

May 2021



## Women's knowledge on the seasonality and causes of child malnutrition in Marsabit County, Kenya

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This publication was produced under the Nawiri project supported by the United States Agency for International Development (USAID) Bureau for Humanitarian Assistance (BHA). The project's goal is to sustainably reduce levels of acute malnutrition among vulnerable populations in Kenya's arid and semi-arid lands (ASALs). The project is being implemented in Isiolo and Marsabit Counties by a consortium led by Catholic Relief Services, and in Samburu and Turkana Counties by a consortium led by Mercy Corps.

**Suggested citation:**

Burns, J., A. Catley and H. Mahmoud. (2021). Women's knowledge on the seasonality and causes of child malnutrition in Marsabit County, Kenya. USAID Nawiri project.

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**Map design:**

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This publication was possible thanks to the generous support of the people of the United States of America, through the United States Agency for International Development (USAID). The contents are the responsibility of Catholic Relief Services (CRS) and do not necessarily reflect the views of USAID or the United States Government.



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# Acknowledgments

The report is based on an analysis with women in Marsabit County, Kenya; their time and assistance was greatly appreciated. The field work was supported by Raffaella Adiyakhiso Bulyaar, Chuluqe Abdulai Jarso, Himra Mohamed Intalo, Mary Bilach Huka, Felista Ntesekwa Timaado, Rahma Osman Huka, Joy Sariyon Leparleru, Judy Oreheya, Muslima Adan Abdi, Galm Guyo, Nicholas Lotini Eregae, and Jacinta Eliokono. The training of the field teams was led by Dr. Raphael Lotira Arasio with support from Mesfin Ayele Molla from the Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University Karamoja Resilience Support Unit. Logistics, administrative, and management support was provided by Dr. Joan Othieno, Ilias Iman, Dr. Mourad Aidi, Margaret Kahiga, Ben Mose, Dida Ali, and Thomas Musyoki from Catholic Relief Services Nawiri project; James Galgalo, Isacko Molu, Caleb Mosoti, Lamech Onyari and Ronald Machoka Ratemo from Caritas Nawiri project; and Bob Kaugi from Concern Worldwide Nawiri project. We would also like to thank the team from Veterinaires Sans Frontiers (VSF) Germany and the One Health project in North Horr for providing valuable insights on livestock and livelihood issues in the sub-county. We are also grateful for the support provided by Dr. Abubakar Hussein, from Isiolo County Government, and Dahabo Adi Galgalo, Shake Stephen Katelo, Juma Wolde Wesa, Tari Doti, and Galm Guyo from Marsabit County Government.

# Acronyms and Abbreviations

ASALs	Arid and semi-arid lands
GAM	Global acute malnutrition
HIV	Human immunodeficiency virus
HSNP	Hunger Safety Net Programme
KES	Kenya shillings
PE	Participatory epidemiology
SILC	Savings and internal lending communities
USAID	United States Agency for International Development
VSF	Vétérinaires Sans Frontières

# Summary

This report presents the results of a participatory analysis of the causes and seasonality of malnutrition in children and mothers in North Horr and Loiyangalani wards in Marsabit County, Kenya. The investigation was undertaken as part of the Nawiri project, the goal of which is to sustainably reduce levels of persistent acute malnutrition in Kenya's arid and semi-arid lands (ASALs).

The analysis set out to investigate the causes and seasonality of malnutrition and associated factors from the perspective of mothers living in the two areas of investigation. This was done with the overall objective of identifying demand-driven programming areas and interventions to address acute malnutrition. The exercise also aimed to test whether the participatory epidemiology (PE) methods piloted by Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University in Uganda could be replicated in the context of the Kenyan ASALs. The exercise involved an initial ethnographic review to understand local language terms around mother and child nutrition followed by the fieldwork involving two PE methods, a monthly calendar and a causal diagram. These exercises are designed to facilitate a joint analysis with participants on the causes and seasonal patterns of malnutrition and the relationship between them. The field work was carried out in 14 communities in North Horr and 16 communities in Loiyangalani. Although the two areas differ in terms of livelihoods, culture, and ethnicity, similar findings emerged from both locations. North Horr is inhabited by the Gabra, who practice expansive mobile livestock production and specialize in camel husbandry. During the dry season, the men migrate with the majority of the animals to dry season grazing areas in search of pasture. The women and children remain behind with a few animals. Loiyangalani is predominantly inhabited by the Turkana, who raise small ruminants and camels. However, fewer people own camels, herd sizes appear to be

considerably smaller, and livestock movements are more restrictive than in North Horr. The Turkana in Loiyangalani are also more engaged in non-livestock-related economic and livelihood activities such as fishing, and the collection and sale of firewood and charcoal.

## Key Findings

- The results show that malnutrition increases during the dry season and improves during the wet season. In Loiyangalani, child malnutrition peaks in August. In North Horr, peaks are experienced in January and then to a slightly lesser extent in July. Participants attribute the malnutrition peaks to the absence of livestock products such as milk and meat for consumption. The availability of these products closely corresponds with local rainfall patterns and the availability of pasture. Although camel milk is available during the dry season, in North Horr the majority of animals move to distant grazing areas (*fora*) during this period, and women and children therefore don't have access to the milk.
- In addition to the seasonal lack of livestock products, participants identified a lack of income as the second- or third-most important factor contributing to both maternal and child malnutrition in both areas. Lack of income was mostly in reference to participants' inability to purchase nutritious foods, specifically high-quality proteins and fats, during the dry season. The remoteness of the two areas along with limited infrastructure means that the cost of basic foods is considerably higher than in more connected parts of the country. There are very few meaningful income-earning opportunities, particularly for women, many of whom depend on selling firewood and charcoal during the dry season in order to make ends meet. Although the lack of income was largely associated with food purchases, other costs

such as schooling and health care are often prioritized over purchasing more nutritious foods. Women therefore have to make difficult decisions on how best to spend the little money they have, and this often comes at the expense of a balanced diet.

- Human disease was identified as one of the most important factors contributing to child and maternal malnutrition in both areas of investigation. Mostly this factor was associated with diarrhea, which increases during the dry season. Participants associated diarrhea with poor water quality, poor child hygiene practices when the children are unattended for long periods of time, and the consumption of certain types of “hunger foods,” including blood and acacia pods. Other human disease and infections, including pneumonia, human immunodeficiency virus (HIV), malaria, tuberculosis, and other respiratory diseases, are also associated with malnutrition but with less of a direct link, particularly in terms of seasonality. For example, participants frequently made a connection between some of these diseases and a loss of appetite. They also clearly described symptoms of kwashiorkor and marasmus as diseases that lead to children being malnourished. Participants made a connection between anemia and malnutrition and attributed anemia to the lack of milk and meat, often in concert with non-spaced pregnancies.
- The analysis revealed a whole set of gender issues and cultural norms that directly or indirectly contribute to maternal and child malnutrition. These norms included issues around control over livestock assets and income, and decisions around household food and medical expenditures. Women spend a considerable amount of time on economic and livelihoods activities that yield minimal returns in terms of income or nutrition. More specifically, women’s workload is associated with the neglect of children, particularly during the dry season, which in turn is linked to poor child hygiene.
- There are also a number of social norms and cultural taboos around diet, exclusive breastfeeding, and child spacing that are potentially harmful to both mothers and children. However, women demonstrated

that they are knowledgeable and quite well informed on these issues; they proposed that gender-based programming should target men instead of them.

- Similarly, women are knowledgeable about nutritious foods and hygiene practices and their relationship to health and nutrition. However, they lack the income, time, or resources to effectively take advantage of this knowledge.
- Water will always be a top priority for communities living in the Kenyan ASALs. For some participating communities, the availability of clean water for human consumption was identified as such. The limited availability of clean water was linked to malnutrition, both directly in terms of deteriorating water quality during the dry season and indirectly in terms of the time women spend collecting water during the dry season. In communities where clean water is available throughout the year, water is less of a priority. However, in some of these communities, participants associated boreholes with a greater concentration of people and livestock, and an associated deterioration of browse and graze. As a result, any time savings for women collecting water is offset by them having to go farther to herd their animals or collect firewood and fodder.
- In both areas, the results suggest that a number of potential contributing factors may all work in concert at the same time that malnutrition peaks during the dry season. High-quality proteins from livestock and fish in the case of Loiyangalani are in short supply. Women’s workload increases, partly as a result of them expanding on time-consuming activities to earn enough income to purchase food. At the same time, their husbands are not around to help take care of the children because they are in the dry season grazing areas. And there is an increase in the prevalence of diarrhea due to a number of factors, including deteriorating water quality.
- Participants proposed interventions to address malnutrition that logically followed from the monthly calendars and causal analysis. The preferred interventions focused on income generation and livelihoods support, including access to inputs and capital as well as relevant



skills training. These activities largely, but not exclusively, focused on the livestock sector as well as the fishing sector in Loiyangalani. However, the specific intervention priorities varied across the assessment area depending on the different challenges and opportunities associated with different locations. This variation in priorities underscores the importance of designing context-specific interventions to address malnutrition or alternatively, providing more flexible forms of assistance such as improving access to credit.

# 1. Introduction

Kenya's ASALs are characterized by high levels of child malnutrition, particularly global acute malnutrition (GAM) or "wasting," which is often reported at between 10% and 20%. Despite significant investments in food security, health, and nutrition programming, these areas have seen an increase in the prevalence of wasting in recent years.<sup>1</sup> The Nawiri project was launched in 2020 in direct response to this concerning trend, with the objective of sustainably reducing levels of acute malnutrition in Turkana, Samburu, Isiolo, and Marsabit Counties. The project includes a two-year design phase to better understand local drivers of persistent acute malnutrition, and to design evidence-based and contextually informed interventions for a second implementation phase.<sup>2</sup> As part of this design phase, a participatory epidemiology (PE) exercise was carried out in Isiolo and Marsabit Counties from February to March 2021 with the overall objective of identifying context-specific and demand-driven interventions for Nawiri. This report presents the findings of the analysis in Marsabit County.

## 1.1 Livelihoods and malnutrition in Marsabit

Marsabit is the largest county in Kenya in terms of land area and is mainly desert or semi desert.<sup>3</sup> The county has three ecological zones that range from arid to very arid, and one smaller sub-humid ecological zone.<sup>4</sup> Prominent geographical features include Mt. Marsabit, Mt. Kulal, the Hurri Hills, and the Chalbi Desert. There are no permanent

rivers, but to the west, the county is flanked by the saline Lake Turkana, the largest desert lake in the world. The county experiences high temporal and spatial rainfall variability, which makes it well suited to pastoralism involving mobile livestock production, in which the majority of the population are engaged.<sup>5</sup>

Pastoral livestock production in the county involves seasonal migrations with a mixture of cattle, camels, and small ruminants. Typically, the younger men move with the animals for extended periods of time, and the women and children remain behind in more established settlements. The distance and duration of these migrations is determined by factors such as the type of animals owned, drought, and insecurity. Livestock raiding is common between different ethnic groups competing for rangeland and water resources. Herd composition varies across the county depending on a number of factors including climate, vegetation, cultural preferences, and market opportunities. An estimated 70% of household income within the county is derived from livestock production.<sup>6</sup>

The county is prone to drought, with severe droughts causing high livestock mortality and related impacts on livelihoods.<sup>7</sup> Drought is often cited as a cause of declining livestock ownership, leading increasing numbers of livestock-poor households to diversify their livelihoods.<sup>8</sup> As human population continues to rise, there is increasing inequality and destitution.<sup>9</sup> For

1 USAID/Kenya 2015.

2 USAID 2019.

3 Czuba 2018.

4 Marsabit County Government 2018.

5 See Marshak forthcoming, Birch forthcoming, and Krätli 2015.

6 Mburu et al. 2017.

7 See Fratkin et al. 2004, Hazard et al. 2012, Mburu et al. 2017, Stites 2021.

8 Mburu et al. 2017.

9 Catley and Aklilu 2013.

example, a recent study in Marsabit reported that over 70% of households were both income poor and livestock poor, and required external support.<sup>10</sup>

Along with other ASAL counties, Marsabit consistently experiences high levels of acute malnutrition, even in non-drought years. A recent analysis of nutrition data by Kenyatta University showed rates of GAM in Marsabit County persistently above the emergency threshold of  $\geq 15\%$ .<sup>11</sup> In the period from 2010 to 2019, the county experienced seven years where GAM rates were above this threshold and three years within the critical threshold (10–14.9% GAM).<sup>12</sup> Of the four sub-counties, North Horr and Laisamis were classified as malnutrition “hotspots” by the study, with GAM consistently exceeding the 15% threshold.<sup>13</sup> In 2019, GAM rates in North Horr and Laisamis sub-counties were 25.1% and 30.7% respectively.<sup>14</sup> Although Saku and Moyale sub-counties are not considered malnutrition hotspots, the study cautions that pockets of acute malnutrition occur within these sub counties.<sup>15</sup> However, all the wards in North Horr and Laisamis were classified as “hotspots,” with North Horr and Turbi wards in North Horr sub-county having the highest rates of acute malnutrition. Loiyangalani and Kargi South have the highest rates in Laisamis.<sup>16</sup>

The response to acute malnutrition in Africa’s drylands, including the Kenyan ASALs, has overwhelmingly focused on treatment, not prevention.<sup>17</sup> Consequently, the research emphasis has been on the immediate and underlying causes of malnutrition, and little is understood about the more systemic or basic causes such as environment and seasonality, systems and institutions, and livelihood systems.<sup>18</sup>

It is recognized that the drivers of acute malnutrition are highly variable in pastoralist areas, both contextually and seasonally,<sup>19</sup> and recent analysis of data specifically on Marsabit points to important gaps in understanding of seasonal factors and context-specific drivers.<sup>20</sup> The Nutrition Framework for Africa’s Drylands<sup>21</sup> has been adopted as the conceptual framework for the Nawiri project and gives renewed emphasis to these systemic causes or drivers of malnutrition. The PE study aimed to partially address these gaps by investigating the seasonality of maternal and child malnutrition and associated factors from the perspective of mothers living in malnutrition hotspots in the county. Through this analysis, the study also aimed to identify contextually relevant interventions to inform the second phase of the Nawiri project.

## 1.2 Participatory epidemiology (PE)

In the 1990s, veterinarians in East Africa started to adapt participatory approaches and methods to investigate livestock diseases, especially in remote and conflict-affected pastoralist areas. An important aspect of the approach was a recognition that pastoralists often possessed strong knowledge on livestock production and diseases, including on the clinical signs and epidemiology of diseases. Over time, this use of participatory methods became known as “participatory epidemiology” (PE), and was widely used by researchers, practitioners, government epidemiology units, and international agencies such as the World Organization for Animal Health, and the Food and Agriculture Organization of the United Nations.<sup>22</sup> One adaptation included the standardization and repetition of PE methods

10 Mburu et al. 2017.

11 Ocholla et al. 2021.

12 Ibid.

13 Ibid.

14 Munene 2019.

15 Ocholla et al. 2021.

16 Ibid.

17 Young 2020.

18 Ibid.

19 See FAO and Feinstein 2018 and Catley et al. 2018.

20 Ocholla et al. 2021.

21 Young 2020.

22 Allepuz et al. 2017

that produced ranks, scores, or proportions, thereby creating datasets that could be analyzed statistically. This approach led to estimates of disease incidence and mortality, analysis of seasonality and causation,<sup>23</sup> and an understanding of complex syndromes involving multiple infections.<sup>24</sup>

In contrast to veterinary research and national livestock disease surveillance systems, the use of participatory approaches and methods in the human health and nutrition sectors has been limited in pastoralist areas. Examples include a participatory assessment of women's health in southern Ethiopia,<sup>25</sup> and studies on malnutrition in the Somali Region of Ethiopia<sup>26</sup> and Karamoja.<sup>27</sup> In 2018, Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University piloted PE to specifically look at the causes and seasonality of malnutrition in pastoralist and agropastoralist communities in Karamoja, Uganda.<sup>28</sup> The study demonstrated that in contrast to more conventional methods, analysis using PE can generate a wealth of rigorous information that is technically plausible within a matter of weeks or months. It also yielded detailed information on the causes of malnutrition and the relationship between these causes and seasonality and livelihoods. The study also identified new seasonal patterns of malnutrition missed by biannual nutrition surveys.<sup>29</sup> These results encouraged the Nawiri partners to propose further piloting and testing of the PE approach in the context of the Kenyan ASALs.<sup>30</sup>

Under Nawiri, the PE approach was piloted in Marsabit (presented in this report) as well as Cherab and Chari wards in Isiolo County. The Marsabit component also included a case study in Mt. Kulal. A combined paper on the detailed methodology and experiences using PE methods across all these areas will be published in a separate report, as will the results from Isiolo and Mt. Kulal.

Although fairly recent, there appears to be a growing recognition of the potential of participatory methods in nutrition research. For example, in addition to the Karamoja and Nawiri studies, a recent mixed methods study looking at the causes and seasonality of malnutrition in Marsabit included some PE methods, and focused on local knowledge and perspectives.<sup>31</sup>

23 Catley et al. 2012.

24 Catley et al. 2001.

25 Tezera and Desta 2008.

26 Sadler and Catley 2009.

27 Stites and Mitchard 2011.

28 Catley et al. 2018.

29 Ibid.

30 Catholic Relief Services 2019

31 FAO et al. 2020.

# 2. Overview of the Design and Methods

As noted above, a detailed account of the methods used in the Marsabit analysis is available in a separate report.<sup>32</sup> This section summarizes the design and methods used for the analysis.

