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## Women's Knowledge on the Seasonality and Causes of Child Malnutrition in Isiolo County, Kenya

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# Acronyms and Abbreviations

ASAL	Arid and semi-arid land
GAM	Global acute malnutrition
KES	Kenya shillings
PE	Participatory epidemiology
USAID	United States Agency for International Development

# Acknowledgments

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# Contents

<b>Summary</b>	<b>7</b>
<b>1. Introduction</b>	<b>10</b>
1.1 Livelihoods and Malnutrition in Isiolo	10
1.2 Participatory Epidemiology	11
<b>2. Overview of the Design and Methods</b>	<b>13</b>
<b>3. Results</b>	<b>16</b>
3.1. Detailed Explanations of Monthly Patterns	22
3.1.1 Availability of cow milk	23
3.1.2 Availability of goat milk	24
3.1.3 Consumption of other foods	24
3.1.4 Disease	25
3.1.5 Gender issues	26
3.1.6 Women’s work (neglect)	28
3.1.7 Insecurity	28
3.1.8 Human births	29
3.2 Differences in Diets Between Healthy and Malnourished Children and Mothers	29
3.3 Intervention Preferences	31
<b>4. Discussion</b>	<b>32</b>
4.1 Seasonality of Malnutrition and Related Factors	32
4.2 Causes of Malnutrition in Children and Mothers	33
4.3 Programming Implications	35
<b>References</b>	<b>36</b>
<b>Figures</b>	
Figure 1. Map of Isiolo County showing assessment areas.	13
Figure 2. Example of causal diagram scoring exercise.	14
Figure 3. Monthly patterns of malnutrition and related indicators.	16
Figure 4. Causes of child malnutrition.	18
Figure 5. Causes of malnutrition in mothers.	19
Figure 6. Objective rainfall pattern vs. rainfall pattern from PE.	22

## Tables

Table 1. Level of agreement for monthly calendars	17
Table 2. Level of agreement for causal diagrams	20
Table 3. Diets of healthy vs. malnourished children	20
Table 4. Diets of healthy vs. malnourished pregnant mothers	21
Table 5. Diets of healthy vs. malnourished lactating mothers	21
Table 6. Women's preferences for nutrition-related interventions	30

# Summary

This report presents the results of a participatory analysis of the causes and seasonality of malnutrition in Borana children and mothers in Cherab and Chari wards, Merti sub-county in Isiolo County. The exercise 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 selected wards. The exercise involved an initial ethnographic review to understand local language terms around mother and child nutrition, followed by the field work involving two participatory epidemiology (PE) methods, a monthly calendar and a causal diagram. These methods are designed to facilitate a joint analysis with participants on the causes and seasonal patterns of malnutrition and the relationship between these. The field work was carried out in 16 communities in Merti sub-county. These communities are primarily engaged in livestock production, with a focus on cattle and small ruminants. The livestock migrate between wet season and dry season grazing areas, although the distances involved are relatively small in comparison to other pastoralist communities in neighboring counties. Some households own camels or are involved in small-scale crop farming close to the Ewaso Ngiro River, but these are a minority and so are not included in the analysis. The overall objective of the analysis was to identify contextually relevant and appropriate interventions to inform the Nawiri project.

## Key Findings

- The results show that malnutrition increases during the dry season and improves during the wet season. Child malnutrition peaks

towards the end of the long (cool) dry season in August, with a smaller peak at the end of the short (hot) dry season in February. Participants largely attribute these peaks to the absence of livestock products, especially milk, for consumption. The availability of milk closely corresponds with local rainfall patterns and the availability of pasture. Participants also made an association between malnutrition and declining livestock ownership due to conflict and drought.

