. No

8.a. Did you **breastfeed your child within the 1st hour after birth?**

- ☐ 1. Yes (go to 8.d, 8e)
- ☐ 2. No (go to 8.b, 8.c, 8.d, 8.e)
- ☐ 3. Don't know

8.b. **If NO,** how long after birth did the child start breastfeeding?

☐ 1. Before 6 hour
☐ 2. After 6 hour
☐ 3. Don't know
☐ 4. Other (specify)…….....

8.c. **If NO**, why did you not breastfeed your child within the 1st hour after birth?

☐ 1. HIV transmission
☐ 2. Traditional habit
☐ 3. Milk is not good
☐ 4. Milk was not enough
☐ 5. Mother was tired
☐ 6. Don't know
☐ 5. Other to specify……..

8.d. Did you hear about **colostrum**? ☐ 1. Yes ☐ 2. No

8.e What are the **advantages to give the first milk within the 1st hour after birth** called "colostrum"?

☐ 1. Protection / Antibody
☐ 2. Child weight gain
☐ 3. Child growth
☐ 4. Don't know
☐ 5. Other to specify……..

9. Which of the following describes your **child's feeding pattern** NOW:

☐ 1. The child is breastfeeding exclusively
☐ 2. Breastfeeding and consuming other types of food or drink
☐ 3. Not breastfeeding at all

10.a . When did you **stop to breastfeed** your child? Child age: ……(months).

10.b Which **difficulties** did you face **to continue breastfeeding?**

☐ 1. New pregnancy
☐ 2. Mother work
☐ 3. Breastfeeding alone was not good for the child
☐ 4. Breastfeeding alone was not enough for the child
☐ 5. Traditional habits
☐ 6. Don't know
☐ 7. Other to specify……..

10.c. What are the **advantages to give breastfeeding to a child?**

☐ 1. Protection / Antibody
☐ 2. Adapted composition for the child development
☐ 3. Ready to use
☐ 4. Cheap
☐ 5. Don't know
☐ 6. Other to specify……..

11.a. **At which age** did you give to your child something to **eat or drink besides breast milk?**

Child age: ……(months).

11.b. **At which age** a child is able to eat **other food or drinks in addition to the breastfeeding?**

☐ 1. From birth
☐ 2. Before 3 months.
☐ 3. After 3 months
☐ 4. From 6 months
☐ 5. Don't know
☐ 6. Other to specify……..

12**. Since this time yesterday**, **how many times** was this child **given thick mashed or solid food?**

☐ 1. One time
☐ 2. Two times
☐ 3. Three times
☐ 4. More than 3 times
☐ 5. Don't know

13.a. Did you **feed any of the following types of foods** to the child in the **past 24 hours and how many times**?

Food groups	**Response**	**Write number within a days**	**Sources**
A.Any bread, rice noodles, biscuits, foods made from maize, rice, millet, sorghum, wheat, or other **grains**? Any potatoes, yams, manioc, cassava or any other foods made from **roots and tubers**?	☐ 1. Yes ☐ 2.No	3. _____	
B. Food made from **legumes and nuts** (lentils, beans, soybeans, pulses, peanuts)	☐ 1. Yes ☐ 2.No	3. _____	
C. **Dairy**: any cheese, yogurt, milk or other milk products? (except breastfeeding)	☐ 1. Yes ☐ 2.No	3. _____	
D. **Flesh food**: beef, lamb, goat, wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meats, fresh or dried fish or shellfish.	☐ 1. Yes ☐ 2.No	3. _____	
E. Any **eggs**	☐ 1. Yes ☐ 2.No	3. _____	
F. **Vitamin A**-rich fruits and vegetables (orange, carrot, green leaves, pumpkin, mango, papaya)	☐ 1. Yes ☐ 2.No	3. _____	
G. Other **fruits and vegetables** (bananas, apples, green beans, avocados, tomatoes)	☐ 1. Yes ☐ 2.No	3. _____	

Sources : ☐ 1. Own production ; ☐ 2. Market ; ☐ 3. Family gift ; ☐ 4. Don't know ; ☐ 5. Other (specify)…….