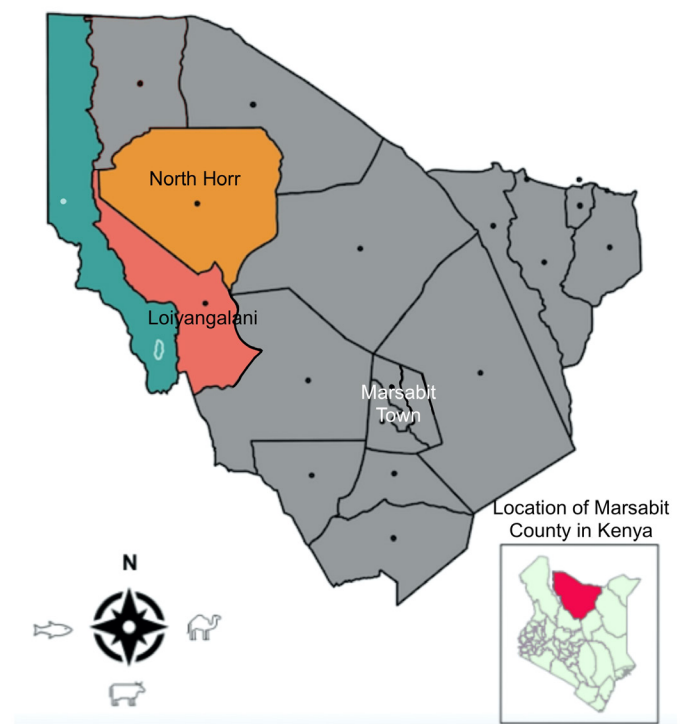
The design drew heavily on a study in Karamoja, Uganda in 2018 that successfully adapted PE methods to analyze the seasonality and causes of malnutrition.<sup>33</sup> In Marsabit, the exercise focused on selected malnutrition hotspots and three main questions:

- What is the seasonality of malnutrition and related factors?
- How do women describe and prioritize the causes of malnutrition in children and mothers?
- What are women’s suggestions and priorities for improving nutrition, and what is the reasoning behind their views?

Based on a Nawiri analysis of hotspots, North Horr and Loiyangalani wards (Figure 1) were selected for the analysis. Although both these areas have high rates of acute malnutrition, the specific areas selected differed in terms of ethnicity, livelihoods, and environment. In North Horr, the focus was on Gabra pastoralists specializing in camel production. In Loiyangalani, the focus was on Turkana pastoralists living close to the lake and engaged in fishing.<sup>34</sup> Both sub-counties are geographically isolated.<sup>35</sup> By road, North Horr is reached by a 4.5-hour drive from Marsabit town; Loiyangalani requires a 5.5-hour drive. In both areas, the specific assessment sites were distant from the main urban centers in each sub-county.

The field work was carried out in 13 villages in North Horr and 14 villages in Loiyangalani between February and March 2021.<sup>36</sup>

**Figure 1. Map of Marsabit county showing assessment areas.**



The analysis had three main stages, viz., an initial ethnographic review; training of local research teams and method testing; and application of the methods in the selected communities.

33 See Catley et al. 2018.

34 Some of these communities had intermarried or integrated with the El Molu but all identified as Turkana and spoke the language. They also identified as pastoralists, primarily focusing on livestock production.

35 The recent FAO/UNICEF study (FAO et al. 2020) on malnutrition focused in Laisamis sub-county in Marsabit. The main highway to Marsabit town runs through the sub-county, and the study worked with Rendille and Samburu communities.

36 PE methods were used in additional villages during field testing; however, those results were used for triangulation and for comparisons with objective rainfall data.

## Ethnographic review

An ethnographic approach was used to understand and document the local language used for malnourished women and children, age groups of children, months and seasons, and related issues. Interviews during this stage used photographs of malnourished women and children, which prompted in-depth discussions. This stage was conducted by an anthropologist with local language skills and long-term field experience in northern Kenya. Local language was used exclusively in the PE methods outlined below. Participatory epidemiology field teams The field work was carried out by a team of nine women from Marsabit and Isiolo counties who were fluent in at least one of the local languages. The team was led and supported by an anthropologist from Marsabit with extensive research experience in Northern Kenya, an epidemiologist from Marsabit County Government, and a Kenyan researcher with over twenty years' experience using participatory methods. In Loiyangalani, the team was supported by two experienced Turkana translators, one male and one female.

## Participatory epidemiology methods

The analysis used two PE methods, viz., a causal diagram and a monthly calendar. Each method was used with 13 independent informant groups in North Horr and 10 independent informant groups in Loiyangalani. Groups size varied from between 8 and 15 women.

The causal diagram (Figure 2) asked participants to identify and discuss the key causes of malnutrition for both women and children, using selected photographs of a child/mother with acute malnutrition as a visual reference. Each identified cause was then represented using a diagram, and the causes were scored by the informants by dividing a pile of 100 counters against the causes to show their relative importance. Further questions were used to probe the scores and understand relationships and linkages between causes.

The monthly calendar (Figure 3) exercise involved asking the participants to show monthly variations of different indicators such as rainfall, human disease, food availability, and child malnutrition.

**Figure 2. Example of causal diagram scoring exercise.**



This exercise was done by asking the participants to distribute 100 counters across the 12 months, using a typical year with a relatively normal wet season as a reference year. For example, participants were asked to show which months of the year they normally receive the most rain and were then asked to assign the most counters to that month. They were then asked to distribute the rest of the counters based on the relative amount of rain they received for each month of the year. Once consensus on the pattern of rainfall was reached, the participants were asked to repeat the scoring for the next indicator. Local terms for the different months were used and confirmed with participants by identifying a major activity or event that occurs in each month. This activity or event was used as a reference to make sure the researchers and participants were always talking about the same month. The scoring provided a basis for discussions around each indicator. For example, participants were asked why goat milk is more readily available at a certain time of the year and not another. Once all the indicators had been scored, the researchers and participants collectively analyzed and discussed the patterns between the different indicators and discussed the relationship between them.

The use of 100 counters per indicator for each of these exercises enabled the results to be recorded numerically and a total score calculated for each month and indicator. Further analysis used the Kendall coefficient of concordance to assess the level of agreement between groups.

Figure 3. Examples of monthly calendar exercises and illustrative results.



INDICATORS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
		Lomaruk <i>Making Bomas for Goats</i>	Titima <i>Grazing Herding</i>	El El <i>Fetching Water</i>	Lochoto <i>Making Ghee</i>	Losuban <i>Celebrations</i>	Lotiba <i>Wild Food Collection</i>	Lodunge <i>Looking for Pasture (migration)</i>	Lopoo <i>Cooking blood</i>	Lolongu <i>Collecting Firewood (12 hrs/day)</i>	Lokwang <i>Burning Charcoal</i>	Lomuk <i>Collecting Acacia pods</i>	Lorra <i>Cooking Acacia pods</i>
	Rainfall	***	****	*****	*****	****							
	Availability of goat's milk	***	****	****	*****	****	**						
	Consumption of purchased food	**	**	**	*	**	**	**	*****	*****	*****	*****	****
	Availability of fish (in the lake)	****	*****	*****	*****	*****	**	**	**	**	**	**	**
	Women's work (time spent away from children)	**	***	**	**	**	**	**	*****	*****	*****	*****	*****
	Child Malnutrition	***	*	*	*	**	****	*****	*****	*****	*****	***	*****

After completing the causal diagram and monthly calendar exercises, participants were asked to identify interventions that from their perspective will address malnutrition, taking into account the causes, seasonality, and other factors relating to nutrition that had been discussed. In each location, one of the causal diagram focus groups was asked to identify differences in diets between healthy and malnourished mothers and children.

Ad hoc proportional piling was used to get estimates on livestock ownership, livestock migrations, and other factors that emerged during

the discussions. The results were triangulated with other sources, including key informants and secondary data and literature.

In North Horr, complementary focus groups discussions were carried out with male participants in Barambate village and with women fetching water in North Horr town. In Loiyangalani, a focus group discussion was held with El Molo community members. Key informant interviews were carried out with representatives from Vétérinaires Sans Frontières (VSF) Germany, the One Health project, and county medical staff in North Horr. In

Loiyangalani, key informant interviews were held with an El Molo elder in Kamote village, a female fish trader in Nakuron village, and county medical staff in Loiyangalani town. The ward administrators in both areas were also interviewed during the exercise.

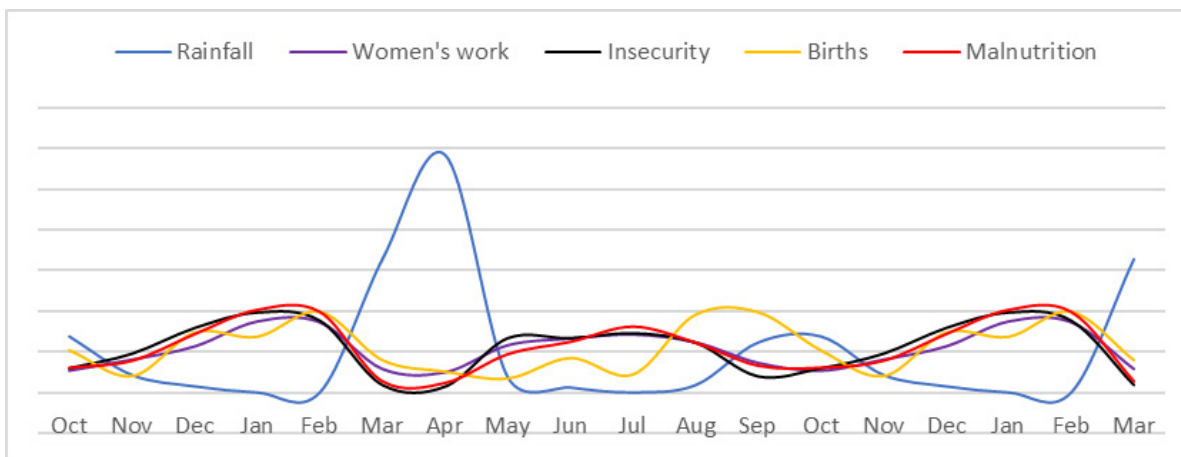
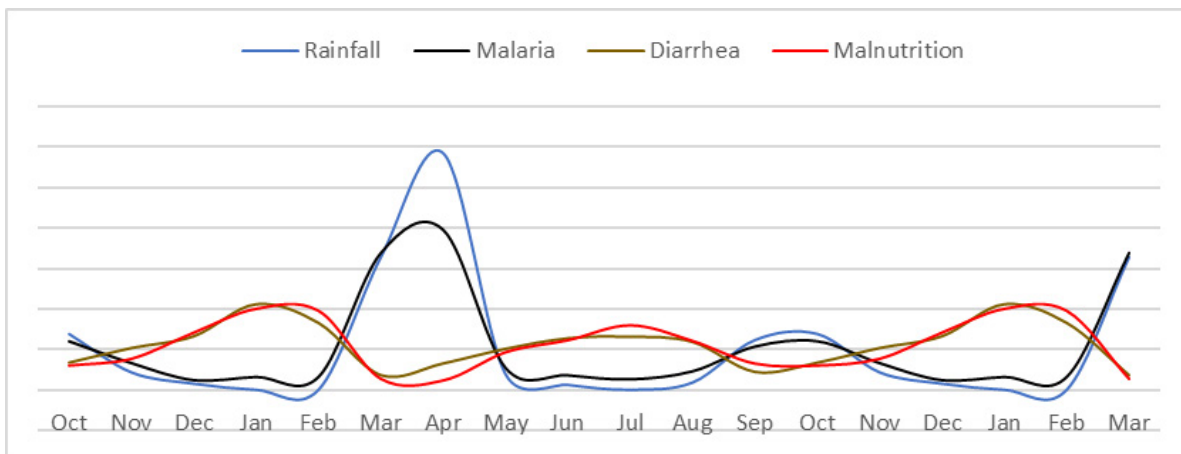
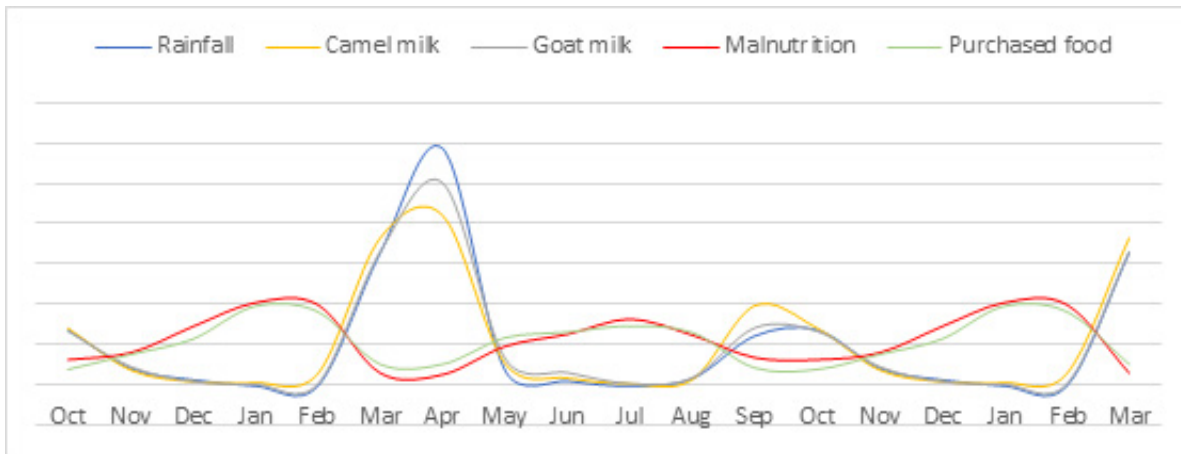




Photo: Gabra camels in North Horr

# 3. Results, North Horr

Figure 4. Monthly patterns of malnutrition and related indicators, North Horr.



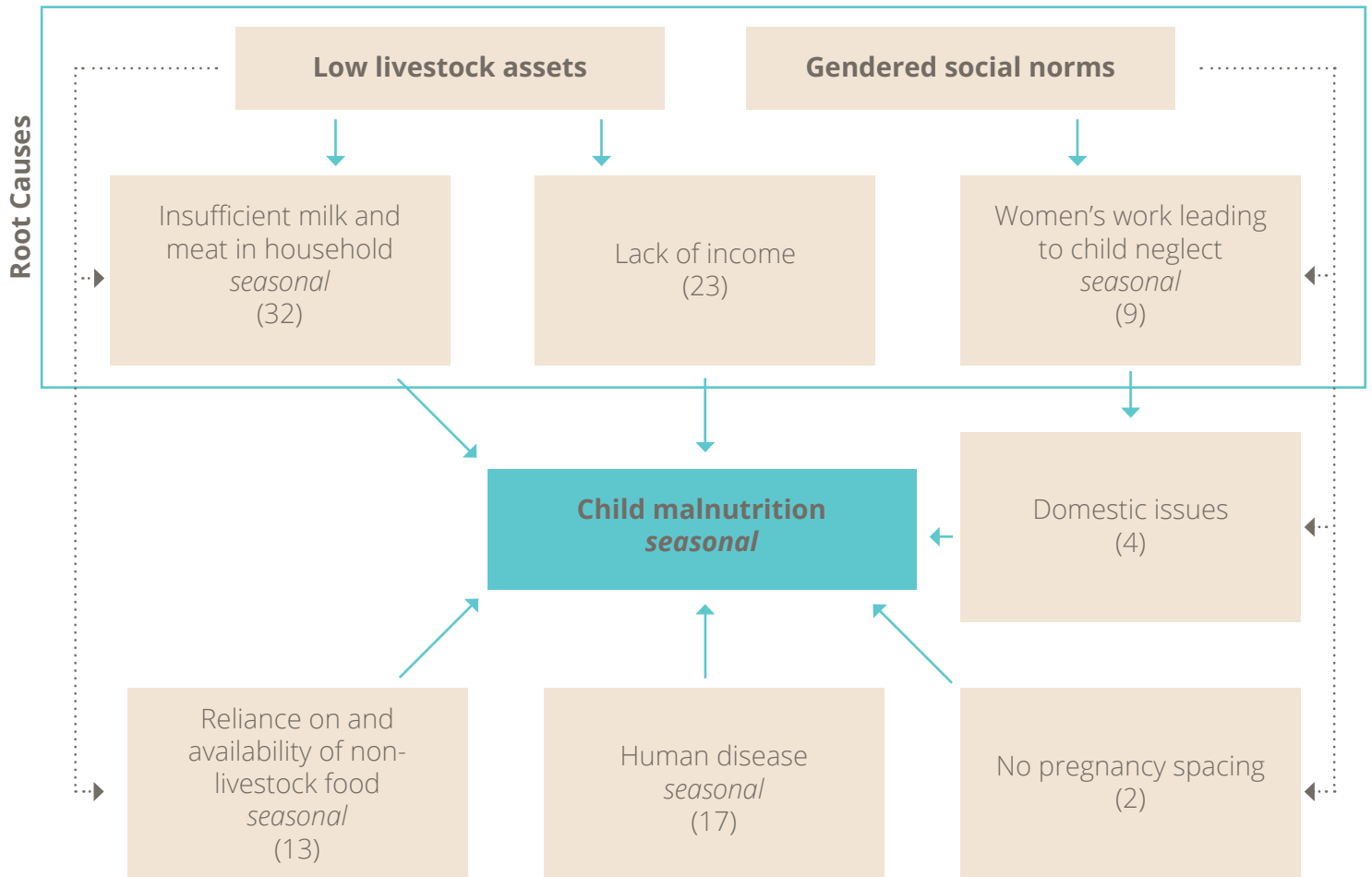
**Notes:** The diagrams were produced from the total summated scores for all indicators and months from 13 independent groups; the data were not summarized using averages. There is no y-axis scale because the number of counters used has no absolute meaning; the lowest level of malnutrition (or any other indicator) shown does not necessarily mean a level of zero. A total of 100 counters was available for each indicator, for distribution across the 12 months. An 18-month timeframe is used on the x-axis to clearly illustrate monthly patterns at the beginning and end of the year.