- Participants identified the lack of income as the second-most important factor contributing to both maternal and child malnutrition. This lack of income was mostly in relation to participants' inability to purchase nutritious foods during the dry season to compensate for the lack of livestock-based food available from their own animals. The remoteness of the area in concert with poor roads and limited transport services means that the cost of basic foods is high relative to other parts of the county. Most of the household income in the area is derived from the sale of livestock and their products, and hence families with fewer animals are more likely to experience malnutrition. Outside of the livestock sector, there are limited income-earning opportunities, particularly for women who have limited control over livestock sales.
- Human disease was identified as the third-most important factor contributing to child and maternal malnutrition. Participants made a connection between illness and a loss of appetite, as well as an inability to absorb nutrients. But they also made an association between not having a healthy diet (being undernourished) and a lowered immunity to disease and infection. Diseases associated with malnutrition were diarrhea, malaria, typhoid, HIV, pneumonia, chickenpox, and visceral leishmaniasis (kala-azar). The women also identified anemia in relation to

maternal malnutrition. The women specifically mentioned malaria and diarrhea as leading to dehydration, weakness, and emaciation in children. As mentioned, in most villages visited the results showed a strong seasonal connection between diarrhea and malnutrition, with both of these health problems increasing during the dry season. The women associated these seasonal peaks with deteriorating water quality, an increase in contaminated food, and sub-optimum childcare due to an increase in women's work burden during this period. Participants also associated diarrhea with the consumption of less-nutritious foods. Although generally the results show an increase in diarrhea during the dry season, in some of the flood-prone villages along the Ewaso Ngiro River, the results also show a small spike in diarrhea during the long, heavy rains in April.

- Women's work burden was scored as the fourth-most important factor contributing to both maternal and child malnutrition. In the case of mothers, participants attributed it to energy spent on strenuous activities with little or nothing to eat all day. For the children, the main reason is that they are left at home for long periods without proper adult care such as the preparing of healthy meals and ensuring of good hygiene practices. As mentioned, women's workload increases during the dry season, as more time is spent on activities such as fetching water for domestic use, collecting hay, watering animals, and collecting milk from the dry season grazing areas (*fora*). During this period, women also spend more time on income-generating activities such as firewood and charcoal sales to earn income to purchase food. The results show a direct correlation between this seasonal increase in women's workload and child malnutrition.
- Participants identified various gender-related issues that directly or indirectly contribute to maternal and child malnutrition. When combined, gender issues were of equal importance to other factors such as the lack of income and livestock products. Gender issues are also related to the time burden placed on women but more broadly on the psychological burden women experience trying to support their families, often with little or no help from their husbands. Participants often described

this burden as a kind of "stress," comparable to an illness that prevents a mother from being able to take care of herself or her child. This stress is caused by multiple and often interlinked factors, including negligence from husbands/fathers, infidelity, domestic violence, substance abuse, or a combination of these or other issues. Many of these issues also stem from destitution associated with declining livestock ownership and the lack of control women have over livestock, income, and expenditure.

- Many of the factors and issues identified relate directly to or are exacerbated by livelihood transformations, most notably those brought about by the decline in livestock wealth. These transformations have resulted in changing gender roles as men relinquish their responsibility to provide for their families. This change in the role of men as providers translates into a greater work and psychological burden on women, with implications on childcare and their own health and wellbeing. However, the inter-relationship between the many different factors that contribute to malnutrition is not always obvious. As such, any strategy to address malnutrition in dryland areas should avoid treating individual, specific causes in isolation from other potential contributing factors.
- The findings underscore the importance of taking seasonality into account when addressing malnutrition in these and other similar contexts. For example, several potential contributing factors occur during the dry season that directly coincide with a perceived peak in malnutrition. In addition to a decline in milk yields during this period, there is an increase in the prevalence of diarrhea due to deteriorating water quality and other factors. Women's workload increases, resulting in them being away from their children for long periods of time. It is reasonable to assume that seasonal peaks in malnutrition may be a result of the combined impact of several different factors.
- Participants' preferences to address malnutrition logically followed on from the causal analysis. The women identified lack of livestock and their products, and lack of income as the two main factors contributing



to malnutrition. Consequently, most of the interventions identified involved different types of support to income-generating activities, including credit and training, and support to livestock production. However, specific priorities did vary across the assessment area depending on the opportunities and challenges associated with each location, highlighting the importance of designing context-appropriate interventions to address malnutrition.