13.c. Which **difficulties** are you facing to get these food items?

☐ 1. Lack of money
☐ 2. Lack of availability (Market)
☐ 3. Cost
☐ 4. No difficulties
☐ 5. Other (specify)……

HEALTH

14.a. Has your child been **sick during the 2 previous weeks**? ☐ 1. Yes ☐ 2.No

14.b. If YES, what was the health problem?

- ☐ 1. Diarrhea
- ☐ 2. Cough
- ☐ 3. Fever
- ☐ 4. Don't know
- ☐ 5. Other (specify)……

15.a. During this period, what did you do regarding the **amount of food, drinks and breastfeeding?**

A. Food:	**B. Drinks**:	**C. BF**
☐ 1. Give more food	☐ 1. Give more fluid	☐ 1. Give more BF
☐ 2. Give less food	☐ 2. Give less fluid	☐ 2. Give less BF
☐ 3. Give same food amount	☐ 3. Give same amount of fluid	☐ 3. Give same amount of BF
☐ 4. Don't know	☐ 4. Don't know	☐ 4. Don't know

15.b. What are the **advantages to maintain or increase food/drinks/BF amount?**

- ☐ 1. Help the child to fight against disease
- ☐ 2. Avoid the loss of weight
- ☐ 3. Don't know
- ☐ 4. Other (specify)……

16.a. What did you do **when your child fall sick?**

- ☐ 1. Go to the health centre
- ☐ 2. See the traditional healer/give traditional food, drinks
- ☐ 3. Nothing
- ☐ 4. Other (specify)……

16.b. If NOT health centre, **why are you not going regularly** to the health facility when your child falls sick?

- ☐ 1. Too expensive
- ☐ 2. Too far, no transportation means
- ☐ 3. Lack of drugs
- ☐ 4. Long waiting time
- ☐ 5. Preference for traditional healer
- ☐ 6. Disease not serious
- ☐ 7. Other (specify)……

16.c. How long does it take to **walk/go from your home to this health center/clinic/post?**

A. Walking
B. Transport

- ☐ 1. Just a moment (about 1/4 hour)
- ☐ 2. Between 15 – 30 minutes
- ☐ 3. Between 31 minutes – 1 hour

☐ 4. Between 1 – 3 hours
☐ 5. Between 3 – 5 hours
☐ 6. > 5 hours
☐ 7. 1 or more days

17. What are the **causes of child diarrhea?**

☐ 1. Will of God
☐ 2. Poor Sanitation
☐ 3. Development of Milk teeth
☐ 4. Too much sun
☐ 5. Food contamination
☐ 6. Don't Know
☐ 7. Other, Specify……

18.a. Who give you **advice c**oncerning your child?

Who usually give you advice about	**Response**	1. Self, 2. Husband, 3. Mother family member, 4. Father family member, 5. Friends, 6. Neighbor, 7. Health staff, 8. Other to specify……
A. Child feeding		
B. Child health		
C. Preparation/cooking/conservation of food items		
D. Selecting the cultivated crops?		

18.b. Who is the **decision-maker**?

Who usually makes decisions about	**Response**	1. Self, 2. Husband, 3. Mother family member, 4. Father family member, 5. Friends, 6. Neighbor, 7. Health staff, 8. Other to specify……
A. Child feeding		
B. Child health		
C. Preparation/cooking/conservation of food items		
D. Selecting the cultivated crops?		
E. Allocation of economic resources		

FOOD PREPARATION

19.a. Which **cooking method** do you use to prepare child meals?

☐ 1. Firewood
☐ 2. Coal
☐ 3. Kerosene
☐ 4. Other (specify)…….

19.b. **How long** did you take **to cook a meal?**

☐ 1. < 30 minutes
☐ 2. 30 minutes to 1 hour
☐ 3. > 1 hour
☐ 4. Don't know
☐ Other (specify)…….

HOUSEHOLD RESOURCES

20. Who **is working** in your HH?

- ☐ 1. None
- ☐ 2. Husband
- ☐ 3. Self
- ☐ 4. Oldest child (1)
- ☐ 5. Other (specify)…….