**Table 1. Level of agreement for monthly calendar indicators, North Horr (n = 13 groups)**

<b>Indicator</b>	<b>Kendal coefficient of concordance W</b>	<b>P-value</b>
Rainfall	0.776	< 0.001
Camel milk	0.757	< 0.001
Goat milk	0.732	< 0.001
Consume purchased foods	0.645	< 0.001
Women's work	0.664	< 0.001
Malaria cases	0.639	< 0.001
Diarrhea cases	0.469	< 0.001
Malnutrition	0.637	< 0.001
Insecurity	0.601	< 0.001
Human births	0.189	< 0.01

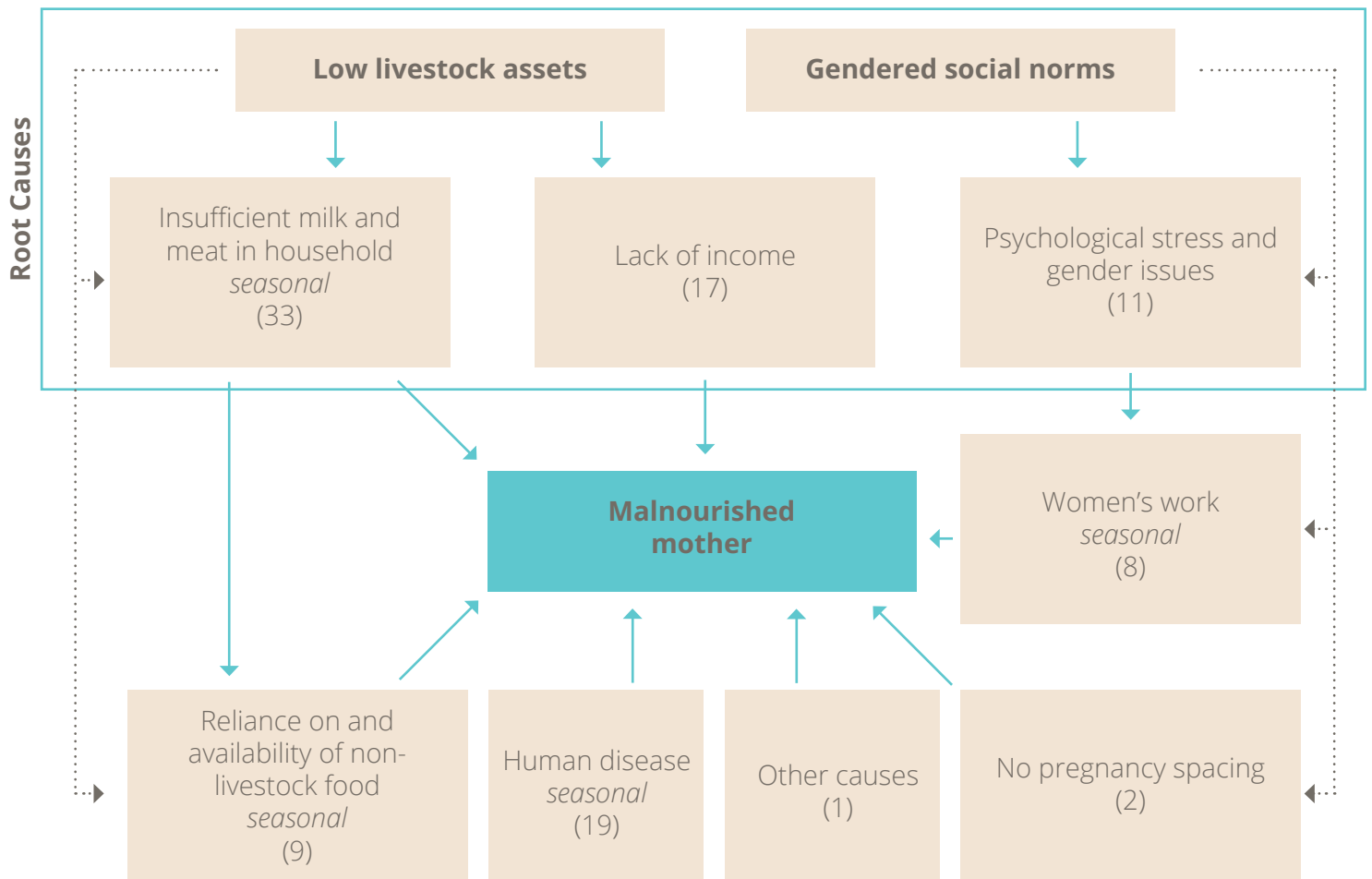
**Notes:** There is significant agreement between the 13 informant groups for all 10 indicators. This strongly indicates that the monthly calendar method is reliable.

**Figure 5. Causes of child malnutrition, North Horr.**



**Notes:** Figure derived from interviews with women in North Horr followed by proportional piling of causes with 13 independent groups of women. The figures in parentheses represent the scores from all the groups presented as a proportion of the total scores.

**Figure 6. Causes of malnutrition in mothers, North Horr.**



**Notes:** Figure derived from interviews with women in North Horr followed by proportional piling of causes with 13 independent groups of women. The figures in parentheses represent the scores from all the groups presented as a proportion of the total scores.

**Table 2. Level of agreement—causes of malnutrition, North Horr (n = 13 groups)**

Causes of malnutrition	Kendal coefficient of concordance	P-value
Children (North Horr)	0.733	< 0.001
Mothers (North Horr)	0.713	< 0.001

**Notes:** There is significant agreement between the 13 informant groups for both types of causal diagram. This strongly indicates that the causal diagram method is reliable.

**Table 3. Diets of healthy vs. malnourished children, North Horr**

Age	Healthy children	Malnourished children
0–5 months	<u>Types of food:</u> - Breastmilk - Boiled camel milk for 4 months <u>Introduced in month 5</u> - Cereals (rice, maize meal, injera) - Soft meat cooked rare so the child can suck on it - Maize (kernels chewed by the mother to soften it) and crushed beans - Ghee from sheep milk—but this is now being replaced with store-bought margarine	<u>Types of food</u> - Breastmilk - Camel milk for 4 months if available—often provided through kinship ties - Porridge from health center
6–9 months (up to 1 year)	<u>Types of food</u> - Breastmilk - Camel milk if the mother and child are in the <i>fora</i> - Same food as adults (maize, milk, tea and up to 3 meals a day)	<u>Types of food</u> - Breastmilk - Camel milk if available or Plumpy'nut if not* - Cereals (maize) - Less than 3 meals a day
1–5 years	<u>Types of food</u> - Breastmilk - Same food as adults (legumes, cereals, and milk and meat when these are available)	<u>Types of food</u> - Breastmilk—the child will nurse for at least 2 years and often up to 3 years - Cereals, <i>uji</i> (maize porridge made with water or milk if milk is available)

\* Plumpy'nut is a peanut-based ready-to-eat therapeutic food (RUTF) used in the treatment of severe acute malnutrition.

**Table 4. Diets of healthy vs. malnourished pregnant mothers, North Horr**

Age	Healthy pregnant mother	Malnourished pregnant mother
2 weeks to 3 months (first trimester)	<u>Types of food</u> - Meat and milk from her husband's animals when available - Cereals (pasta, rice, maize meal), meat, and cooking oil purchased on credit	<u>Types of food</u> - Milk from relatives' animals when available - Cereals (mostly maize) purchased on credit
4–6 months (second trimester)	<u>Types of food</u> - Cereals, beans, milk - Animal blood ( <i>but this is becoming less common nowadays</i> )	<u>Types of food</u> - Cereals and milk - Porridge from health centers
7–9 months (third trimester)	<u>Types of food</u> - Milk when available - Cereals and beans - Tea	<u>Types of food</u> - Milk when available - Tea

**Table 5. Diets of healthy vs. malnourished lactating mothers, North Horr**

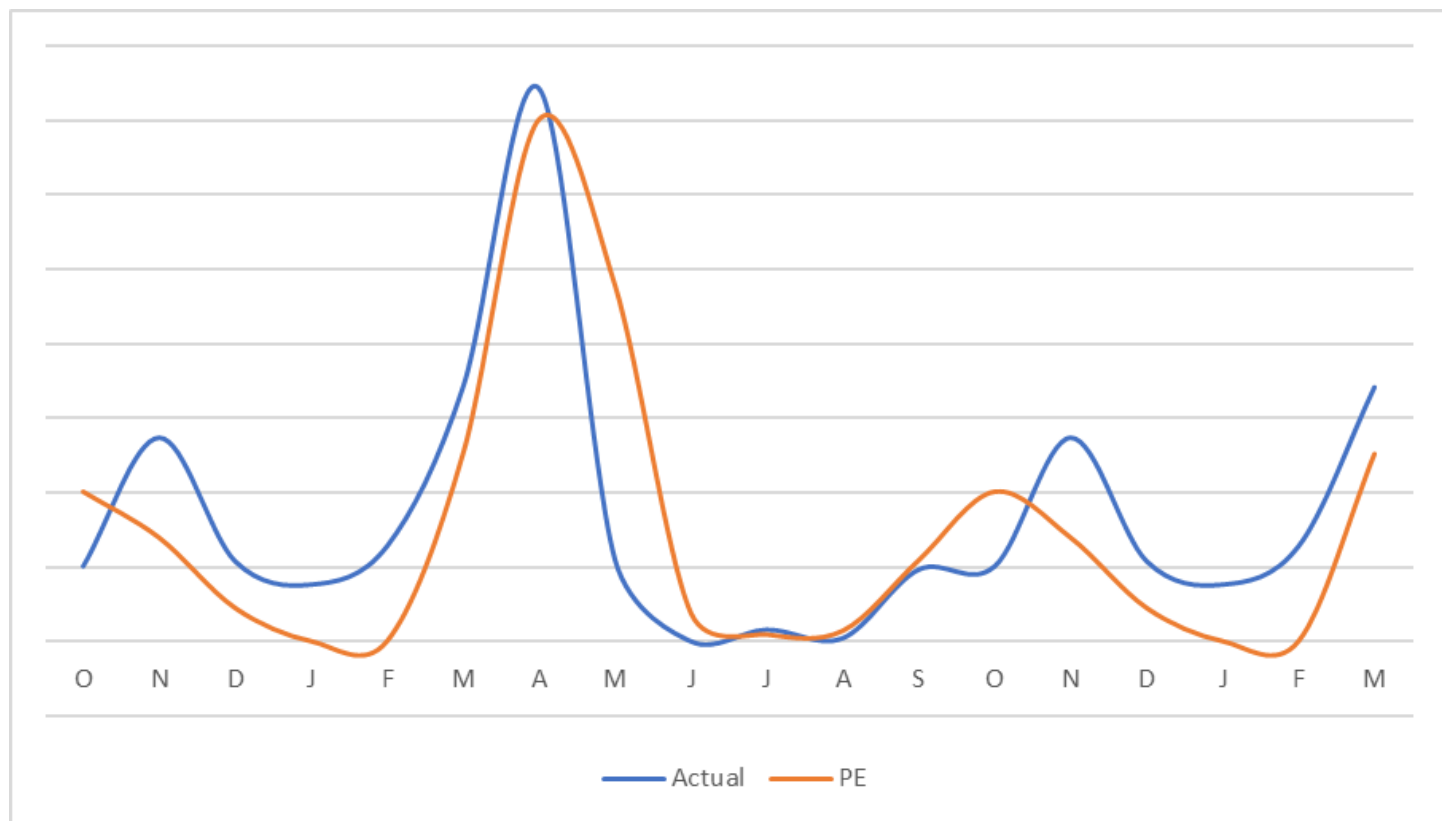
Age	Healthy lactating mother	Malnourished lactating mother
Just given birth (first 2 weeks)	<u>Types of food</u> -Not allowed food for 1 week (only black tea) <u>After 1 week</u> -Black tea and animal fat -Soup made from animal meat	<u>Types of food</u> - Not allowed food for 1 week (only black tea) <u>After 1 week</u> -Black tea and animal fat -Soup made from animal meat  <i>The only difference is that the malnourished mother is more reliant on kinship support, or they may have to sell or slaughter one of the few animals they own.</i>
From 3 weeks to 2 years	<u>Types of food</u> - Roasted meat frequently - After <i>Ulma</i> (1–2 months for the first pregnancy), they will eat regular foods such as meat, cereals, etc.  <u>Other</u> <i>For the first pregnancy, women will not do any hard chores for the first 2.5 months.</i>	<u>Types of food</u> - Roasted meat but not very often - After <i>Ulma</i> (1–2 months for the first pregnancy), they will eat whatever food is available  <u>Other</u> <i>For the first pregnancy, women will not do any hard chores for the first 2.5 months.</i>

### 3.1. Detailed explanations of monthly patterns

The results from the monthly calendars (Figure 4) were supported by explanations by the participants on the patterns of the different indicators depicted. Rainfall was always used as the first indicator because it can easily be compared with actual rainfall data to make sure the participants understand the method. Secondly, rainfall influences livelihoods, so it is a useful starting point to understand what's happening in a given context. Rainfall data collected from the police station in North Horr town since 2008 show rainfall peaking in April, with a much smaller second peak in November. The results from the PE analysis shows the same peak in April and the smaller second peak in October. The overall distribution from the PE results which represents a “typical” year is very similar to the thirteen-year average from one location in North Horr (Figure 7).

The women across all groups agreed that malnutrition is highest during the dry season with the main reason being the absence of livestock products for consumption. The results show that the availability of both camel milk and goat milk corresponds with the short and long rains. In the case of goat milk, production increases during the rains, whereas camel milk is more or less produced throughout the year. However, during the dry season the majority of the animals move to distant grazing areas (*fora*) in search of pasture, leaving most of the population without access to camel milk or meat from small stock. There are exceptions: when animals are brought back for ceremonies that occur during the dry season. During these ceremonies, animals are slaughtered, and so both milk and meat are available for a limited period of time. In general, during this period people largely depend on foods such as pasta, rice, and maize meal (*ugali*), which is purchased on credit.

**Figure 7. Objective rainfall pattern vs. rainfall pattern from PE, North Horr.**



**Notes:** Figure 7 shows a comparison of rainfall distribution from the PE results and objective rainfall data. The objective rainfall data show the average monthly rainfall from 2008–2020 collected from the police station rain gauge in North Horr. The PE rainfall data show the average scores from 13 independent groups. The distribution has been adjusted to align the Gabra and Gregorian calendar. An 18-month timeframe is used on the x-axis to clearly illustrate monthly patterns at the beginning and end of the year.



### 3.1.1 Availability of camel milk

Participants almost exclusively agreed that the lack of camel milk is the most important factor contributing to both child's and mother's malnutrition. For example, women in one community explained that children who are given milk have strength and mothers who give birth during the rains have plenty of milk to nurse their child. Conversely, children born during drought (or the dry season) end up weak.

Camel milk is produced throughout the year, except when the animals are sick or pregnant. Although production is highest during the rains, availability of camel milk for consumption is largely contingent on the proximity of the animals to the homesteads. During the dry seasons, the majority of animals are taken to the *fora* in search of pasture, while most of the women and children remain behind. Key informants estimated that roughly 70% of the animals move to the *fora*. These dry season grazing areas include Buluk, Darade, Sarimo, Sibilo, Hurri Hills, Mt. Kulal, and Charigalo, which participants described as being at an average of about three days' walk from the homesteads. However, during extended dry spells or drought, the animals will move even farther away. The absence of roads or transport means that even if milk is available in the *fora*, it cannot be accessed by most of the population during the dry season. An exception is during certain ceremonies that may occur during the dry season, when animals will be brought back from the *fora* and milk will be available for a few days.

Across all the communities, most households owned camels, but many owned only one or two animals. In cases where households had lost all their animals, mainly due to drought or livestock raiding, wealthier households will loan them milking animals. One group suggested that households with 10 or more camels were unlikely to experience malnutrition due to insufficient milk, and those with 5 or fewer camels were most likely to experience malnutrition. A key informant from the community working for an international livestock health organization provided similar

estimates. Results from a proportional piling exercise with the same group estimated that 34% of households in the community owned 10 or more camels, 48% owned between 6 to 9 camels, and 18% owned 5 or fewer.<sup>37</sup>

Participants frequently mentioned livestock disease as a factor contributing to the availability of milk, but disease was perceived to be less important than the absence of the animals during the dry season. Commonly reported disease affecting camels in the area include trypanosomiasis and respiratory diseases.<sup>v</sup> Participants also mentioned that the availability of camel milk declines when the animals are pregnant. Typically, herders manage their camels to conceive during the two dry seasons so births will occur shortly before the long and short rains.<sup>38</sup> The women suggested that when the animals give birth, there is only enough milk available for the calves, but surplus milk for human consumption becomes available once the rains start.

### 3.1.2 Availability of goat milk

The availability of milk from small stock corresponds closely with rainfall patterns. Although the majority of goats also move to the *fora*, production appears to be managed to take advantage of fresh pasture during the wetter months. Milk from small ruminants is considered less important for nutrition purposes, with the women saying that it is only used for tea. Participants from several communities maintained that they typically do not give goat milk to infants as it is considered indigestible. However, during times of food scarcity they will dilute the milk with water and give it to children.<sup>vi</sup>

Participants generally agreed that most households own goats but there has been a massive reduction in recent years due to drought and conflict. For example, women from one community suggested that in the past it was common for wealthier families to own over 200 small stock, whereas now it would be rare for a wealthier family to own more than 100.<sup>vii</sup> Diseases

37 Slightly different livestock wealth indicators were given in different communities but generally households with fewer than 3 camels or 11 small ruminants are considered more likely to experience both maternal and child malnutrition.

38 The gestation period is 13 months, so camels conceive around December/January and June/July (short and long dry season) to give birth around February/March and August/September (long and short rains).

affecting small ruminants include contagious caprine pleuropneumonia (CCPP), which causes high mortality at the end of the hot dry season and at the onset of the rains; peste des petits ruminants (PPR); and sheep pox.<sup>viii</sup> High abortion rates are also experienced due to heat stress at the end of the hot dry season; tick- and vector-borne diseases are most prevalent towards the end of the long rains.<sup>ix</sup> Brucellosis is also common. This disease in people was associated with increased milk consumption when the animals return from the *fora*.<sup>x</sup>

Although goat milk was not generally related to maternal or child malnutrition, the availability of meat from these animals was consistently viewed as an important factor. Although the analysis did not systematically assess the availability of meat for consumption, participants explained that meat was consumed during the rains as well as during specific ceremonies when the animals are near the homesteads. Meat consumption is primarily restricted to meat from small ruminants, as the Gabra rarely slaughter camels. In addition to meat provision, small stock also represent the most important and often only source of income for women in the assessment area.

### 3.1.3 Consumption of other foods

In addition to livestock products, communities in the area consume grains and to a lesser extent vegetables, legumes, and fruit. The most commonly mentioned foods were rice, pasta, maize meal (*ugali*), and sometimes potatoes. These commodities are usually purchased with income from livestock sales or bartered for animals, in most cases small ruminants. For communities living close to urban centers such as North Horr, some income is derived from the sale of camel milk, although the quantities appear to be small and the transaction costs high. Participants also frequently mentioned unconditional cash transfers from the Hunger Safety Net Programme (HSNP) as a source of income, and in one village participants mentioned that some of them also receive remittances.<sup>xi</sup>

Purchased foods are consumed throughout the year as a complement to livestock products. For example, maize meal will be made into porridge by mixing it with milk. The women explained that consumption of purchased foods increases during the dry season when the animals are in the *fora* and decreases with the availability of livestock products when the animals are near the homesteads (mostly during the rains). During this period participants maintained that at times, their diet consists only of *injera*,<sup>39</sup> a type of chapati made with flour, salt, water, and oil supplemented by tea.