# 1. Introduction

Kenya's ASALs are characterized by high levels of child malnutrition, particularly global acute malnutrition (GAM) or "wasting," which is often measured at between 10% and 20%.<sup>1</sup> 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>2</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>3</sup> As part of this design phase, a participatory epidemiology (PE) analysis was carried out in Isiolo and Marsabit Counties from February to April 2021, with the overall objective of identifying context-specific and demand-driven interventions for Nawiri. This report presents the findings of this analysis in Isiolo County.

## 1.1 Livelihoods and malnutrition in Isiolo

Isiolo County covers approximately 25,700km<sup>2</sup>, with 95% of the county being classified as arid and 5% as semi-arid.<sup>4</sup> The county is largely characterized by flat, low-lying plain between 200–300 meters above sea level. Elevation rises to

1,100 meters in the vicinity of Isiolo town.<sup>5</sup> Isiolo has several permanent rivers, including the Ewaso Ngiro River, which is one of the more prominent geographical features in the county. The county experiences two rainy seasons, with the long rainy season occurring between March and May and the short rains between October and December.<sup>6</sup> Most of the county receives less than 300 mm of rainfall a year and is prone to frequent droughts.<sup>7</sup> However, higher elevations close to Mt. Kenya and the Nyambene hills to the south receive between 500–670 mm of rain.<sup>8</sup>

Pastoral livestock production is the most important livelihoods activity in the county, involving over 80% of the population and representing the most important sector of the local economy.<sup>9</sup> This livestock production is largely characterized by mobile livestock systems involving seasonal movements of animals between dry season grazing units (*fora*) and wet season grazing units.<sup>10</sup> Different species of livestock are reared in the county including cattle, camels, sheep, and goats, which are sold in the market to earn income.<sup>11</sup> Milk from cattle and small stock is typically sold in local markets, while camel milk is transported to markets in Isiolo and Nairobi. The livestock sector is affected by drought, conflict in the form of livestock raiding, poor general infrastructure such as roads and communications, and poor market access and infrastructure. Over time these factors have been contributed to high levels of destitution among pastoralists in the county.<sup>12</sup>

1 See Ochola et al., 2021.

2 USAID/Kenya, 2015.

3 USAID, 2019.

4 Birch, 2021.

5 Isiolo County Government, 2018.

6 Ibid.

7 Ibid.

8 Ibid.

9 Ibid.

10 Wasonga et al., 2016.

11 Small ruminants are frequently sold whereas cattle and camels are less frequently sold

12 Hogg, 1985.

An estimated 13% of the population is involved in a mixture of crop farming and wildlife conservation, in many cases combined with livestock production.<sup>13</sup> Crop farming is mostly small scale and limited to higher elevations and a few specific riverine areas. Other livelihoods activities include fishing and aquaculture, beekeeping, firewood collection, and charcoal production.

Along with other ASAL counties, Isiolo frequently experiences high levels of GAM in children under five years of age. A recent analysis of nutrition data from 2010–2020 revealed no years where the prevalence of GAM was in the acceptable range ( $\geq 5\%$ ).<sup>14</sup> In three out of the ten years, GAM rates exceeded the emergency threshold of  $\geq 15\%$ , and for six years GAM was above the critical threshold (10–14.9%).<sup>15</sup> Within the county, the three sub-counties most vulnerable to acute malnutrition were Garbatulla, Merti, and Isiolo with four years, three years, and two years of GAM exceeding the  $\geq 15\%$  threshold respectively.<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 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 Isiolo 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 exercise 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

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 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.<sup>22</sup> One adaptation included the standardization and repetition of PE methods 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

13 Erickson et al., 2013 cited by Birch, 2021.

14 Ochola, 2021.

15 Ibid.

16 Ibid.

17 Young, 2020.

18 Ibid.

19 See FAO and Feinstein, 2019 and Catley et al., 2018.

20 Ochola et al., 2021.

21 Young, 2020.

22 Allepuz et al., 2017.

23 Catley et al., 2012.

24 Catley et al., 2001.

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 agro-pastoralist 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 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 Isiolo (presented in this report) as well as in North Horr and Loiyangalani in Marsabit County. A combined paper on the detailed methodology and experiences using PE methods across both areas will be published in a separate report, as will the results from Marsabit.