21. What are the main **HH sources of income** over the year? (up to 3)

- ☐ 1. Selling own products (agricultural and/or livestock)
- ☐ 2. Causal work
- ☐ 3. Government work
- ☐ 4. Credit - borrowed money
- ☐ 5. Other (specify)……
- ☐ 6. Don't know

22.a. What time of the year your HH has the **highest level of income**? From 1._____(month) to 2. _____(month)

22.b. What time of the year your HH has the **lowest level of income?** From 1._____(month) to 2. _____(month)

23. What were **your daily / monthly expenses?**

Daily expense	Average ($)	Don't know
A. Meal preparation	1.	2.
B. Water	1.	2.
Monthly expense	Average ($)	Don't know
C. Education	1.	2.
D. Health	1.	2.
E. Power/Firewood/Parafin & caddle	1.	2.
F. Accommodation rent	1.	2.

FOOD SECURITY

24.a. **Do you farm**? ☐ 1. Yes ☐ 2.No

24.b. If YES, what is **the size of the field that you farm**? ……..ha

25. Which **type of crops** do you cultivate?

- ☐ 1. Maize
- ☐ 2. Cotton
- ☐ 3. Wheat

☐ 4. Ground nut
☐ 5. Other (specify)…….

26. **Types of livestock** owned by the HH.

☐ 1. Cow
☐ 2. Sheep / Goat
☐ 3. Donkey
☐ 4. Pig
☐ 5. Poultry
☐ 6. None
☐ 7. Don't know
☐ 8. Others (Specify)……..

27. Has your **livestock increased or decreased compared to the previous year?**

☐ 1. Increased
☐ 2. Decreased
☐ 3. No changes
☐ 4. Don't know

WATER

28. What is the **distance** between your HH and the **nearest functioning water point?**

☐ 1. Less than 250 m
☐ 2. 250 to 500 m
☐ 3. More than 500m
☐ 4. Don't know

29.a. From which **type of water sources** do you collect water?

☐ 1. Protected well
☐ 2. Protected spring
☐ 3. Tap
☐ 4. Unprotected well
☐ 5. Unprotected spring
☐ 6. Dam / lake / canal/river
☐ 7. Don't know
☐ 8. Other (specify)
☐ 9. Borehole

29.b. How do you consider **your water source?**

A. Source 1
B. Source 2

☐ 1. Very good
☐ 2. Good
☐ 3. Bad
☐ 4. Very Bad
☐ 5. Don't know

30. For which **purpose** do you use **collected water?**

Purpose	Use	Priorities given in case of water shortage (up to 3)
A. Hygiene	☐ 1. Yes ☐ 2.No	
B. Drinking	☐ 1. Yes ☐ 2.No	
C. Cooking	☐ 1. Yes ☐ 2.No	
D. Cleaning clothes	☐ 1. Yes ☐ 2.No	
E. Livestock needs	☐ 1. Yes ☐ 2.No	
F. Farming needs	☐ 1. Yes ☐ 2.No	
G. Other (specify)	……..	

31. What is the **estimation of the total quantity of water used daily by your household?**

☐ 1._____(specify unit) ☐ 2. Don't know

32.a. Do you face any **problem with your water source**? ☐ 1. Yes ☐ 2.No

32.b. If YES, could you detail them:

A. Water quantity
- ☐ 1. Water shortage
- ☐ 2. Variation of the available quantity
- ☐ 3. No problem
- ☐ 4. Other (specify)……..

B. Water quality
- ☐ 1. Bad colour
- ☐ 2. Bad odour
- ☐ 3. Bad taste
- ☐ 4. No problem
- ☐ 5. Other (specify)……..

33. Did or do you participate **in community self-help group or NGO activity**? ☐ 1. Yes ☐ 2.No

34.a When do you **wash your hand at home**?