During the dry season, purchased food products are mostly bought on credit, and debts are repaid with animals or income from the sale of small stock or meat during the rains. As a result, women from one village explained that more credit, both in terms of duration and amount, is given to families with more livestock.<sup>xii</sup> Although women have some influence over the sale of small ruminants, their influence is limited, and the final decision is mostly made by men. With no other meaningful income-earning opportunities, women are thus dependent on their husbands and require their blessing for food purchases. During the dry season, women have to send a message to their husbands in the *fora* requesting permission to sell an animal or purchase food on credit. Given the limited cell phone network coverage, approval can take several days.

For some of the more remote villages in the area, food commodities are not always available for purchase throughout the year, and in some cases are only available from larger centers some distance away.<sup>40</sup> Food commodities that are available are almost exclusively nonperishables, and even those with access to larger towns like North Horr are more likely to prioritize grains or pulses over fruit or vegetables given the time investment involved in going to town on foot. For example, a one-way trip from North Horr to one of the closest villages visited would be about five-and-a-half hours' walk, whereas one of the farthest villages would be about eleven-and-a-half hours' walk.

39 Not to be confused with the Ethiopian/Eritrean *injera* made from more-nutritious *teff*.

40 The distance may to some extent explain why perishables such as fruit and vegetables were rarely mentioned.

Participants, particularly older women in the groups, associated the increased consumption (dependency) on purchased food with a decrease in nutritional status. Some even maintained that in the past when they only had milk and meat, they never experienced malnutrition. Nonetheless, women across different age groups acknowledged that food preferences are changing, particularly among children who are now more likely to prefer purchased foods.

### 3.1.4 Disease

Women consistently scored disease as one of the most important causes of malnutrition (Figures 5 & 6). The two main diseases mentioned were malaria and diarrhea, although pneumonia and anemia were also frequently mentioned in relation to malnutrition. Participants from three villages also described diseases with very similar symptoms to kwashiorkor and marasmus (*Kors, Feto, and Gorosa*).<sup>xiii</sup> Although uncommon, they perceived these to be a cause of child malnutrition, but there was disagreement on the causes of these diseases. Some participants associated *Feto* with eating worms (parasites), while others said the child is born with it and attributed it to the mother not getting enough vitamins during pregnancy. Some said *Feto* was more common with non-spaced pregnancies where the mother was nursing while pregnant. For maternal malnutrition, the women linked anemia with a lack of iron, which they associated with a lack of animal products or, in one case, with the lack of iron supplements that had previously been provided by an aid organization.

The women also mentioned brucellosis as being common, referring to it as the “milk disease” but did not identify it as a cause of malnutrition.

The results from the monthly calendar showed that malaria outbreaks closely follow the rains. The women directly associated malaria with mosquitos and the presence of stagnant water after the rains. Participants perceived malaria to be a cause of malnutrition, as infants or young children with malaria lose their appetite and do not nurse or eat. The same reasoning was given for pneumonia.

Although in many cases diarrhea is associated with the onset of the rains and an increase in water-borne disease, participants consistently described an increase in diarrhea during the dry season. The women said that they always have diarrhea—“*We live with it*”—but maintained that it gets worse during the dry season as the water quality in the wells deteriorates and “dirt” in the wells becomes concentrated. Once the rains come, they explained that the “dirt” in the water becomes diluted. Notably, livestock are mainly away in the *fora* during the dry season and return to homesteads at the start of the rains.

Participants also frequently linked diarrhea in children with worms (parasites). They explained that “*parasites*” are commonly ingested from eating dirt when the children are left at home unattended while the women are out working. They also linked diarrhea with the consumption of strong tea during the dry season as there is not enough milk available to properly dilute their tea.

For many of these communities, access to basic health care is limited given that the only facility in the area is a health center in North Horr town. The entire sub-county only has one sub-county referral hospital, four health centers, and two private clinics<sup>41</sup> in an area of 39,248 square kilometers.<sup>42</sup>

### 3.1.5 Gender issues

Various gender-related issues emerged during the analysis from both the causal diagrams and monthly calendars. Some of these issues related directly to milk availability, control over livestock assets and income, women’s work, and disease. From the causal diagrams, women consistently mentioned “stress” as one of the main causes of malnutrition (figure 6). Although at times it was difficult to unpack this indicator, it mostly was in reference to the burden women felt in trying to provide for their children, especially when their husbands were away in the *fora*. Notably, women distinguished this “stress” burden from the usual work they do, which they also saw as contributing to malnutrition for both mothers and children (see section 3.1.6).

41 Marsabit County Government 2018.

42 Almost one-and-a-half times the size of Rwanda.

Women explained the anxiety they felt in having to shoulder the burden of providing for their children without any support from their husbands, and often not knowing if they would be able to feed their children the next day. As discussed, the women have little-to-no control over the sale of livestock and no alternative income, and so they depend on their husband's decisions for food purchases. This dependency obviously becomes more pronounced when the husbands are away and it becomes more challenging to get approval to sell animals or purchase food on credit. Some women also suggested that they needed to get their husband's approval to seek medical attention for themselves or their children given the costs of transportation to the health center.

Adding to this anxiety is the possibility that the husband might be killed or injured in the *fora* due to insecurity, which, along with the likely loss of livestock wealth, would guarantee complete destitution. Relating to this, the women said that children of widows or single mothers (who had been abandoned) are far more likely to experience malnutrition than those with husbands. Furthermore, the women suggested that when their husbands returned from the *fora*, the long absences created mistrust, with some husbands accusing their wives of infidelity, which in some cases resulted in domestic violence and abandonment.

The women did however acknowledge that extramarital affairs sometimes happened when the men are away. These affairs were directly linked to the issue of non-spacing of pregnancies. The women suggested that spacing of pregnancies occurs by design because the men are away. However, when an illegitimate child is conceived while the husband is in the *fora*, the likelihood is that the mother will be nursing a legitimate child while pregnant, and there is a common belief that doing so will affect the quality of her breast milk. In addition, the women pointed out that the illegitimate child is more likely to be born during the dry season when there is no livestock milk available, and so the mother is not able to properly nourish the child. The women were very specific in suggesting that a malnourished child (like the ones in the photos) is more likely to have been born as a result of an extramarital affair.

here is also a common belief in the area that if a mother eats after giving birth it affects the quality of breastmilk, which is harmful for the child. Due to this belief, the women are only allowed to drink black tea for a week. The women explained that doing so inhibits the production of breast milk, and so the infant will be introduced to camel milk almost immediately. There is also the belief that camel milk is good for the baby. The women were well aware of the benefits of exclusive breastfeeding and very skeptical of the belief that they needed to fast after giving birth. They even linked the consumption of black tea after giving birth to diarrhea but said that the men forced them to follow these practices. However, they cautioned that when organizations come in and talk to them about gender or family planning issues, the men get suspicious, which often results in domestic violence. They were very clear that they did not need to be taught about exclusive breastfeeding or spacing of pregnancies; rather it was their husbands who needed educating on these issues.

The women suggested that substance abuse, specifically the chewing of *Catha edulis* (*miraa*) was becoming more common among men in the area and that this substance abuse contributes to child malnutrition, as the husband spends income on his habit rather than on food for his family. This seemed to be quite rare and was probably more common in more urban settings. However, even though the lack of income was ranked as one of the most important causal factors for malnutrition, participants from one group insisted that none of the women in their village would consider selling *miraa* as they had witnessed what it might do to their men.

### 3.1.6 Women's work (neglect)

Participants explained that the time spent on women's work contributed to both child disease and child malnutrition (Figure 5). The women explained that while they are engaged in time-consuming activities such as herding animals, fetching water and fuel, and harvesting hay, their children are left alone, often with limited or no care. As a result, the women do not have enough time to prepare "healthy" meals or ensure that

young children are following proper hygiene practices.

Although women are busy throughout the year, the results from the monthly calendars show that women spend more time away from their children during the dry season. The women explained that, during the short (hot) dry season, they spend long periods of time either collecting water for domestic use or bringing animals long distances to drink or browse. Women from one community described a typical workday for women during this period starting at 6:00 am with milking livestock and finishing at 11:00 pm with the feeding of the children.<sup>xiv</sup> Children are fed tea and milk at around 7:00 am and then fed *injera* at around 3:00 pm when the women return from their main activities. The children might then be fed leftovers at 11:00 pm.

To illustrate the work burden, one village did not have its own well, so women would work in shifts to collect water from North Horr, which they estimated to be an eight-hour round trip. The same day, team members met with a different group of women from the same village at the water point in North Horr at around 1:00 pm. The group, consisting of five women, had just finished loading 20-liter jerrycans on to about 15 donkeys (two jerrycans per animal). The women said they had left home at about 8:00 am and that another group would fetch the same amount the following day, which was to be used for both humans and livestock. They would have the next day "*resting*," which would involve collecting hay (fodder) and firewood, and herding livestock, among other domestic chores. Their water-collection shift would resume the day after that. By coincidence it rained that evening, and the following day the team met the first group of women collecting surface water near their homesteads, thus saving them the trip to North Horr. This example illustrates that during the dry season, women might potentially spend half their working life on the task of fetching water for survival.

Most of the communities visited had a nearby well or borehole. Although in these communities'

women did not have to spend as much time fetching water, they also maintained that during the dry season it could take hours to fill up their jerrycans due to the reduced flow rate from the borehole. In some of these communities, the women explained that during the dry season they spend most of their time taking their animals long distances in search of pasture.<sup>43</sup> Focus group participants from at least three communities specifically mentioned the loss of pasture or "*deforestation*" as an indirect cause of malnutrition. This loss of pasture was attributed to greater competition for pasture due to the increased numbers of people settling near boreholes.

Aside from the more time-consuming tasks, women are responsible for other daily tasks such as collecting firewood, preparing food, and milking and corralling livestock, leaving little time to take care of their children. During the dry season they explained that the fact that their husbands are away in the *fora* and so they have no one to help them makes it even more difficult. They explained that the men who remain behind are typically older or have disabilities. Although these men are mostly willing to help with certain tasks, there is a limit to this support. Participants agreed that when their husbands are at home, they also help but even so, men will not engage in some of the more physical or time-consuming tasks such as carrying water, which is traditionally done by women.

Although women did not score their workload as high as other causal factors for malnutrition, the scoring may have been influenced by the fact that women from several groups emphasized that it is their "*God-given destiny to work*." Nonetheless, they consistently mentioned an association between the neglect of children while they are working and child malnutrition. The corresponding pattern of malnutrition and increased time spent on women's activities during the dry season from the monthly calendars suggests this association is valid.

### 3.1.7 Insecurity

Insecurity, specifically livestock raiding, was often mentioned as a cause of malnutrition. However,

43 Note that these are the few animals that are left behind, not those that have been taken to the dry season *fora*.

when this indicator was unpacked it mostly related to the loss of livestock, or milk or income from livestock. Sometimes it was described as a “stress” factor because insecurity could result in the death or injury of a husband. It also could cause stress because it forced their husbands to migrate greater distances into the *fora* to avoid conflict, resulting in longer absences and greater anxiety for the women for all the reasons mentioned. The results show that insecurity increases during the dry season since it mostly occurs in the *fora*, when the men are more likely to come into contact with their “enemies.” The women said that livestock theft did sometimes occur closer to the homesteads during the rains, but occurrences are not common.

As such, they consume more livestock products and can afford to purchase high-protein foods such as meat and beans, and a greater variety of cereals. Conversely, the poorer households are more dependent on support from relatives or feeding programs and eat fewer livestock products. For both groups, infants are introduced to boiled camel milk within a few days of being born; milk will be provided to poor households with few camels for the first four months. Both groups will continue to nurse their children for up to two years, although poorer mothers may continue for longer as they have little else to feed the child.

### 3.1.8 Human births

In North Horr, human conceptions are associated with the rainy season as well as certain traditional celebrations when most of the animals are back from the *fora* and therefore men are around the homesteads. It is interesting to note that in 2021, the *sorio* celebrations occurred during the months of February and March which coincides with the beginning of the rainy season. The two events (the *sorio* celebrations and the rainy season) have had the combined effect of bringing men home. The women stated that when the men come back from *fora*, they order their women to stop breastfeeding to allow conception to take place. According to the communities, generally an increased number of conceptions are expected to take place around the time of *sorio* celebrations and the rainy seasons. The animals will stay around the homesteads until the rains are over and the long, cool dry season, locally referred to as *adolesa*, kicks in in June when the trek back to the *fora* begins once again.

## 3.2 Differences in diets between healthy and malnourished children and mothers

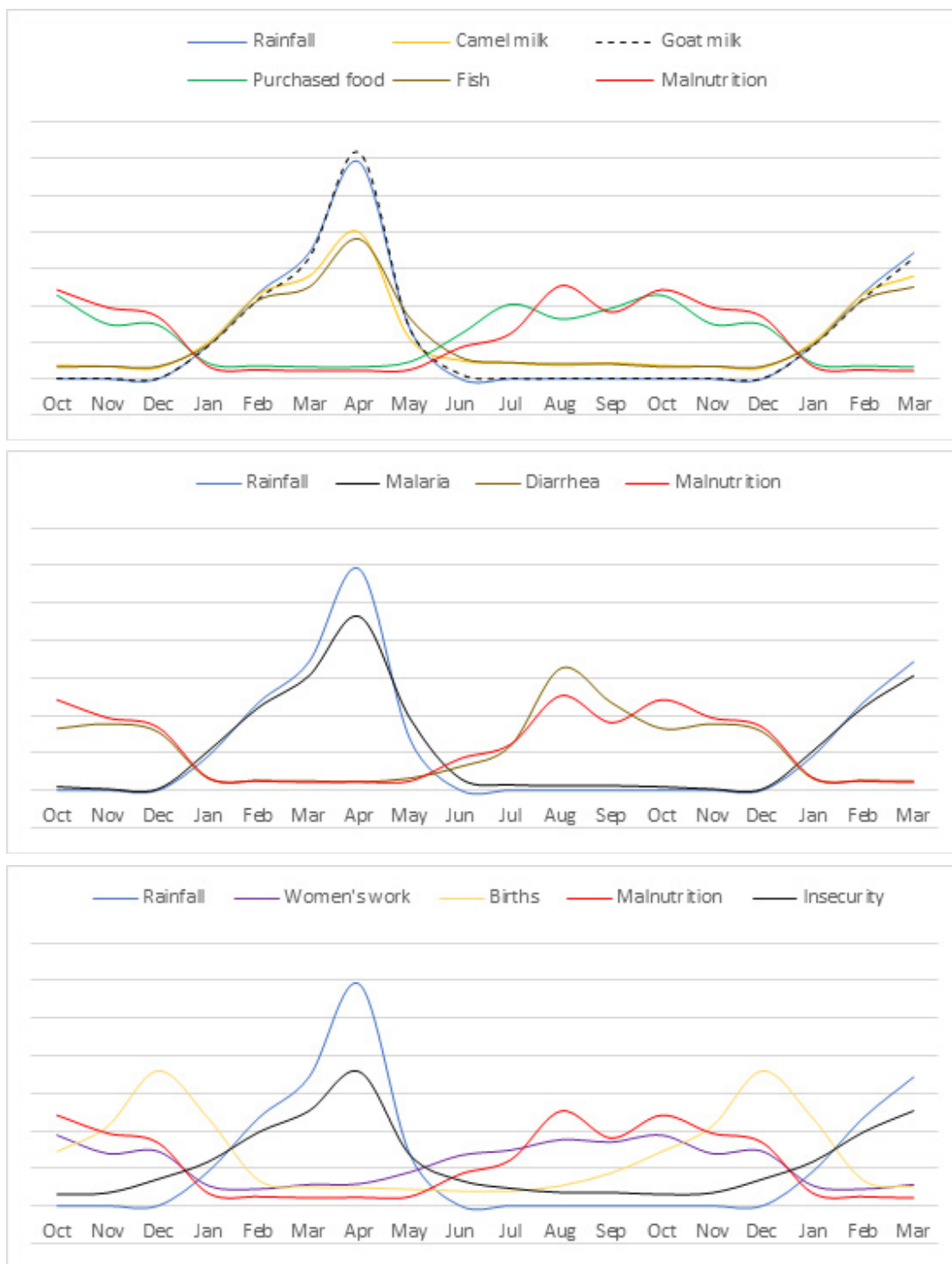
Women described the differences in diet between healthy and malnourished children and healthy and malnourished pregnant and nursing mothers (Tables 3–5). The main difference between these groups is that the healthy children and mothers came from wealthier families with more livestock.



Photo: Pastoralist fishing village in Loiyangalani

# 4. Results, Loiyangalani

Figure 8. Monthly patterns of malnutrition and related indicators, Loiyangalani.



**Notes:** The diagrams were produced from the total summated scores for all indicators and months from 14 independent informant groups; the data were not summarized using averages. There is no y-axis scale so the lowest level of malnutrition (or any other indicator) shown does not necessarily mean a level of zero. A total of 100 counters was available for each indicator, for distribution across the 12 months. An 18-month timeframe is used on the x-axis to clearly illustrate monthly patterns at the beginning and end of the year.