25 Tezera and Desta, 2008.

26 Sadler and Catley, 2009.

27 Stites and Mitchard, 2011.

28 Catley et al., 2018.

29 Catley et al., 2018.

30 CRS, 2019.

# 2. Overview of Study Design and Methods

As noted above, a detailed account of the methods used are available in a separate report.<sup>31</sup> This section summarizes the design and methods used. 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>32</sup> In Isiolo, the analysis 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?

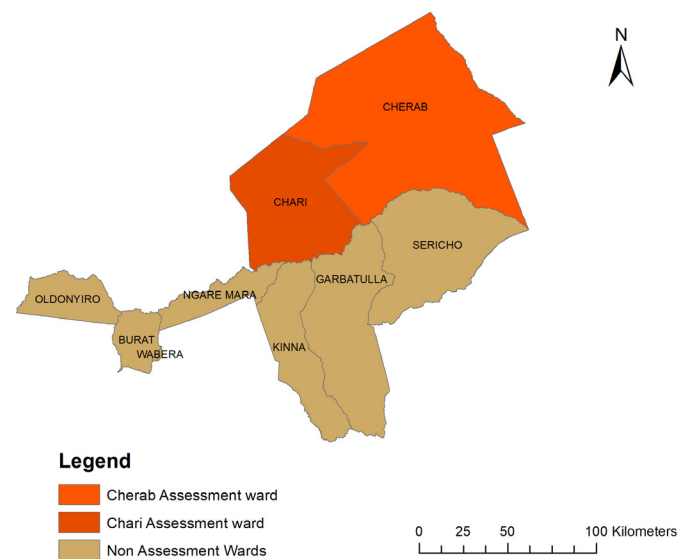
Based on a Nawiri analysis of hotspots, Cherab and Chari wards were selected for the analysis.<sup>33</sup> The assessment area is primarily inhabited by pastoralists from the Borana ethnic group. The study was carried out in eight villages in Cherab and seven villages in Chari between March and early April 2021.

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

## Ethnographic review

An ethnographic approach was used to understand and document Borana language terms used for malnourished women and children,

**Figure 1. Map of Isiolo County showing assessment locations.**



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.

## Training in participatory epidemiology

The exercise was carried out by a team of nine women from the Nawiri target counties with relevant local language skills. The team was led by an experienced researcher from Northern

<sup>31</sup> Burns et al., 2021a.

<sup>32</sup> See Catley et al., 2018.

<sup>33</sup> Other hotspot wards in Isiolo were excluded, as these are being covered by other Nawiri research.

Kenya. The training for the field teams was led by a Feinstein researcher, also from Northern Kenya and with extensive experience in participatory methods, including co-leading a PE study focusing on human nutrition in Karamoja, Uganda. The training included two days of classroom training involving both theory and practical sessions but focusing on the two PE methods (see below). This classroom training was followed by two days of practical field work in Garbatula and Laisamis sub-counties, where the team practiced using these two methods. A final day was spent reviewing experiences from the field practical and adjusting the methods.

### Participatory epidemiology methods

The analysis used two PE methods, a causal diagram and a monthly calendar. The monthly calendar was used with 13 independent informant groups in Chari and Cherab wards, Merti sub-county. Group size varied from between 8 and 15 women. The causal diagram was carried out with 16 independent groups of between 4 and 8 women in the same locations.