- ☐ 1. After agriculture work
- ☐ 2. After defecating
- ☐ 3. Before cooking

☐ 4. Before feeding the children
☐ 5. Before eating
☐ 6. Other (specify)…….
☐ 7. Never

34.b Do you **use soap** to wash your hand?
☐ 1. Always
☐ 2. Sometimes
☐ 3. Never

34.c If sometimes or never, what **difficulties are you facing to use soap/ash more often**?
☐ 1. No need
☐ 2. Lack of financial means
☐ 3. Soap not available on the market
☐ 4. Don't know
☐ 5. Other specify)……

35.a. Are **diseases transmitted by dirty hands**? ☐ 1. Yes ☐ 2.No ☐ 3.Don't know

35.b. Are **diseases transmitted by unsafe water**? ☐ 1. Yes ☐ 2.No ☐ 3.Don't know

SANITATION

36. **Distance** from the HH to the **sanitation facility**:
☐ 1. Less than 250 m
☐ 2. 250 to 500 m
☐ 3. More than 500m
☐ 4. Don't know

37. Which **type of sanitation facility** are you using?

A. Improved sanitation facilities
☐ 1. Septic tank
☐ 2. Ventilated improved pit latrine
☐ 3. Pit latrine with slab

B. Unimproved sanitation facilities
☐ 4. Open pit
☐ 5. No facilities / field
☐ 6. Other (specify)

38. How do you evacuate / destroy your **garbage?**
☐ 1. Burning

☐ 2. Buried
☐ 3. Left in open
☐ 4. Other (specify)……..

39.a. How do you evacuate / destroy the **child stools**?

☐ 1. Put into latrines
☐ 2. Thrown into garbage
☐ 3. Buried
☐ 4. Left in the open
☐ 5. Other (specify)……

39.b. Are **diseases transmitted by child stools**? ☐ 1. Yes ☐ 2.No ☐ 3.Don't know

OBSERVATIONS AT HOUSEHOLD LEVEL

40. **Food aspect observations**. Could we have a look on your kitchen or where you stock the food items?

Food storage	Observation	Comments
A. Food items are stocked in a safe place (protected from rats…)	☐ 1. Yes ☐ 2.No	
B. Food is protected covered	☐ 1. Yes ☐ 2.No	
C. Cooked food is kept in a clean container	☐ 1. Yes ☐ 2.No	
D. Absence of flies	☐ 1. Yes ☐ 2.No	

41. **Enabling facilities**.

Enabling facilities	Presence
Soap	☐ 1. Yes ☐ 2.No
Tooth brush	☐ 1. Yes ☐ 2.No
Toothpaste	☐ 1. Yes ☐ 2.No
Shampoo	☐ 1. Yes ☐ 2.No

Towel	☐ 1. Yes ☐ 2.No
Washing powder	☐ 1. Yes ☐ 2.No
Hand washing point	☐ 1. Yes ☐ 2.No
Brooms	☐ 1. Yes ☐ 2.No
Garbage pit	☐ 1. Yes ☐ 2.No
Pot track	☐ 1. Yes ☐ 2.No

42**. General hygiene**:

General hygiene	Observations	Comments / Justification
Cleanliness of the house	☐ 1. Good ☐ 2. Middle ☐ 3. Poor	
Cleanliness of the environment around the house	☐ 1. Good ☐ 2. Middle ☐ 3. Poor	
Cleanliness of the kitchen	☐ 1. Good ☐ 2. Middle ☐ 3. Poor	
Hygiene the HH sanitation situation	☐ 1. Good ☐ 2. Middle ☐ 3. Poor ☐ 4. None	
Hygiene the HH water situation	☐ 1. Good ☐ 2. Middle ☐ 3. Poor ☐ 4. None	

APPENDIX 5 : Variable creation

From each questionnaire (or household) about a hundred of variable are resulting in the database. The first step of the multivariate analysis consists in reducing this large amount of variables building scores.
Scores are ordinal variables, meaning that a superior score correspond to a higher (or better) level for the considered characteristic (or factor). The following questions have been transformed as explained onto scores:

- Advantage Colostrum Knowledge Score:

Question 8.e: What are the **advantages to give the first milk within the 1st hour after birth** called "colostrum"?

☐ 1. Protection / Antibody
☐ 2. Child weight gain
☐ 3. Child growth
☐ 4. Don't know
☐ 5. Other to specify……..