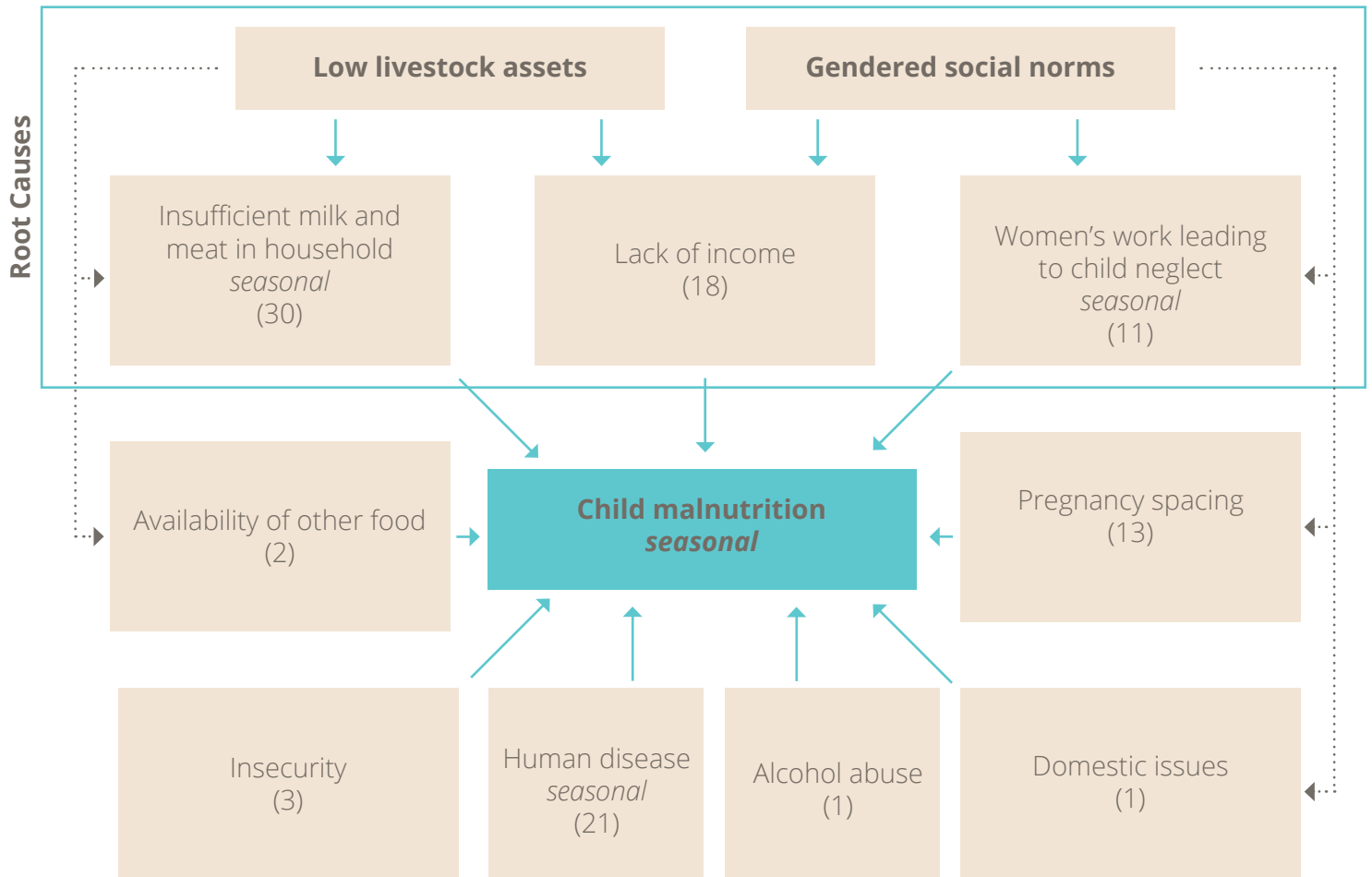
**Table 6. Level of agreement for monthly calendar indicators, Loiyangalani (n = 14 groups)**

<b>Indicator</b>	<b>Kendal coefficient of concordance W</b>	<b>P-value</b>
Rainfall	0.991	< 0.001
Camel milk <sup>a</sup>	0.904	< 0.001
Goat milk	0.974	< 0.001
Consume purchased foods	0.742	< 0.001
Fish	0.854	< 0.001
Women's work	0.461	< 0.001
Malaria cases	0.905	< 0.001
Diarrhea cases	0.832	< 0.001
Malnutrition	0.848	< 0.001
Insecurity	0.771	< 0.001
Human births	0.505	< 0.001

<sup>a</sup>n=8

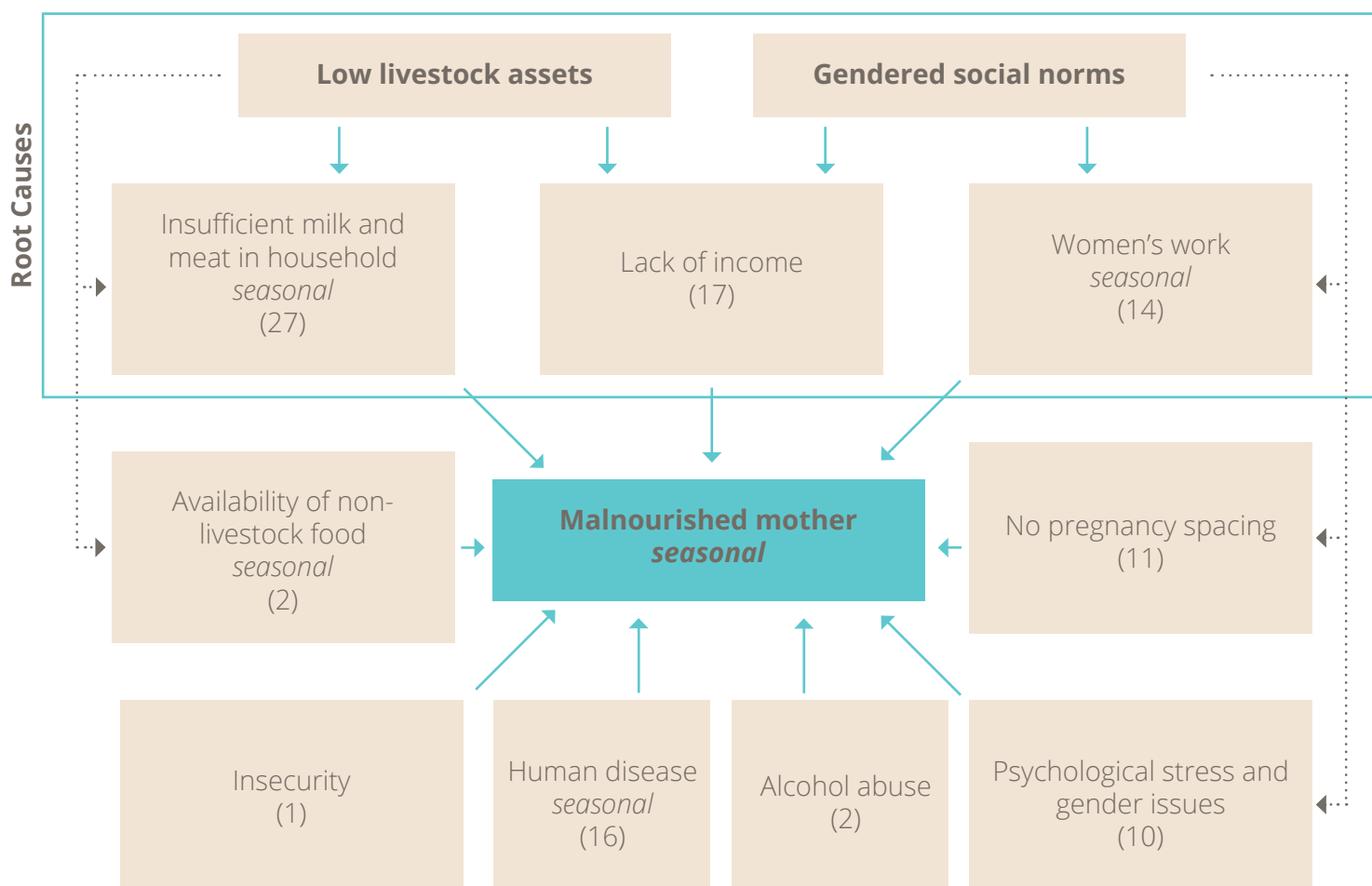
**Notes:** There is significant agreement between the 14 informant groups for all 11 indicators. This strongly indicates that the monthly calendar method is reliable.

**Figure 9. Causes of child malnutrition, Loiyangalani.**



**Notes:** Figure derived from interviews with women in Loiyangalani followed by proportional piling of causes with 10 independent groups of women and presented as a proportion of the total. The figures in parenthesis represent the scores from all the groups presented as a proportion of the total.

**Figure 10. Causes of malnutrition in mothers, Loiyangalani.**



**Notes:** Figure derived from interviews with women in Loiyangalani followed by proportional piling of causes with 10 independent groups of women and presented as a proportion of the total. The figures in parenthesis represent the scores from all the groups presented as a proportion of the total.

**Table 7. Level of agreement—causal diagrams, Loiyangalani (n = 10 groups)**

Causes of malnutrition	Kendal coefficient of concordance W	P-value
Children (Loiyangalani)	0.792	< 0.001
Mothers (Loiyangalani)	0.723	< 0.001

**Notes:** There is significant agreement between the 10 informant groups. This strongly indicates that the monthly calendar method is reliable.

**Table 8. Diets of healthy vs. malnourished children, Loiyangalani**

Age	Healthy children	Malnourished children
0–5 months	<u>Types of food:</u> - Breastmilk (exclusive)	<u>Types of food</u> -Breastmilk -Introduce goat milk if available
6–9 months (up to 1 year)	<u>Types of food</u> -Breastmilk -Introduction of animal products such as milk, meat soup, and ghee - <i>Uji</i> (maize porridge combined with milk or ghee)	<u>Types of food</u> -Breastmilk - <i>Uji</i> (maize porridge made with water, rarely with milk or ghee)
1–5 years	<u>Types of food</u> - <i>Ugali</i> (maize meal) with meat soup or fish - Milk and meat - Cooked animal blood mixed with maize and milk	<u>Types of food</u> - <i>Ugali</i> (maize meal) - Wild fruits - Cooked animal blood

**Table 9. Diets of healthy vs. malnourished pregnant mothers, Loiyangalani**

Age	Healthy Pregnant Mother	Malnourished Pregnant Mother
2 weeks to 3 months (first trimester)	<u>Types of food</u> - Meat soup - Milk - Beans -Cereals (maize, <i>ugali</i> , rice) - Fruits (mangos, oranges, and doum palm fruit)	<u>Types of food</u> - Cereal (boiled maize, ugali and uji made with water) - Wild fruit (doum palm) - Cooked animal blood
4–6 months (second trimester)	<u>Types of food</u> - <i>Uji</i> —made with sugar, oil, salt, and milk - Wild fruits (various) - Tea with milk - Cooked blood mixed with maize	<u>Types of food</u> - <i>Uji</i> —without milk, salt, sugar, or oil - Wild fruits (doum palm only) - Black tea - Cooked blood
7–9 months (third trimester)	<u>Types of food</u> - <i>Ugali</i> (maize meal) with meat soup or fish - Milk and meat - Cooked animal blood mixed with maize and milk	<u>Types of food</u> - <i>Ugali</i> (maize meal) - Wild fruits - Cooked animal blood

**Table 10. Diets of healthy vs. malnourished lactating mothers, Loiyangalani**

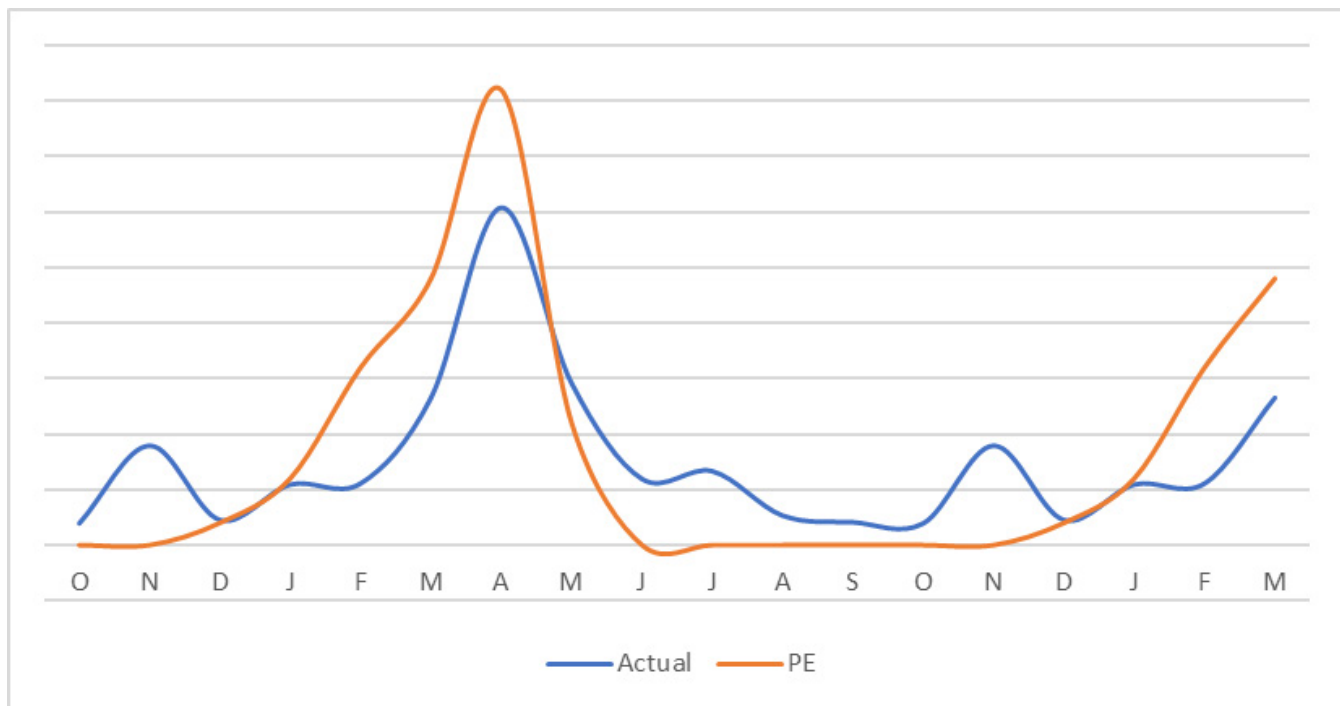
Age	Healthy lactating mother	Malnourished lactating mother
Just given birth (first 2 weeks)	<u>Types of food</u> -Milk from husband's livestock -Pasta and meat purchased by her husband	<u>Types of food</u> - Milk from relative's animals - Cereals/maize (usually purchased on credit)
From 3 weeks to 2 years	<u>Types of food</u> - Milk and meat - Beans - Cereals (with milk, vegetables, beans, meat, and fish) - <i>Sukumawiki</i> (leafy greens) - Tea with milk	<u>Types of food</u> - Milk when available or from relatives - Ugali and uji (made with water) - Black tea - Cooked blood - Wild fruits - <i>Uji</i> from feeding programs or health centers

## 4.1 Detailed explanations of monthly patterns

As expected, rainfall data for Loiyangalani from 1970–2008 (39 years) showed considerable variability between years, but on average, rainfall peaks in April with a very small peak again in November. The results from the PE show a similar peak in April, although participants from all the groups only recognize two seasons, a rainy season roughly from January to June and a dry season from July to December (Figure 11). Participants explained that although they sometimes receive rain between October and December, it is not typical and not enough to actually make any difference in terms of improved pasture. When analyzing the actual data across 39 years, this explanation of rainfall by participants makes sense. There is extreme variability across months and years, with annual rainfall ranging from 0 mm to over 470 mm. The small November peak is also unusual in the data; for example, in 14 years out of 39 years there was no rainfall at all in November. In other words, 35.8% of the time there was no rain in November, and 56% of the time this November rain was less than 3 mm. These data explain why participants do not consider the second rain typical.

The results from the monthly calendars show an increase in the prevalence of malnutrition during the dry season. The seasonal pattern of malnutrition shows an increase in malnutrition as the rain tapers off, with slight peaks in August and October. Similar to North Horr, the women across all but one of the groups agreed that the increase in malnutrition had to do with a lack of livestock products for consumption during this period. However, unlike North Horr, the communities in the area are more sedentary and so the availability of animal products, specifically milk, is largely determined by rainfall patterns and the corresponding availability of pasture. The communities are more dependent on small stock than on camels, so even though camel milk is available throughout the year, far fewer people own camels than in the North Horr assessment area. The results also show a decline in the availability of fish and an increase in the prevalence of diarrhea as well as an increase in the time women spend on various activities during the dry season. Collectively the results show that a number of different potential factors contributing to malnutrition occur at the same time as the actual peaks of malnutrition during the year.

**Figure 11. Objective rainfall pattern vs. rainfall pattern from PE, Loiyangalani.**



**Notes:** Figure 11 shows a comparison of rainfall distribution from the PE results and actual rainfall data. The actual rainfall data show the average monthly rainfall in Loiyangalani from 1970–2008 excluding four years that were considered extreme outliers.<sup>1</sup> The PE rainfall data show the average scores from 16 independent groups. An 18-month timeframe is used on the x-axis to clearly illustrate monthly patterns at the beginning and end of the year.

<sup>1</sup> Source: Lepenoi-Lekapana, P. 2013.

### 4.1.1 Availability of goat milk

Small ruminants are the most important livestock species in the Loiyangalani area in terms of numbers and ownership, and the limited availability of goat milk was consistently identified as the most important cause of malnutrition in children and mothers. The results show that the availability of milk from small stock corresponds directly with rainfall patterns and the availability of pasture. Although small stock will be taken in search of pasture during the dry season, these movements were restricted, e.g., due to insecurity. The milk from small stock is consumed fresh and made into ghee, and women considered both forms as having high nutritional value for children. All groups suggested that even households with few animals benefit when milk is available as it is shared with everyone in the community.

In addition to milk, the lack of goat meat was also frequently associated with malnutrition. Women

explained that this meat is often prepared in a broth that is fed to the children. The blood from small stock is also consumed during the height of the hunger period due to the absence of other foods. *Lopoo*, the local name for the month of August literally means “to cook blood,” is used to describe this coping mechanism.

### 4.1.2 Availability of camel milk

Eight out of 14 groups that participated in the monthly calendars owned both camels and small ruminants. Some of the groups that only had small stock recalled that in the past they did own camels, but these had been lost to a combination of drought and livestock raiding. However, camel ownership did appear to be partly influenced by location, and specifically access to browse. Camel herd sizes appeared to be small at around 15 to 20 animals.<sup>44</sup>

<sup>44</sup> This estimate is based on observations and a general sense of livestock ownership arising from discussions with participants. It is difficult to estimate herd sizes for Loiyangalani as livestock data are typically aggregated for Laisamis sub-county.

Although the results show that camel milk is mostly available during the rains, the women explained that at least some milk is available throughout the year, thus providing an important source of food during the dry season. As with goat milk, surplus camel milk is shared with others within the community, including those without camels. Participants from some groups described a reciprocal relationship with neighboring communities that focus more on fishing whereby they share camel milk in return for fish. This relationship appeared to be very strong and based on mutual dependency as well as possible kinship ties. In most of the camel-owning villages, the women considered milk from goats to be more important in relationship to malnutrition than camel milk, largely based on the relative number of goats owned compared to camels. However, in at least two villages that had previously owned camels, the older women in the groups suggested that they had experienced fewer cases of malnutrition when they had camels.

As with small stock, camels also “migrate” in search of pasture during the dry season but this migration seemed to be fairly restricted. Some of the camel-owning communities were located closer to the dry season grazing areas, but others intentionally keep their camels close to centers such as Soit and Loiyangalani throughout the year so they can sell camel milk.