The causal diagram asked participants to identify and discuss the key causes of malnutrition for both women and children. The initial stage of the method involved detailed discussion (using language gathered during the ethnographic

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



review), followed by the use of selected photographs of a malnourished child/mother 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 method involves asking the participants to show monthly variations of different indicators such as rainfall, human disease, food availability, and child malnutrition. It is done by asking the participants to distribute 100 counters across 12 months (as named during the ethnographic review), using a typical year with a relatively normal wet season as a reference year. For example, participants will be asked to show in which months of the year they normally receive the most rain, and they will be asked to assign the most counters to that month. They will then be asked to distribute the rest of the counters based on the relative amount of rain they receive for each month of the year. Once consensus on the pattern of rainfall has been reached, the participants will be asked to repeat the scoring for the next indicator. Local terms for the different months are used and confirmed with participants by identifying a major activity or event that occurs in each month. This identification of months is used as a reference to make sure the researchers and participants are always talking about the same month. The scoring provides a basis for discussions around each indicator. For example, participants will be asked why goat milk is more readily available at a certain time of the year and not another. Once all the indicators have been scored, the researchers and participants collectively analyze and discuss the patterns between the different indicators and discuss the relationship between them.

The use of 100 counters per indicator for each of these methods enabled the results to be recorded numerically, and a total score for all informant groups calculated for each month and indicator in the case of the monthly calendar, and each cause in the case of the causal diagrams. Further analysis used the Kendall coefficient of concordance ( $W$ ) to assess the level of agreement between groups.

After completing the causal diagram and monthly calendar methods, 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 malnourished mothers and children.

The results were triangulated with other sources, including key informants, and secondary data and literature. Key informants included livestock traders at the Merti livestock market, a herder who owned a butchery, and the chairperson of a women's self-help organization.