The above question (from HH questionnaire) permits to construct three variables in the database. From these three variables the score of advantage of colostrum knowledge was created.
 Advantage of colostrum knowledge [AdvgColoKnowledge] is an ordinal variable:

- 0 = "Don't Know"
- 1 = "one answer"
- 2 = "two aswers"
- 3 = "three answers"

- How Long First Breastfeeding Score

This score consider the delay from birth to colostrum intake. [HowLongFirstBFScore] is an ordinal variable:

- 0 = "No breastfeeding"
- 1 = "After 3 days"
- 2 = "After 6 hours"
- 3= "Before 6 hours"
- 4="After 1hour"

- IYCF Practice Score:

Question 9: Which of the following describes your **child's feeding pattern** NOW?

☐ 1. The child is breastfeeding exclusively
☐ 2. Breastfeeding and consuming other types of food or drink
☐ 3. Not breastfeeding at all

The sample has been stratified by age group in order to assigned differently points according to the adherence of IYCF practices.
Four age group have been defined and points have been attributed according to the IYCF practice (0=Bad practice; 1=Acceptable practice; 2=Good practice), see the above table.

IYCF Practices Score	**Age groups**			
	0-6 months	6-12 months	12-24 months	>24 months
Exclusive BF	2	1	0	0
Complementary Fding.	1	2	2	2
No BF	0	0	1	2

- Advantage Breast Feeding Knowledge Score:

Question 10.c: What are the **advantages to give breastfeeding to a child?**

☐ 1. Protection / Antibody

☐ 2. Adapted composition for the child development
☐ 3. Ready to use
☐ 4. Cheap
☐ 5. Don't know
☐ 6. Nutrient

In the above multiple-answer question the six possibilities have been divided into three categories. Answers 1, 2 and 6 were considered has related to Health. Answers 3 and 4 were considered has Practical.
The score have been constructed attributing O=Don't know, 1=Practical consideration of BF, 2=Healthy advantage of BF and 3=Healthy and Practical considerations of BF.

- Complementary Feeding Practice Score

Question 11.a: **At which age** did you give to your child something to **eat or drink besides breast milk?**
Child age: ……(months).

This score were also considering age group. When first food was introduced before 4 month (=0 point), if between 4 to 8 months (=2 points), if between 8 to 12 months (=1 point) and if after 12 months (=0 point).

- Complementary Feeding Knowledge Score

Question 11.b: **At which age** a child is able to eat **other food or drinks in addition to the breastfeeding?**
☐ 1. From birth
☐ 2. Before 3 months.
☐ 3. After 3 months
☐ 4. From 6 months
☐ 5. Don't know
☐ 6. From 10 months

This score were also considering age group. When mother considered first food could be introduced 'From birth', 'Before 3 months' or 'Don't know' (=0 point), 'After 3 months' or 'After 10 months' (=1 point) and if after 'From 6 months' (=2 points).

NB: 1 point was attributed for introduction of food 'After 3 months' or 'After 10 months' because in the first case, The IYCF recommendation indicates from 4 to 6 month for the introduction of the first aliment. In the second case, if the child was weak between 6 to 10 month, exclusive BF is preferable (anyway, only 14 cases are concerned).

- NO Difficult Food Access

Question 13.c: Which **difficulties** are you facing to get these food items?
☐ 1. Lack of money
☐ 2. Lack of availability (Market)
☐ 3. Cost
☐ 4. No difficulties
☐ 5. Other (specify)……

The above question were dichotomized (Yes/No variable) in
- 0 = "Access Problem (cost, money, presence, small harvest)"
- 1 = "No Pb"

- Increase or Decrease of the amount of Food, Drinks and Breastfeeding during Illness of Child (3 scores).

Questions: if you give less, the same amount or more food/drinks/BF to your child when he got health problem? Were recoded as ordinal variables (0=less quantity, 1= same amount, 2=more quantity) for the following variables IncreaseIllFood, IncreaseIllDrink and IncreaseIllBF

- Cause of Child Diarrhea Knowledge Score

Question 17: What are the **causes of child diarrhea?**
☐ 1. Will of God
☐ 2. Poor Sanitation
☐ 3. Development of Milk teeth
☐ 4. Too much sun
☐ 5. Food contamination
☐ 6. Don't Know
☐ 7. Uncleanliness

First of all, scores of 0/1 were attributed to wrong/right knowledge. Some household had answered up to three answers. Score from one to three were attributed according to the number of correct answer.