### 4.1.3 Consumption of purchased foods

Food was purchased throughout the year, especially grains such as maize, maize meal (*ugali*), and rice. These will be supplemented with milk or meat when available, but the women from several groups maintained that without these, they lack any real nutritional value.<sup>xv</sup> One group suggested that when combined with beans, grains provide good nutrition for children but mostly, maize meal was preferred over pulses as it is half the price and “fills the stomach.” Several groups suggested that when grains are cooked with oil they have greater nutritional value, but grains cooked with oil are

also considered somewhat of a luxury item. In one group, participants mentioned using powdered milk mixed with maize flour to make a nutritious porridge for their children during the dry season. However, they explained that they could only do so on a few occasions given the high cost of the milk powder.<sup>45</sup>

Participants explained that the lack of fruit and vegetables contributes to malnutrition, but these are rarely consumed due to their perishability and availability. Some vegetables, including potatoes, onions, and *sukumawiki* (leafy greens), are consumed; this consumption was largely limited to communities living closer to urban centers such as Loiyangalani. Consistent with this finding, participants from one of the more remote communities in the area of investigation complained that even dry goods aren't available to purchase in their village. In order to purchase basic foods, the women explained that it would take a day to reach the nearest market center where they would have to spend the night and return the next day with their purchased items.<sup>xvi</sup> The absence of roads, and the limited transport options such as boats or motorcycles in the area, effectively means that shopping excursions are exceedingly time-consuming.

The cost of staple foods consistently came up as a barrier to a healthy diet, and correspondingly the lack of income was collectively scored as the second main reason for malnutrition in mothers (Figure 10). The income-earning opportunities most frequently mentioned by participants was the sale of firewood and charcoal. Participants explained they expand on these activities in September and October in order to purchase food given the absence of livestock products and other food types at this time. The results from the monthly calendars support this finding, showing a corresponding pattern of food purchases during this period and an associated increase in women's work (Figure 8).

Other income-earning activities include the sale of dried fish, incense, traditional handicrafts, and in some cases milk and small ruminants. However, as

45 At the time of the fieldwork, the price of 1 kg of NIDO powdered milk in Loiyangalani was KES 800 compared to KES 100 for 1 kg of beans or KES 50 for 1 kg of maize flour.

with North Horr, animals can only be sold with the husband's consent, so women have little control over this income source. Similarly with fish, in most cases where women earn income from this source, they are involved in the drying/preparation and sale of fish caught by others, including their sons or husbands. The price of dried fish varied from place to place, with a range from Kenyan shilling (KES) 5–10<sup>46</sup> for an average-sized fish. The women explained that they can sell fresh fish, particularly cooked fresh fish, for more but they had no way of preserving the fish to take advantage of this opportunity.

The importance of different income-earning opportunities did vary across the area. For example, villages closer to urban centers can take advantage of the demand for firewood and charcoal, whereas the transaction costs of collecting and transporting this commodity is just too high for those living farther away.<sup>27</sup> Similarly, those living close to urban centers could sell milk and “fresh” fish, and rely on relatives living there to link them to buyers and even provide accommodation for them if they have to spend the night in town.<sup>48</sup>

Alternatively, more remote villages offered different albeit limited opportunities. For example, one village located about 30 km south of Loiyangalani is situated on fertile fishing grounds and on the main road to Marsabit.<sup>xvii</sup> The women explained that they barter firewood for fish with commercial fishermen who set up fishing camps in the area. They then sell the fish to passing vehicles going to Marsabit. However, the limited vegetation in this particular village meant that the women still had to spend a considerable amount of time collecting firewood. Alternatively, villages between 30–70 km north of Loiyangalani benefit from an abundance of fuelwood as well as incense, wild foods, fish, and livestock products derived from better browse. However, the absence of decent roads and transport services effectively excludes them from meaningful market opportunities.

This absence of infrastructure and services has left these communities vulnerable to exploitation. Participants consistently identified the need for a reliable market where they can sell their products at a fair price. The transaction costs of doing business in this environment obviously warrant a considerable markup on these products, but participants frequently mentioned that they felt exploited by middlemen and “*cartels*” when selling fish, incense, and even milk or livestock. Whether these communities are truly being exploited needs further investigation, but the existing business environment certainly means that they are not benefiting from the existing resources that are evidently of high monetary value.<sup>49</sup> As such, there are very limited income-earning opportunities, and most of those available to women are neither meaningful nor sustainable.

#### 4.1.4 Availability of fish

The importance of fish varied across the communities depending on their location and their livelihoods specialization. These communities were predominantly Turkana who identified as pastoralists. In some villages, they had intermarried with El Molo, who are fishing specialists. Therefore, in some villages, fishing appeared to be more of a mainstream livelihoods activity, whereas in others it was more opportunistic, or possibly even a strategy to compensate for the loss of livestock, specifically camels. As mentioned, there also appears to be some reciprocity between predominantly livestock keepers and those who focus on fishing, both within communities and with neighboring communities.

By and large, women expressed a strong preference for livestock-based foods over fish and only increase fish consumption during the dry season to compensate for the lack of milk and meat products. Although fish is available throughout the year, the results from the monthly calendars show that it is more readily available during the rains when it is less needed as a source of protein (Figure 8). The participants

46 Less than 10 US cents

47 For example, participants from one village mentioned that they sell a bucket of charcoal for KES 200.

48 Participants from Palo village, which is about 30 km north of Loiyangalani, said they provide their town-dwelling relatives with fresh milk and fish when they visit, underscoring the importance these rural-urban linkages.

49 A viable commercial fish industry exists in the area, with fish being exported to Busia and the Democratic Republic of Congo.



explained that during the dry season, water levels recede, and the fish move farther out into the lake, making them more difficult to catch. At the same time, persistent high winds make the lake extremely dangerous even for seaworthy craft, which these communities do not own.<sup>50</sup> In one village, the women attributed the high number of widows in the village to drownings associated with overturned traditional canoes.<sup>xviii</sup> One participant explained, *“Our husbands are pastoralists and have no expertise with fishing.”* This statement, along with other discussions and observations during the fieldwork, suggests that for some, fishing represents more of a coping strategy comparable to the sale of firewood and charcoal than a reliable or safe economic activity.

Although fishing is done mostly by men, in some of the villages a few of the women are engaged in fishing and even claimed that there are some women who operate power boats. There was considerable interest in training women on fishing and boat operating from a number of the groups visited. Women are also engaged in the sale of fish caught by the men. Given the distance to markets, in concert with an absence of transport or refrigeration, this activity mostly involves the sale of dried fish. In many of the villages visited, participants explained that typically out of every five fish caught, two would be consumed fresh and three would be dried and sold later.<sup>51</sup>

Fresh or frozen fish can be sold for up to ten times the price of dried fish, but this activity is largely limited to communities living close to urban centers or along the Loiyangalani-to-Marsabit road. A number of solar refrigeration units have been installed along the lake with support from the county government and other donors. These allow nearby communities to aggregate and sell frozen fish to cooperatives and fish traders. However, most of the villages visited did not have access to these units given the distance and lack of transportation. Where they did exist, fish traders and cooperatives were observed coming on boats and purchasing frozen and dried fish, as well as fresh fish caught the night before.

## 4.1.5 Disease

Disease was scored as the second-most-important factor contributing to child malnutrition (Figure 9). The most commonly mentioned diseases were HIV/AIDS, malaria, diarrhea, tuberculosis, ulcers, pneumonia, and other respiratory ailments.

Diarrhea was the disease participants most commonly associated with malnutrition. Although the women explained that diarrhea occurs throughout the year, it is most prevalent during the dry season and follows an almost identical pattern to that of malnutrition (Figure 8). In most cases, the women associated this pattern with the consumption of “cooked” blood and acacia pods. As milk production tapers off after the rains, people engage in various strategies to offset the loss of this food source, including bleeding their animals and preparing the blood for consumption. Consumption of blood typically happens in August; the women explained that after this point the animals are too weak for bleeding. They then resort to other strategies; for example, the collection of wild foods, including doum palm fruits, wild cassava, and acacia pods. By November and December, acacia pods are the only wild foods readily available. These are considered a hunger food given that they are bitter and undigestible.

Participants also explained that diarrhea increases during the dry season as women have to spend more time away from the homestead herding animals, collecting firewood, making charcoal, and collecting wild foods. During this time, their young children are left at home with little or no supervision or management of good hygiene. Similar to North Horr, participants frequently used the example of the children “eating dirt” while they are unattended. The women also explained that during the dry season, their food is often contaminated by dust from the persistent wind while they are preparing it. Surprisingly, only a few participants associated the quality of the water they drink with diarrhea although it was mentioned in a few villages. Four of the villages visited identified clean water as a potential intervention for addressing malnutrition.

50 This indicator should be treated with some caution as it relates to how easily fish can be caught by Turkana pastoralists with limited fishing expertise. A focus group with the El Molo, a group that specializes in fishing, revealed an entirely different pattern of fish availability from the results from the Turkana sample.

51 This would depend on the size of the fish. For example, if one large fish was caught, that one would be consumed, and the rest sold.

As expected, the pattern of malaria corresponds closely with rainfall. The women explained that although malaria cases were seen all year round, they generally occur shortly after the rains. They attributed this occurrence to stagnant water as well as the abundance of grass, which provides a fertile breeding ground for mosquitos. The participants did not make a direct association between malaria and malnutrition. One community requested mosquito nets, but they wanted these to protect their husbands from venomous snakes when they are poaching fish on South Island National Park.

Women directly associated HIV with malnutrition, but specifically in children. HIV was mentioned frequently and appears to be common in the area. Participants explained that a child born with HIV is more likely to be malnourished.

Although participants did not make a direct association between malaria and malnutrition, more generally they explained that an unhealthy mother is unable to properly nurse or feed her children. Similar explanations were given for pneumonia, which increases during the long dry season and was often attributed to the cold strong winds coming off the lake. In one community, the women associated respiratory problems with charcoal burning.

Human disease came out clearly as a major cause of malnutrition either directly or indirectly. In one community, it was scored as the most important factor contributing to both child and maternal malnutrition.<sup>xx</sup> The lack of health services was also mentioned by participants. In some communities, they claimed that their children had never been immunized. However, only two of the fourteen communities identified improved health services as a proposed intervention for addressing malnutrition.

#### 4.1.6 Gender issues

Similar to North Horr, a number of gender-related issues emerged as direct or indirect causes of malnutrition. Women often described stress or anxiety related to the responsibility placed on them to provide for their families, compounded by factors such as the limited income-earning opportunities available to women, the cost of basic necessities, and the time burden placed

on women. The women explained that the stress associated with all of these factors often leads to depression, which they said is unhealthy for both the mother and the child. In one community, they rationalized that a depressed mother is essentially unhealthy and therefore unable to psychologically take care of her children or herself.

Stress was described as worse for single mothers who had either lost or been abandoned by their husbands. As discussed, there appeared to be a high number of widowed mothers in the area, but neglect or abandonment of a family by the husband was also mentioned and, in some cases, was associated with alcohol or substance abuse. Participants linked alcohol abuse with domestic violence and in some cases, rape resulting in involuntary pregnancies, more single (unmarried) mothers, and non-spacing of children. Participants from one community explained that living with an alcoholic or abusive husband directly contributes to the psychological “stress” that leads to malnutrition. Despite these testimonies, alcohol only came up as an issue directly associated with malnutrition in two communities.<sup>xxi</sup> These are both situated close to Loiyangalani town, suggesting that alcohol abuse may be less of an issue in more remote communities.

More specifically, the women made a direct linkage with non-spacing of pregnancies and child malnutrition. Participants across the sample strongly felt that breastfeeding while pregnant provides suboptimal nutrition for both the nursing and unborn babies. They explained that this practice causes anemia in the mother, as well as a condition called “*Edos*” that causes diarrhea, vomiting, and a lack of appetite for nursing infants. The women explained that exclusive breastfeeding was less likely to be practiced with non-spaced children. Although the participants were all aware of family planning, they explained that culturally it is believed that a wife’s job is to produce children for her husband, and so it is not her choice. In one community, the participants illustrated this point by explaining that if a wife does not produce children on a regular basis, her husband will have her publicly beaten. In addition to this strong cultural disincentive to practice family planning, some of the participants mentioned they are worried about some of the physical side effects of using birth control.

Although the gender and psychological stress issues were difficult to unpack in detail, when combined with women's workload, these potentially represent an important, albeit complex set of issues contributing to malnutrition. For example, when combined, the scores for women's work (14), stress (10), non-spacing of pregnancies (11), and alcohol abuse (2) exceed the highest scored indicator of insufficient meat and milk (27) for mother's malnutrition (Figure 10). Furthermore, the indicators on income and access to livestock products are also gendered and are very much linked to the psychological stress issues described.

#### 4.1.7 Women's work (neglect)

Participants directly associate malnutrition in children with neglect, which is caused by the mother being away from the home for long periods while engaged in time-consuming activities. These include the collection of firewood, fodder, water, wild foods, and the production of charcoal. Women then travel long distances to sell some of these products. Although the time needed for these activities differed from place to place depending on the proximity to resources and markets, typically a woman can expect to be engaged in any one of these activities for at least six hours a day. However, it was not unusual for participants to describe how the collection and sale of firewood, for example, could take up to two days and involve spending a night away from home.

As illustrated in the scores from the monthly calendar (Figure 8), the most time-consuming activities occur during the dry season. Participants explained that while the mother is engaged in these tasks, she is unable to prepare meals for her children or ensure proper hygiene practices are observed. The women associated this work burden with an increase in mother's malnutrition, particularly during times when there is little or no quality food to give them energy. The participants explained that quality foods are ones that give them strength like milk, meat, and oil when combined with *ugali* (maize meal) or rice.

#### 4.1.8 Insecurity

Insecurity in the form of livestock raiding or livestock theft was seen mainly as an indirect cause of malnutrition by participants, and was associated with destitution through the loss of livestock and related losses of food and income. Participants identified the Gabra, Samburu, and Dassanech as the main perpetrators of livestock raids. One community also mentioned the Pokot.<sup>52</sup>

In contrast to many pastoralist areas, monthly calendars showed that insecurity in the form of livestock theft typically happens during the rainy season. This timing appears to be partly driven by commercial incentives. For example, participants explained that their "*enemies*" target them when the animals are healthy and have a greater resale value. One woman also suggested that the reason they attack at this time is that "*the animals are healthy enough to run and so they can easily escape capture from our warriors.*" However, participants did say that livestock theft can happen at any time. A number of communities specifically reported a small spike in December, which they attributed to the increased demand for meat over the Christmas period.<sup>52</sup>

In some of the more remote communities, participants specifically identified insecurity as a cause of child malnutrition. They explained that when their enemies attacked, they are forced to run and seek refuge on the lake, and so their children could spend days without being fed. In the absence of police, these communities requested boats and donkeys to allow them to both escape their enemies and carry supplies to survive on while on the run.

#### 4.1.9 Human births

The results from the monthly calendars show that most births occur during the dry season between December and January, right before the rains when pasture growth and livestock milk is expected to increase. Participants reported that although people give birth throughout the year, people mostly conceive during the rains in April ("*Lochoto*") when there is plenty of food and milk. In

52 A number of participants maintained that conflict with the Gabra had been resolved and they had not experienced any raids in the past two years.

all the communities visited, the women explained that when people are hungry and stressed, they have little interest in romance. In one community, the women also mentioned that during *Lochoto* there are a number of traditional ceremonies and dances that promote courtship.

## 4.2 Differences in diets between healthy and malnourished children and mothers

Women described the differences in diet between healthy and malnourished children, and between healthy and malnourished pregnant and nursing

mothers (Tables 8–10). As in North Horr, the main difference is that healthy children and mothers belong to wealthier families. These families have greater access to livestock products and can afford to purchase a greater variety of foods, including beans, fruit, meat, fish, and vegetables. Poorer households are more reliant on cereals and wild foods and often have to depend on friends or relatives for milk or meat products.

**Table 11. Women’s preferences for nutrition-related interventions**

North Horr (n = 13)		Loiyangalani (n = 17)	
Type of support	Responses	Type of support	Responses
Restocking (including livestock credit)	10	Credit/cash transfer for IGA	17
Support to income-generating activities (IGA) including savings groups	9	Restocking/livestock credit	14
Cash transfer/credit	5	Provision of boats	12
Water (borehole)	5	Provision of fishing equipment	11
Animal health services	5	Market linkages/support	10
Fodder provision	4	Vocational training (fishing/boat operation)	8
Support livestock marketing	3	Business skills training for women’s groups	8
Human health services	3	Provision of fodder	5
Transport provision (including credit)	2	Security (police presence)	4
Pasture rehabilitation	2	Provision of clean water	4
Training/support on crop farming	2	Provision of solar freezers for fish and milk	3

Relief food	1	Health services (mobile clinics)	3
Deworming medication	1	Schools	3
Provision of food and supplements	1	Provision of mosquito nets	3
Mosquito nets	1	Provision of supplements	1
School	1	Other	0

**Notes:** Table 11 shows the different types of intervention preferences women identified for addressing both child and maternal malnutrition based on both the causal analysis and monthly calendar diagrams. The chart shows the frequency of responses from all the groups interviewed.

# 5. Intervention Preferences in North Horr and Loiyangalani

The causal diagrams show that women view the lack of livestock and their products and a lack of income as the two main factors contributing to malnutrition. Consistent with this view, the two priority interventions involved restocking (or livestock credit) and support to income-generating activities (Table 11). Although restocking was viewed as a way to increase milk production, the women were mostly interested in rearing small stock as a source of income. Other activities to support livestock production included the provision of animal health services (North Horr) and the provision of fodder during the dry season (both areas). In North Horr, some of the women proposed interventions to support rangeland rehabilitation. They attributed rangeland decline (“deforestation”) to both climate change and increased settlements around boreholes.

Aside from livestock rearing, other types of support to income generation included access to capital or credit, training on business skills, group formation, and specific types of vocational training. In Loiyangalani much of the emphasis was on the fishing sector, whereas in North Horr it mostly involved small retail businesses. In a couple of communities, the women were interested in training and provision of inputs (including water) for small-scale crop production (watermelon and vegetables).

Participants were also interested in markets for their products, specifically livestock and fish. However, in most cases the focus was on market linkages or a place where they could sell these products for a fair price as opposed to physical infrastructure. Linked to the focus on markets, there was a big interest in the provision of transport such as boats and motorcycles so they could transport their products to markets. In the case of North Horr, transport is needed to

move people and goods between the *fora* and the villages.