*Borana cattle near Malka Galla*

# 3. Results

**Figure 3. Monthly patterns of malnutrition and related indicators.**



**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.

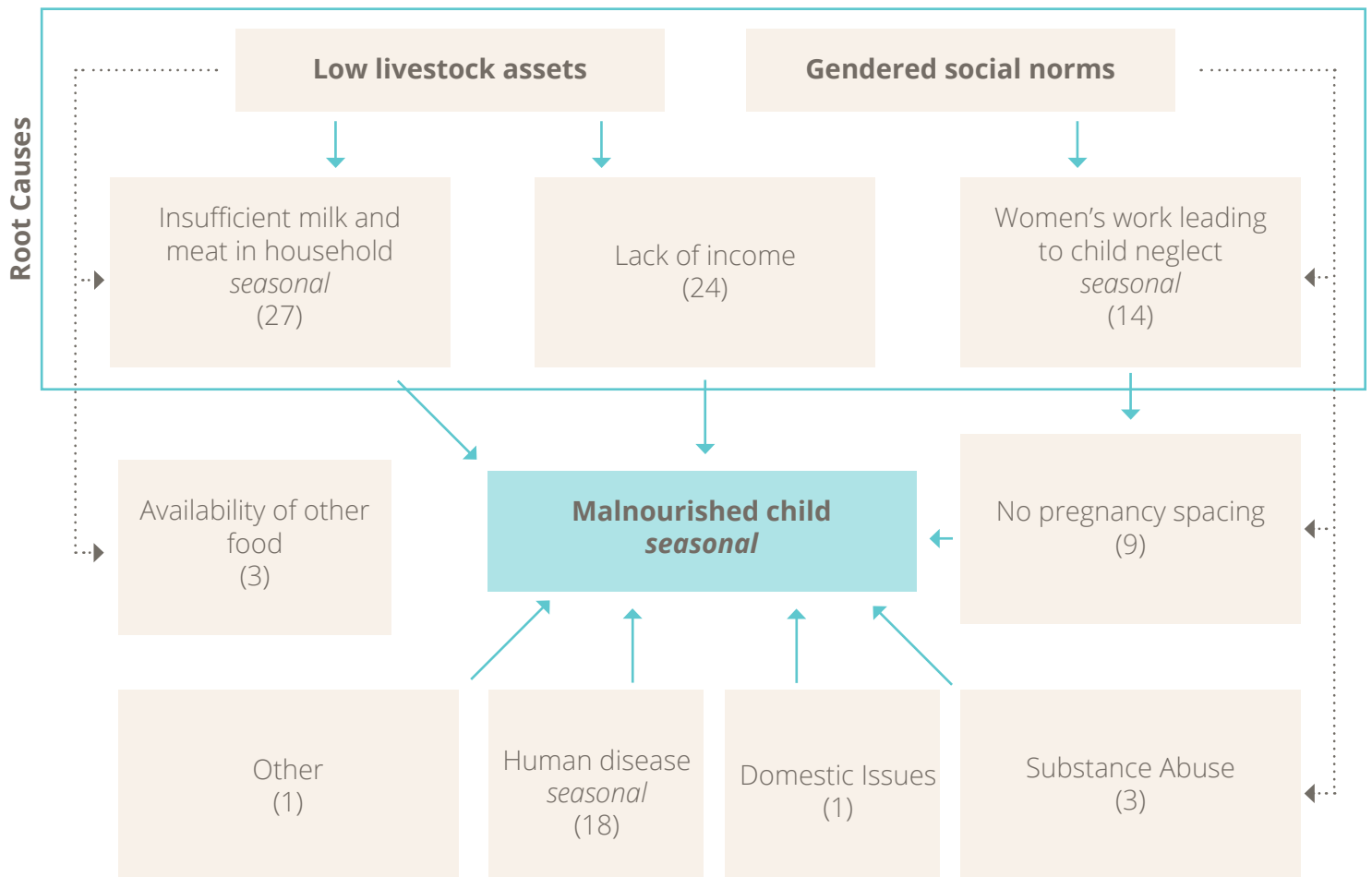


**Table 1. Level of agreement for monthly calendar indicators (n = 13 groups)**

<b>Indicator</b>	<b>Kendal coefficient of concordance W</b>	<b>P-value</b>
Rainfall	0.833	0.000
Cow milk	0.764	0.000
Goat milk	0.722	0.000
Consume purchased foods	0.682	0.000
Women's work	0.651	0.000
Malaria cases	0.729	0.000
Diarrhea cases	0.352	0.000
Malnutrition	0.743	0.000
Insecurity	0.327	0.000
Human births	0.431	0.000