- Household Employment Score

Question 20: Who **is working** in your HH? ☐ 1. None
☐ 2. Husband
☐ 3. Self
☐ 4. Oldest child (1)
☐ 5. Grand Parents
☐ 6. Parents
☐ 7. Grand Parents
☐ 8. Last born
☐ 9. Uncle

This score consider who and how many people are working in the HH. Score is from 0 to 3 (0= none works, 1=one person or mother works, 2=head of HH or two person work, 3=head of HH + other (s) work).

- Crop Diversity Cultivated Household Score

Correspond to the number of different crop cultivated by the household.

- Livestock Diversity Owned Household Score

Correspond to the number of different livestock species owned by the household.

- Water Source Type Score

Question 29.a: From which **type of water sources** do you collect water?
☐ 1. Protected well
☐ 2. Protected spring
☐ 3. Tap
☐ 4. Unprotected well
☐ 5. Unprotected spring
☐ 6. Dam / lake / canal/river
☐ 7. Don't know
☐ 8. Borehole

An ordinal variable was design according to the answer of the above question.
0= 'Dam / lake / canal/river', 1= 'Unprotected spring',2= 'Protected spring', 3= 'Unprotected well', 4= 'Protected well',5= 'Borehole', 6= 'Tap'.

- Wash Hand Score

Question 34.a: When do you **wash your hand at home**?

☐ 1. After agriculture work
☐ 2. After defecating
☐ 3. Before cooking
☐ 4. Before feeding the children
☐ 5. Before eating
☐ 6. Other (specify)…….

This score count the number of different occasion the respondent wash his hands.

APPENDIX 6 : Focus group discussion guide

A. Feeding practices.

7. What are the feeding practices in this area from birth to 2 years.
    a. What are the early breastfeeding, exclusive breastfeeding and continue breastfeeding practices in your community?
    b. What are the reasons supporting these practices?
    c. Which difficulties did you met to follow the recommended feeding practices?

8. What is the composition of a common meal for a child of 1 year ½ old in this area?
    a. Do you think the mentioned food items composed a balanced meal?
    b. Do you use to eat fruits? Animal proteins sources?
    c. What are the main difficulties faced to reach the food requirement?

9. What are the feeding changes over the year (pot size and meals number)?

10. What are the feeding practices during child illness?

11. Who are the influent key persons and the decision maker on child feeding practices?

12. What is the average of the daily food expenses?

B. Farming practices

7. What are the main farming crops in this area?
    a. What are the reasons explaining the selection of these crops?
    b. What are the difficulties faced for cultivating the entire field?
    c. Who is the decision maker on crop selection, planting and harvesting timing?

8. How was the situation of the past harvests?
    a. What are the main causes of a poor harvest?
    b. What are the main household consequences of a poor harvest?
    c. What are your main copying mechanisms?
    d. What are the main household priority in case of good harvest / more money?

9. Did you notice price variations of food and essential items over 2010?
    a. How much was the price variation?
    b. Do you know the reason of the increase?

10. Is high unemployment in Zimbabwe affecting you in this area?

C. Livestock situation

4. What is the current livestock situation compare with the previous year?
    a. What were the causes of livestock decrease?

5. How livestock head numbers are updated in your community to the District?

6. What do you do when one of your livestock head is sick?

D. Health access

1. When your child is sick what do you do?
    c. What do you do in priority?
    d. What do you do in case the disease persists?

2. Did you attend Antenatal Care and why ANC is important?

3. Did you hear about malnutrition?
    c. How do you recognize a malnourished child?
    d. What are the main causes of malnutrition in your area?

4. What are the perception and impacts of HIV/AIDS in your community?
    a. Are people with HIV/AIDS stigmatized in the community?
    b. Can people speak freely about HIV/AIDS with friend and with the couple?