Provision of clean water was identified as a priority in some communities. Other services such as health and education were less frequently mentioned. This finding does not mean that these are not priorities for these communities, but that women did not see them as being the most effective interventions to address the specific issue of child and maternal malnutrition.

Priorities varied across the study sample depending on location. For example, communities with year-round access to clean water showed a preference for livestock feed or fodder provision during the dry season. Conversely, those without clean water identified water as their “*first, second, and third*” priority. Similarly, those living closer to urban centers identified income-generating activities that could take advantage of these markets, whereas those living farther away might prioritize the provision of transport.

It should be noted that participants often defaulted to mentioning other interventions that they are familiar with. In North Horr, the Hunger Safety Net Programme (HSNP) cash transfers, livestock insurance, and support to income-generating activities were mentioned. In Loiyangalani, many of the villages visited maintained they had never received any kind of assistance from either the government or an aid organization. However, they had heard of the HSNP and wondered why it did not include their communities.

# 6. Discussion

The overall finding of the analysis was that women position the problem of malnutrition within a context of changing and gendered livelihoods, marked seasonality of livelihood systems, and physical remoteness, with limited infrastructure or public services. These factors combine in ways that place women and children at a very high risk of acute malnutrition. In general, women were aware of the need to provide an adequate diet for children and themselves, and they were aware of the need for basic hygiene and clean water. All of the main issues raised by women are consistent with a body of research and evidence on changing livelihoods in pastoralist areas of East Africa, and specifically in Kenya and Marsabit County. Across pastoralist areas, there are long-term trends such as declining per capita ownership of livestock as human populations increase, drought and conflict continue to reduce herds, and commercialization evolves.<sup>53</sup> All of these factors contribute to average levels of livestock ownership that are far below the levels needed to support a livelihood based on livestock production. While wealthier pastoralists continue to supply livestock to domestic and regional markets, there are increasing number of poorer “pastoralists” who rely heavily on diversified livelihoods activities.<sup>54</sup> Typically, these activities require considerable effort for limited income. Looking specifically at Marsabit County, a poverty study in 2016 concluded that 70% of households were both income poor and livestock poor.<sup>55</sup> In part, the large-scale HSNP was a response to chronic food security and nutrition challenges in Kenya’s ASALs. The program started in 2013.

The environment of Kenya’s ASALs dictates livestock production systems that use seasonal mobility of herds. In general, areas with lower annual rainfall and higher rainfall variability require

more herd mobility, and the use of more drought-tolerant livestock species such as camels and goats. The seasonal *fora* for dry season livestock grazing in Marsabit are entirely rational from the perspective of managing livestock herds, but in a context of weak infrastructure, the use of seasonal *fora* means that most dry season milk production has low accessibility for women and children.

Although the gendered nature of livelihoods in Kenya’s ASALs has been well described,<sup>56</sup> this investigation revealed the burden of work and responsibility of women, and how they associate “stress” with malnutrition in very logical ways. Dry season peaks in malnutrition are associated with this stress and workload, as well as other factors, and show the importance of culture and gender in the drylands nutrition framework. However, there are limited opportunities for livelihood activities that provide reasonable incomes for reasonable effort and that enable women to care for their children. In part, this situation relates to the persistent problem of weak infrastructure and physical remoteness, and hence the economic feasibility of starting or sustaining small businesses. In addition, insecurity continues to cause direct loss of life and loss of assets. These issues could be positioned under “governance” in the drylands nutrition framework.

53 Catley and Aklilu 2013.

54 Fratkin 2013.

55 Mburu et al. 2017.

56 See Stites and Dykstra-McCarthy 2020 and Catholic Relief Services 2021.

## 6.1 Seasonality of malnutrition and related factors

### 6.1.1 Food availability and accessibility

In both North Horr and Loiyangalani, the results show that malnutrition increases during the dry season. Participants largely attributed this increase to the absence of milk and meat during this period. These results are consistent with other studies carried out in pastoralist areas in the region, including a recent study in Marsabit.<sup>57</sup> The results show that the availability of milk from small stock corresponds directly to the availability of rainfall and pasture. In contrast, camel milk is available throughout the year, although in smaller quantities during the dry season. However, although milk is available, women have limited access to it during the dry season because the camels are away in the *fora* during this period. In both areas, the lack of livestock products (specifically milk and meat) was identified as the main cause of malnutrition in both women and children. The relationship between rainfall, milk availability, and malnutrition is technically plausible and is supported by other research findings. For example, one study shows a positive correlation between normalized difference vegetation index (NDVI) as a proxy for forage and mid-upper arm circumference (MUAC) z-scores in Marsabit.<sup>58</sup> The Milk Matters study in Ethiopia also showed a significant difference in weight-for-height z-scores of children in treatment and control groups based on the availability and consumption of livestock milk.<sup>59</sup>

The results from Loiyangalani show that fish are mostly available during the rains, but when they are least needed, as people have plenty of milk and meat at this time. Participants showed a strong preference for livestock products over fish,

but they do eat fish, particularly when livestock products are not available. However, during the dry season, the fish move farther out into the lake due to receding water levels, and persistent high winds make the lake dangerous even for seaworthy craft, which these communities cannot afford. They also explained that, being pastoralists, they do not have the skills or expertise to fish or manage traditional canoes like the neighboring El Molo who specialize in fishing.

During the dry season, participants from both areas increase their consumption of purchased foods. However, these are costly in comparison to most parts of the country given the high transaction costs of delivering them to these remote locales. For example, a 2017 study in a neighboring county showed that households in the pastoralist zone couldn't afford a nutritious diet, suggesting cost could be one of the key factors contributing to high rates of malnutrition in the area.<sup>60</sup> Considering that these communities fall below the poverty line both in terms of income and assets,<sup>61</sup> it is understandable that they simply can't afford to purchase more-nutritious foods, such as high-quality proteins, to compensate for the absence of meat and milk from their own animals. Women showed a strong awareness about nutritious foods but explained that they can only afford to purchase simple grains, even though they know these grains have limited nutritional value.

### 6.1.2 Human disease prevalence

The results also show an increase in diarrhea during the dry season in both North Horr and Loiyangalani. This finding was interesting, as typically one would expect diarrhea to increase during the rains as water sources become contaminated.<sup>62</sup> The reasons varied, but in both areas the women made an association between the long periods they spend away from their children at this time and not being

57 See Sadler et al. 2012; Catley et al. 2018; FAO et al. 2020.

58 Mburu 2016.

59 Sadler et al. 2012.

60 Save the Children 2017.

61 See Mburu et al. 2017.

62 Morbidity data from the health clinic in North Horr showed similar patterns, as did results from a field testing of the monthly calendar done during the training in Laisamis ward. The results from Isiolo also corresponded with this pattern, with the exception of communities living close to the river that are exposed to flooding during the rains.



able to properly take care of their children's hygiene. For example, in both areas the women frequently mentioned that their children got sick from "eating dirt" while unsupervised. In North Horr, one of the main reasons given was that the quality of the water in the wells deteriorates at this time due to the greater concentration of dirt in the water as the well water recedes. In Loiyangalani, they mostly associated diarrhea with the increased consumption of "hunger foods" such as blood and acacia pods. However, they also made a connection between their food being contaminated with dust due to the strong winds at this time. Although participants associated other disease and infections with malnutrition, diarrhea was the only one with a direct seasonal correlation. In terms of possible zoonotic diseases as a cause of diarrhea, diarrhea cases peaked when women and children were largely separated from livestock, which were in the dry season *fora*.

### 6.1.3 Women's workload

Women's workload increases during the dry season as they increase their time and energy on activities such as firewood and charcoal collection in order to earn income to purchase food. They also have to spend more time collecting water, herding animals that need to go farther due to diminishing pasture, and collecting wild foods. These activities include carrying heavy loads for hours on end in temperatures frequently in excess of 40° Celsius, with limited clean water available for drinking and limited food availability. Other activities involve the women having to spend a night or two away from home.

In one of the more remote communities in Loiyangalani, the women explained how they collect a wild cassava (*erut*) in December, during the hunger period. As the plant is toxic, the preparation involves boiling the root for six hours to make it safe to eat. Considering the time and energy involved in collecting the roots, and collecting the firewood and water to safely prepare the food, the calorific value of the food is unlikely to compensate for the human energy needed to

prepare it. Comparable problems are evident for many livelihood activities, in which considerable time and effort is needed to acquire very low levels of income. In North Horr, the women from one group explained the advantages of milk over foods like beans which require time, fuel, and water to prepare: "We don't need to cook it, and we can easily add it to other meals." Although anecdotal, these examples illustrate that any initiative that aims to reduce malnutrition in these contexts needs to consider how to reduce women's workload, particularly during the dry season.

As discussed, these time-consuming activities also mean that children are left alone for long periods of time with little or no adult supervision. Doing so means that there may be nobody at home to prepare proper meals for them or make sure they observe proper hygienic practices.<sup>63</sup> In North Horr, the women explained that during this period their husbands are in the *fora*, and so they have less help with domestic chores at the time of year when they need this help the most.<sup>64</sup>

In summary, in both North Horr and Loiyangalani a combination of factors that potentially contribute to malnutrition occur at the same time during the dry season, and these correspond directly with an observed increase in malnutrition. Protein-rich foods such as milk, meat, and fish are not readily available, and most people can only afford to purchase less-nutritious foods. Women have to spend more time away from home trying to earn income to buy food or collect wild foods, leaving their children without proper care or adult supervision. At the same time, the men are not around to help. And diarrhea increases at the same time, arguably affecting the utilization of the little food people are consuming.

63 Participants from the Mt. Kulal case study suggested that they sometimes tie their toddlers up to prevent them from harming themselves when they have to leave them to work.

64 Many of these activities such as collecting water and firewood are traditionally considered to be women's work, and men will not engage in these even if they are present. However, the women did say that the men help look after the children.

## 6.2 Causes of malnutrition in children and mothers

### 6.2.1 Availability of livestock and livestock products

The causal diagrams show that in both areas, the main immediate cause of malnutrition from the perspective of participants is insufficient animal proteins such as milk and meat. These results are consistent with other studies in pastoralist areas in the region,<sup>65</sup> including one from Marsabit, that demonstrate the importance of livestock products in preventing malnutrition.<sup>66</sup> As discussed, there is a clear seasonal pattern to the availability of these products. However, participants in both areas also associated an increase in the number of cases of child malnutrition with declining numbers of livestock over time due to drought and livestock raiding. This finding is supported by a growing body of evidence, including a recent poverty assessment in Marsabit.<sup>67</sup>

The same study provides supporting evidence of the longer-term trend of livestock redistribution from poorer households<sup>68</sup> to wealthier households associated with destitution and an increasing number of people exiting pastoralism.<sup>69</sup> In Loiyangalani, this trend is more evident than in North Horr, with people engaging in more diversified and sedentary economic and livelihood activities in order to make ends meet. As discussed, seasonal livestock movements in Loiyangalani appeared to be more restricted than in neighboring areas. The Turkana here are effectively surrounded by “enemies” with the Dassanech to the north, the Gabra to the east, and the Samburu to the south. They are physically bordered by the mountain (Mt. Kulal) and the lake. These two factors might explain the more restricted livestock movements, with lower mobility accounting for the smaller herds and fewer numbers of camels compared to neighboring areas. Consequently, people have

likely been forced to shift to fishing, and firewood and charcoal sales to compensate for the loss of livestock, specifically camels. This shift from pastoralism to fishing is also occurring on the western shore of the lake, but at a much larger scale.<sup>70</sup>

The availability of, or reliance on, non-livestock food products was identified as a cause of malnutrition and was considered an important factor in North Horr. This partly relates to the availability of livestock food products, or the seasonal absence of these, and in some ways elevates the importance of this causal factor. However, the shortage of alternative food sources also serves to illustrate the remoteness of these communities relative to markets and the absence of infrastructure connecting these communities to the rest of the country.

### 6.2.2 Lack of income and economic opportunities

Lack of income was identified as either the second- or third-most important factor contributing to malnutrition and relates to the availability of livestock. For example, this indicator was largely explained in terms of the ability to purchase alternative high-protein foods to livestock products. Furthermore, livestock represent the most important source of income, with 70% of household income in Marsabit being derived from this source.<sup>71</sup> This statistic underscores the fact that there are limited income-earning opportunities in these areas, particularly for women. In North Horr, the livestock sector has potential, but livestock trade is constrained by poor market access, which in turn relates mainly to poor road and communications infrastructure.

Some women in both North Horr and Loiyangalani had been involved in small stock production and sales, but this involvement was ad hoc and yielded mixed returns. Part of the challenge is that livestock, including small stock, are controlled

65 See Sadler et al. 2012, Iannotti and Lesorogol 2014, Catley et al. 2018.

66 FAO et al. 2020.

67 See Hazard et al. 2012 and Mburu et al. 2017.

68 Mburu et al. 2017.

69 Catley and Aklilu 2013.

70 Carr 2017.

71 Mburu et al. 2017.

by men.<sup>72</sup> Again, the level of control varied from place to place and apparently from family to family. However, this cultural norm represents a significant barrier preventing women from benefiting from the opportunities the sector provides. In addition, many of the participants who had been involved in rearing and selling goats complained that the returns were hardly worth the investment due to what they perceived to be exploitation by livestock aggregators and traders.

In Loiyangalani, there is a lucrative fishing industry, but the benefits are more evident for those with access to equipment such as power boats, transport, and refrigeration. Again, there is a perception that people are being exploited by fish traders and “*cartels*.” The issue of exploitation may largely have to do with the transaction costs of doing business in these areas. Like North Horr, the very limited basic infrastructure, such as roads and electricity, means that traders incur high costs in moving products to end markets; these costs are handled by offering minimal pay for the raw products. As mentioned, the cost of staple foods is high for the same reason, so fish and livestock producers don’t realize an equitable return for their products. As with livestock, it is mostly men who are engaged in fishing, although not exclusively.

Given the challenges and lack of incentives for women to engage in these two sectors, it is not surprising that most of the women who participated in the analysis are dependent on “maladaptive livelihoods strategies”<sup>73</sup> such as firewood and charcoal sales for their income. Although lack of income may seem like a fairly general indicator or cause of malnutrition, it not only makes sense but also illustrates the lack of opportunities for communities in these areas who are effectively caught in a poverty trap. The indicator is also gendered given that men have control over assets, thereby depriving women of opportunities to earn income.

### 6.2.3 Human disease

As discussed, the results showed a direct seasonal correlation between malnutrition and diarrhea.

However, participants also associated malaria, HIV, pneumonia, anemia, parasites, and respiratory infections with malnutrition. This association was often linked with a loss of appetite leading to malnutrition, particularly in the case of nursing infants. In several groups, when participants were shown photos of malnourished women or children, they immediately associated these with disease such as HIV or even cancer. In two of the communities assessed, one in each area, participants scored human disease as the number-one cause of malnutrition in both mothers and children. In North Horr, malnutrition was attributed to diarrhea associated with poor-quality water and a lack of water to clean themselves or their cooking utensils. In the village in Loiyangalani, it was attributed to HIV.<sup>xxii</sup> In both areas, health facilities are limited and not easily accessible for more remote communities given the transport costs to transfer sick patients to these facilities.

### 6.2.4 Gender and social norms

A host of gender-related issues came out strongly in relation to malnutrition, although often these were concealed under other causes such as income or women’s work. More specific issues like the non-spacing of pregnancies were identified as direct causes of malnutrition. However, even this indicator was partly related to cultural norms that discourage child spacing. Participants also illustrated how certain taboos and potentially harmful cultural norms contribute to malnutrition; for example, those that discourage exclusive breastfeeding. More complex mental health issues including stress, anxiety, and depression were linked to malnutrition, although these were also linked to other causal factors including the lack of income, women’s workload, and marital or domestic issues, all of which can be considered gendered in their own right.

Although the gender and psychological stress issues were difficult to unpack within the time available, when all gender-related factors are combined, they represent a very substantial and complex set of issues contributing to malnutrition. For example, when the scores for women’s work, stress, non-spacing of pregnancies, and alcohol

72 See also Stites and Dykstra-McCarthy 2020

73 Young et al. 2009.

abuse from Loiyangalani are combined, they will exceed the number-one indicator for mother's malnutrition. Similarly, the combined scores for gender issues, women's workload, and non-spacing of pregnancies from North Horr exceed the second-most important individual cause, lack of income, which itself is not gender neutral. It is therefore important to recognize that many of these indicators are linked and should not be treated in isolation from each other.

### 6.2.5 Other factors

Other less-frequently mentioned causes included insecurity, the lack of childcare, and alcohol or substance abuse by husbands and fathers. However, these were linked to other causes such as livestock, poverty, and gender issues. Again, this linkage highlights the inter-relationship between the different causes as well as the multi-sectoral nature of malnutrition. Interestingly, poor water quality was rarely specifically identified as a cause of malnutrition, but it did come up regularly in relation to women's work and diarrhea. It was identified as a priority intervention to address malnutrition in nine communities across both areas of investigation. In many of the villages that lacked year-round access to clean water, particularly in North Horr, water was identified as the number-one priority, whereas in a nearby community with a reliable borehole it wasn't even mentioned. This finding underscores the importance of context. Factors contributing to malnutrition and the solutions to address these may differ, even within communities that live in fairly close proximity.

## 6.3 Programming implications

Based on the causal analysis, not surprisingly, the two priority interventions identified involve either restocking or livestock credit, and support to income-generating activities. More broadly the findings indicate that interventions to address malnutrition should primarily focus on livelihoods

and income generation. These types of support are discussed below, but with the caveat that the choice of interventions needs to be based on more detailed dialogue at community level, and careful joint assessment of the feasibility, likely benefits, and other issues.

From the perspective of the participants, the obvious way to address malnutrition is to support livelihoods and create meaningful income-earning opportunities, particularly for women. Most of the interventions identified by participants either directly or indirectly focus on these objectives. For example, there was strong demand for credit, restocking, and provision of equipment and training on income-generating activities.

The intervention preferences indicate more of an emphasis on livestock in North Horr, whereas in Loiyangalani opportunities around the fishing sector appear to be equally important. Although barriers exist for women in both the livestock and fishing sectors, these were the areas of focus for most of the interventions identified. As mentioned, restocking was the first- and second-most frequently mentioned intervention in North Horr and Loiyangalani. In most cases, the women specifically wanted small ruminants as they have more control over these than other livestock. Primarily the women were interested in rearing these animals in order to sell, although milk for consumption was also seen as a benefit. Fodder provision, specifically for goats during the dry season, and animal health services and rangeland rehabilitation also came up as a way of improving livestock production. Livestock support interventions were not always limited to small stock that women have more influence over. Women included camels as the women acknowledged they benefit from camel milk, even though the men have even greater control over them in comparison to small stock.