11. Are you children fully immunized against recommended vaccinations?

12. Do you have regular contact with a Village Health Workers?
    a. Is the existing VHW active in your community?
    b. How often did you see him?
    c. For which type of community activity do you see him?

D. Water access

1. How do you have access to the water?
    e. What is the type of water facility you get water?
    f. How long it take for you to go and come back?
    g. How often do you go to take water?
    h. What are the quantities you carry per trip?

2. What are the consequences of water shortage at household level?
    a. What are the consequences in terms of water use?
    b. What are the consequences on the women daily planning?
    c. What are the variations of water availability over the year?

3. Do you treat the water before drinking?
    a. Which method are you using?
    b. Is your water can transmit diseases and which types?

4. Do you have access to enabling facilities in your community?

E. Sanitation access

2. How is the sanitation situation in your community?
    a. How many household have access to latrines?
    b. Where people without latrines go to defecate?
    c. Can child stools transmit diseases?
    d. Did you try to solve water & sanitation issues at community level?

F. General data

1. Could you describe your daily planning?
2. What are the main problems faced in your community?
    a. What are the main problems?
    b. Could you rank the mentioned problems?

APPENDIX 7 : Key informant interview guide

Interviews with health professionals

- Child health and nutrition knowledge of the mother;
  - → Exclusive breastfeeding practices;
  - → Continue breastfeeding practices;

- Feeding practices during child sickness;

- Malnutrition problematic in the area;

- Influences on feeding practices.

- HIV/AIDS access in the community, perception.

- Consequences of the shortage of skilled health staff in the District on the health access;

Interviews with animal health professional

- Main problematic affecting livestock in Chivi District;
  - → Trends over the past year, per type of livestock.
  - → Trends over the last year for cattle.

- Existing decentralized animal health services in the District.

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USAL ANALYSIS

ACTION AGAINST HUNGER

The Link NCA methodology was developed by Action Against Hunger – France with technical support from our scientific committee including multi-sectorial experts and eminent scientists from Tufts University | Friedman School of Nutrition Science and Policy, the French Institute for Development Research (IRD), and World Food Program (WFP).

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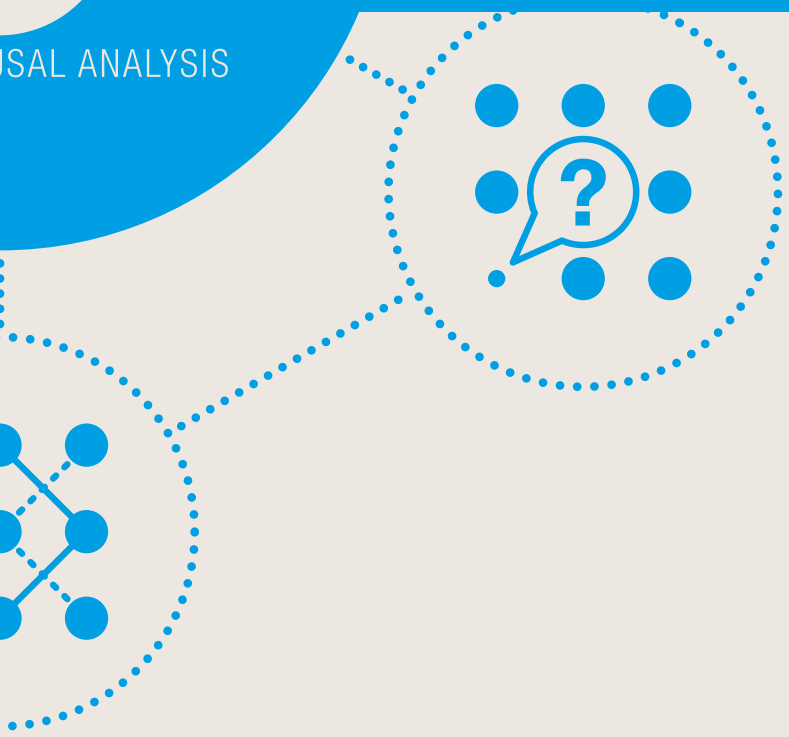

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