In Loiyangalani, much of the focus was on supporting fish production and sales, including the provision of equipment such as boats, nets, refrigeration, and training.<sup>74</sup> Although mostly men are involved in fishing, participants expressed

<sup>74</sup> Even where mosquito nets were identified, these were to be used to protect men from venomous snakes while camping out during fishing expeditions to South Island National Park.

considerable interest in women being trained on fishing and boat operating. However, the women also supported the idea of their husbands and sons receiving fishing support interventions as the women benefit from being involved in selling the fish. There was interest in value addition. In a number of villages, women were interested in selling fried fish. Freshly cooked fish can be sold for considerably more money than dried or uncooked fish. And as they explained, “*The men don’t cook.*” Transport and refrigeration were identified as a way to increase profits from fish sales. Fresh or frozen fish can fetch up to ten times the price of its dried equivalent.

It seems somewhat counterintuitive to invest in the fishing and livestock sectors in these areas given the aforementioned challenges around exclusion of women and poor households more generally. The lack of basic infrastructure and services makes these sectors relatively uncompetitive. However, major investments are being proposed or are already underway, including tarmac roads from both Marsabit and Laisamis. The largest wind farm in Africa is only a short distance from Loiyangalani and is due to come online soon. These developments will undoubtedly improve connectivity and services and bring down the cost of goods. Perishability of milk, meat, and fish has until now been a challenge for these two sectors. However, solar refrigeration solutions are increasingly being used successfully for milk and fish in remote parts of Kenya, including Loiyangalani. The challenge of limited road networks in remote rural areas is rapidly being overcome by the ubiquitous *bodaboda* (motorcycle). The absence of all these elements explains why the livestock and camel milk sector in North Horr is underdeveloped. But with all these elements in place, there are opportunities to support the modernization of these sectors, including through public-private partnerships.

One of the most frequently mentioned areas of support was for a market for people’s products. Participants consistently said, “*We need a market*

*to sell our livestock*” or “*We need a market to sell our fish.*” With a few exceptions, they did not mean a physical structure but rather a place where they can sell their products for a fair price. Again, there are opportunities for projects like Nawiri to identify potential buyers and support market linkages for these products. However, the lack of roads, transport, and more broadly to value addition of these products are related issues. Nonetheless, investments such as solar refrigeration placed in strategic locations for aggregation of milk and fish, and possibly also meat, along with transport subsidies (or soft loans for *bodabodas*) could go some way towards addressing these challenges.<sup>75</sup> This support could be combined with relevant training on food safety and value addition, and the provision of basic equipment.

There are other sectors that have potential, and over time these could be important. For example, both areas have considerable untapped potential for tourism, which if developed could support numerous spinoff livelihood or income-earning opportunities.<sup>76</sup> There is also potential to support small-scale vegetable and fruit production and preservation on Mt. Kulal. With improved infrastructure and transport services, there may be opportunities to make these products available to the neighboring communities in both Loiyangalani and North Horr.<sup>77</sup>

Aside from the fish and livestock sectors, women also expressed interest in setting up small shops or eating establishments. There was considerable interest in support to establishing women’s business groups as well as training on business skills and general support or capacity building around setting up businesses or cooperatives. In North Horr, a number of groups specifically mentioned the BOMA project’s graduation model. Interestingly, many of these same participants had never been engaged in a traditional *chama* (savings group) and even denied the existence of any kind of informal women’s group in their village. Nonetheless, there was considerable interest in support to help them establish and organize such

75 For example, smart subsidies have been used by Mercy Corps to help buy down the risk of market entry for goods and service providers in Wajir. These subsidies included a partial loan for a vehicle to a transporter to support a women’s camel milk cooperative in their efforts to ferry milk from Hadado to Wajir town. The loan repayment was then converted into a transport subsidy for the women’s cooperative.

76 See Marsabit County Government 2018.

77 The PE analysis was also carried out in the Mt. Kulal area. The findings will be published in a separate report.

groups. This area is certainly one that Nawiri can support at scale through its saving and internal lending groups (SILC) and graduation models.

While support to income-generating activities is both desired and needed, caution should be applied. Not everyone will benefit. There are a limited number of businesses that any given community can absorb. There are also other risks; for example, in one community participants said they were reluctant to start up a new business because their previous business, a food shop supported by an aid organization, had failed after one year. Therefore, careful consideration needs to be given to selecting viable opportunities, including developing a proper business plan for these.

Access to finance or credit was a common theme across all areas of intervention and was specifically mentioned by every group, although sometimes indirectly. For example, in some cases participants mentioned livestock credit, while others mentioned loans for transport such as motorbikes or boats. Essentially, the participants emphasized the need for capital to either start up a new enterprise or invest in upgrading an established one. In the short term, projects like Nawiri can provide limited access to finance through SILCs and graduation interventions. However, in the long term, more formal and appropriate financial services will be needed for poorer households to take advantage of the existing economic opportunities at scale. These services might include the establishment of Shariah-compliant Savings and Credit Cooperatives (SACCOS). Although Nawiri can support the establishment of SACCOS, as with the market systems and value chain interventions, this effort will require leveraging both public and private sector resources.

The findings suggest that activities to raise women's awareness on exclusive breastfeeding, nutritious foods, and hygiene are unlikely to have much impact. The women are evidently well aware of these issues and how they relate to health and nutrition. However, unless women can afford to purchase nutritious foods, this knowledge is of

little value. The hygiene issue is similar: if women are too busy to be around to ensure their children are washing their hands, or they don't have clean water or soap, then the children will continue to get sick regardless of the mother's awareness around this issue. Projects like Nawiri would be better served by identifying creative interventions that will make high-protein foods available and affordable to women and children during the dry season and at the same time reduce women's workload during the dry season. However, there is certainly a need to address attitudes and beliefs around harmful cultural practices, but these interventions need to be sensitive to potential backlash, and they need to target the men.

The provision of clean water was also identified as a priority intervention in some of the communities that lacked it. As a basic human right, clean water should be provided irrespective of malnutrition and could provide both health and time-saving benefits for women. However, careful consideration should be given to any water-related infrastructure in pastoralist areas. As mentioned, participants from North Horr made the connection between rangeland degradation and increased settlement as a result of boreholes, which in turn increased the time they spend herding animals and collecting firewood and hay. Any investments in water infrastructure should follow good practice such as the water governance guidelines developed by Wajir County Government.<sup>78</sup> In summary, "water points need to be sited and spaced appropriately to avoid pressure on any single water point or neighboring pastures."<sup>79</sup>

As discussed, intervention priorities varied across the communities sampled depending on location, based on specific contextual challenges and opportunities. For example, communities living near urban centers will have different opportunities from those living farther away but close to productive rangeland or fishing grounds. The absence of transport and road infrastructure means that these differences might be observed in a fairly small area. Projects like Nawiri face a unique challenge in finding a balance between designing context-specific interventions (at the

78 Bedelian 2019b.

79 Bedelian, C. 2019a.

village level) and implementing at scale. Given this challenge, it makes sense for Nawiri to consider flexible programming options such as the provision of credit combined with financial literacy training and business mentorship support. It also makes sense to invest in sectors that will benefit the most people, including livestock-based interventions and more locally the fishing sector in the case of Loiyangalani. The project might consider focusing on a few specific wards or sub-counties that are considered malnutrition “hotspots” and invest heavily in these areas. The project is unlikely to effectively realize impact if it spreads itself too thin.

creativity, opportunism, partnerships, and adaptive nonlinear programming, but it’s certainly a worthwhile challenge.

As mentioned, these intervention areas should be viewed as provisional. There was not enough time during the fieldwork to engage in detailed discussions of each intervention preference at the community level. These will need careful joint assessment of the feasibility of the interventions along with other issues. For example, although restocking was a preferred intervention, would restocking result in women spending more time away from their children while herding? Or would the men insist on taking these animals to the dry season grazing areas? These are the kinds of issues that need to be interrogated. Similarly, when identifying income-generating activities, careful analysis will be needed to ensure that these are viable.

With this caveat in mind, one of the dominant messages from the participants is that we are unlikely to address malnutrition in these counties without providing people with reliable economic opportunities and increasing their income. Nawiri is not in a position to create tens of thousands of new jobs, but with strategic investments to support income generation, it can certainly move the needle. To this end, Nawiri can provide significant support to software interventions such as training and capacity building. But these will only be effective if combined with significant and complementary investments in infrastructure as well as services. If Nawiri can, in concert with these interventions, identify complementary investments and leverage the private sector, county government, and other development resources, it can have a meaningful impact on malnutrition in these counties. Identifying these opportunities and investments and leveraging external resources to support them will be a challenge. It will require

# References

- Allepuz, A., K. de Balogh, R. Aguanno, M. Heilmann and D. Beltran-Alcrudo. (2017). "Review of participatory epidemiology practices in animal health (2015-1980) and future practice directions." PLoS ONE 1(12): e0169198. DOI:10.1371/journal.pone.0169198. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5240953/pdf/pone.0169198.pdf>.
- Bedelian, C. (2019a). Water for livestock in the drylands: The case of Wajir County. BRACED technical brief.
- Bedelian, C. (2019b). Water governance and development in the drylands: The case of Wajir County, Kenya. Wajir County Government working paper.
- Birch, I. (2021). Natural resource management and nutrition (in the Kenyan ASALs): A desk study for the Nawiri project, forthcoming.
- Burns, J., Catley, A. and Mahmoud, H. (2021). Using Participatory Epidemiology to Investigate the Causes and Seasonality of Acute Malnutrition in Marsabit and Isiolo Counties, Northern Kenya: Methods and Experiences. Feinstein International Center, Tufts University. Nawiri project forthcoming.
- Carr, C. J. (2017). River basin development and human rights in Eastern Africa – a policy crossroads. <https://link.springer.com/content/pdf/2%10.1007F8-50469-319-3-978.pdf>. Accessed 2021/01/05.
- Catholic Relief Services. (2019). Proposal in response to USAID/FFP FY19 request for applications for development food security activities in Kenya.
- Catholic Relief Service (2021), USAID Nawiri Gender Youth & Social Dynamics Analysis to Explore Gender, Social and Cultural Norms Associated with Acute Malnutrition in Isiolo and Marsabit Counties of Kenya. Final Report. Catholic Relief Services, Nairobi, Kenya. Forthcoming.
- Catley, A. and Y. Aklilu. (2013). Moving up or moving out? Commercialization, growth and destitution in pastoralist areas. *In Pastoralism and Development in Africa: Dynamic Change at the Margins*, ed. A. Catley, J. Lind and I. Scoones. Ch. 7. Oxford: Routledge Publishing.
- Catley, A., R. G. Alders and J. L. N. Wood. (2012). "Participatory epidemiology: Approaches, methods, experiences." *Veterinary Journal* 160–191:151.
- Catley, A., R. Lotira and C. Hopkins. (2018). Hidden peaks: Women's knowledge on the seasonality and root causes of child malnutrition in Karamoja, Uganda, and their programming preferences. Karamoja Resilience Support Unit, USAID/Uganda, UK aid, and Irish Aid, Kampala.
- Catley, A., S. Okoth, J. Osman, T. Fison, Z. Njiru, J. Mwangi, B. A. Jones and T. J. Leyland. (2001). "Participatory diagnosis of a chronic wasting disease in cattle in southern Sudan." *Preventive Veterinary Medicine* :(4–3)51 81–161.
- Czuba, K. (2018). Ethnic politics in Marsabit. Working paper, September. [https://www.researchgate.net/publication/318456646\\_Ethnic\\_Politics\\_in\\_Marsabit](https://www.researchgate.net/publication/318456646_Ethnic_Politics_in_Marsabit). Accessed 2021/30/04.



FAO and Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University. (2019). Twin peaks: The seasonality of acute malnutrition, conflict and environmental factors – Chad, South Sudan and the Sudan. FAO, Rome.

FAO, UNICEF and Washington State University. (2020). Seasonality of malnutrition: Community knowledge on patterns and causes of undernutrition in children and women in Laisamis, Marsabit County, Kenya. FAO, Rome. <https://doi.org/10.4060/ca8749en>.

Fratkin, E., E. A. Roth and M. A. Nathan. (2004). «Pastoral sedentarization and its effects on children's diet, health, and growth among Rendille of Northern Kenya.» *Human Ecology* Vol 32 No. 5

Fratkin, E. (2013). Seeking alternative livelihoods in pastoral areas. *In Pastoralism and Development in Africa: Dynamic Change at the Margins*, ed. A. Catley, J. Lind and I. Scoones. Ch. 17. Oxford: Routledge Publishing.

Hazard, B., C. Adongo, A. Wario and M. Ledant. (2012). Comprehensive study of pastoral livelihoods, WASH and natural resource management in Northern Marsabit. IFRA Nairobi research report IIAC UMR 77 81 CNRS EHESS. Nairobi.

Iannotti, L. and C. Lesorogol. (2014). "Animal milk sustains micronutrient and child anthropometry among pastoralists in Samburu, Kenya." *American Journal of Physical Anthropology* 76–155:66.

Paul Lepenoi Lekapana (2013) Socioeconomic Impacts of Drought on Pastoralists, Their Coping Strategies, and Government Interventions in Marsabit County, Kenya. University of Nairobi

Krätli, S. (2015). Valuing variability: New perspectives on climate resilient drylands development. IIED. Ed. H. de Jode.

Marsabit County Government. (2018). Second County Integrated Development Plan 2022–2018.

Marshak, A. (2021). Secondary data analysis of environment, conflict, and disasters in the Kenyan ASALS: Working paper for the Nawiri project, forthcoming.

Mburu, S. (2016). Incomes and asset poverty dynamics and child health among pastoralists in northern Kenya. PhD thesis in economics. University of Hohenheim, Stuttgart.

Mburu, S., S. Otterbach, A. Sousa-Poza and A. Mude. (2017). "Income and asset poverty among pastoralists in Northern Kenya." *Journal of Development Studies* 986–971 :(6)53. DOI: 00220388.2016.1219346/10.1080.

Munene, F. (2019). Marsabit County, Integrated SMART survey report.

Ocholla, S., J. Munga and E. Odundo. (2021). Malnutrition hotspot analysis and mapping for the Nawiri project in Marsabit County.

Sadler, K. and A. Catley. (2009). Milk matters: The role and value of milk in the diets of Somali pastoralist children in Liben and Shinile, Ethiopia. Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston and Save the Children, Addis Ababa. <http://fic.tufts.edu/publication-item/milk-matters3-/>.

Sadler, K., E. Mitchard, A. Abdi, Y. Shiferaw, G. Bekele and A. Catley. (2012). Milk matters: The impact of dry season livestock support on milk supply and child nutrition in Somali Region, Ethiopia. Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston and Save the Children, Addis Ababa, Ethiopia.

Save the Children. (2017). A cost of the diet analysis in Turkana County, Kenya: Central pastoral livelihood zone. Nairobi.

Stites, E. (2021). Livelihoods in the Kenya ASALs as a component of the new conceptual framework on acute malnutrition in Africa's drylands: Draft desk study for the Nawiri project.

Stites, E. and E. Dykstra-McCarthy. (2020). Gender gap analysis on Isiolo and Marsabit Counties: A desk study for the Nawiri project.

Stites, E. and E. Mitchard. (2011). Milk matters in Karamoja: Milk in children's diets and household livelihoods. Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston. <http://fic.tufts.edu/publication-item/milk-matters-in-karamoja/>.

Tezera, S. and S. Desta. 2008. Summary of a participatory assessment for pastoral women's health concerns on the Borana Plateau, Southern Ethiopia. USAID GL CRSP Pastoral Risk Management (PARIMA) Project, Cornell University, Ithaca.

United States Agency for International Development (USAID). (2019). Request for applications for fiscal year 19 development food security activities in Kenya. USAID Office of Food for Peace (FFP).

USAID/Kenya. (2015). Feed the Future Northern Kenya 2015: Zone of influence interim assessment report. Westat, Rockville.

Young, H. (2020). Nutrition in Africa's drylands: A conceptual framework for addressing acute malnutrition. Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston.

Young, H., A. M. Osman, A. M. Abusin, M. Asher and O. Egemi. (2009). Livelihoods, power and choice: The vulnerability of the Northern Rizaygat, Darfur, Sudan. United Nations Environment Programme (UNEP) and Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston.

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## Endnotes

<sup>i</sup>Women's focus group (causal diagram), Barambate village, February 24.

<sup>ii</sup>Key informant interview with VSF Germany and One Health, North Horr town February 23.

<sup>iii</sup>Female focus group (causal diagram) participants, El Boru Magado.

<sup>iv</sup>VSF Germany, North Horr.

<sup>v</sup>Key informant interview with VSF Germany and One Health, North Horr town.

<sup>vi</sup>Women's focus groups (causal diagram), El Besso 1 February 27 and El Gofu, February 25.

<sup>vii</sup>Women's focus group, El Gofu, February 25.

<sup>viii</sup>Key informant interview with VSF Germany and One Health, North Horr town.

<sup>ix</sup>Key informant interview with VSF Germany and One Health, North Horr town.

<sup>x</sup>Key informant interview with VSF Germany and One Health, North Horr town.

<sup>xi</sup>El Gofu village, February 25.

<sup>xii</sup>Women's focus group (causal diagram), Barambate village, February 24.

<sup>xiii</sup>El Boru Magado, El Gofu, Barambate.

<sup>xiv</sup>Qabdo village February 22.

<sup>xv</sup>Nawoitrong and Lenterit villages.

<sup>xvi</sup>Chanarare village.

<sup>xvii</sup>Nakuron (and nearby settlement).

<sup>xviii</sup>Palo village—a proportional piling exercise indicated that 66% of the women in the village were single mothers.

<sup>xix</sup>South Island is notorious for venomous snakes, notably the saw scaled/carpet viper (*Echis pyramidum*), per correspondence with David Williams (WHO) and Anthony Childs (Bioken snake farm).

<sup>xx</sup>Nakuron village.

<sup>xxi</sup>Kamote Laga and Nawoitrong villages.

<sup>xxii</sup>El Gofu (North Horr) and Nakuron (Loiyangalani).