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

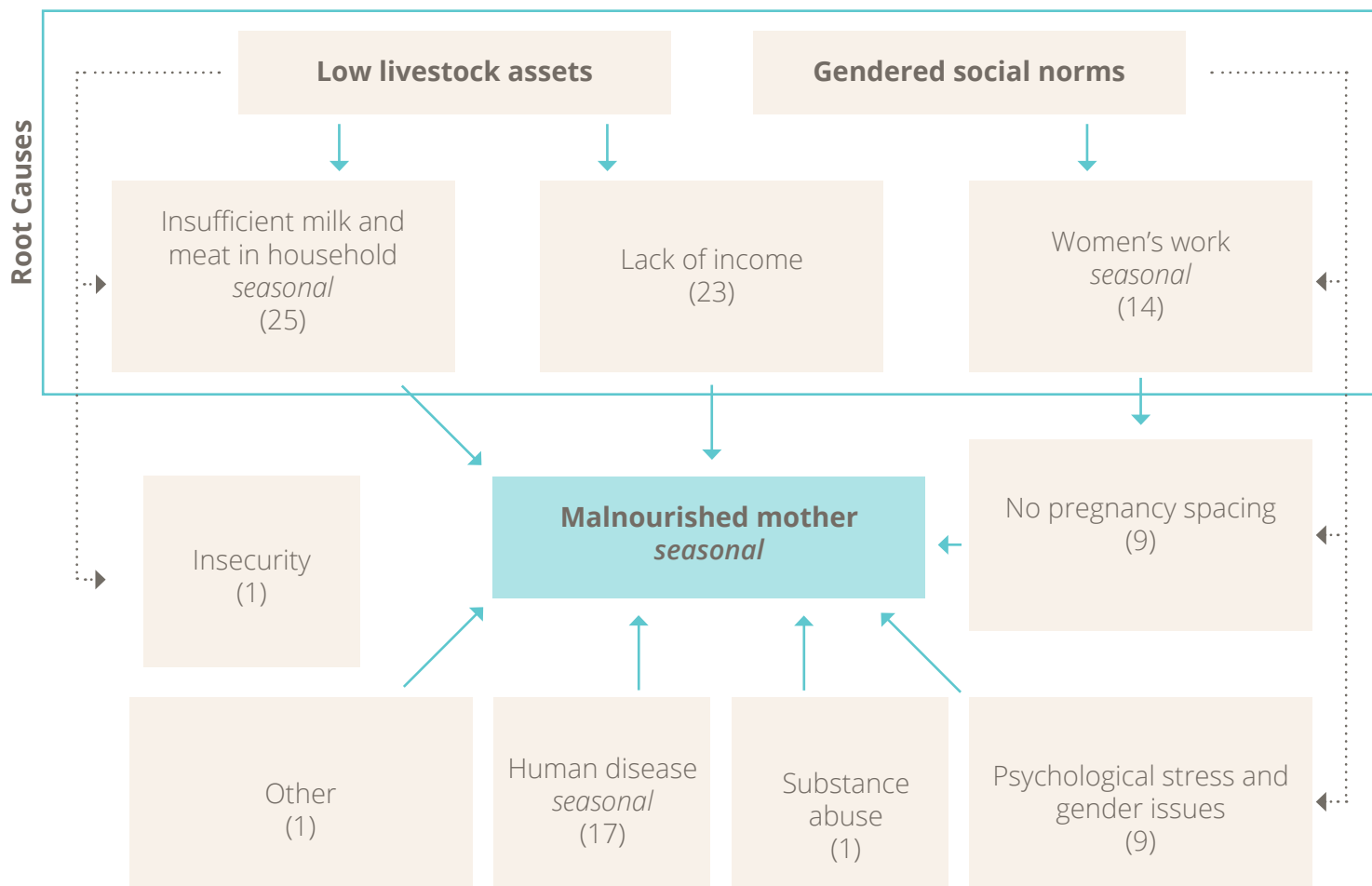
**Figure 4. Causes of child malnutrition.**



Other = lack of childcare

**Notes:** Figure derived from interviews with women in Merti followed by proportional piling of causes with 16 independent groups of women. The figures in parentheses represent the scores from all the groups presented as a proportion of the total scores.

**Figure 5. Causes of malnutrition in mothers.**



Other = availability of non-livestock food

**Notes:** Figure derived from interviews with women in Merti followed by proportional piling of causes with 16 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 (n = 16 groups)**

Causes of malnutrition	Kendal coefficient of concordance <i>W</i>	P-value
Children	0.803	< 0.001
Mothers	0.747	< 0.001

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

**Table 3. Diets of healthy vs. malnourished children**

Age	Healthy children	Malnourished children
0–5 months	Exclusive breastfeeding	Exclusive breastfeeding
6–9 months (up to 1 year)	<u>Types of food</u> - Breastmilk - Mashed potatoes - Mashed beans - Cow and goat milk (diluted with water) - Porridge	<u>Types of food</u> - Breastmilk - Plumpy'nut* - Diluted milk ( <i>arer</i> )
1–5 years	<u>Types of food</u> - Cow milk and goat milk (diluted with water) - Beans, rice, <i>ugali</i> (maize meal), vegetables, fruits	<u>Types of food</u> - Plumpy'nut - Diluted milk ( <i>arer</i> ) - Tea - <i>Ugali</i>

\* 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**

Age	Healthy pregnant mother	Malnourished pregnant mother
2 weeks to 3 months (first trimester)	<u>Types of food</u> - Milk, fruits, porridge - Vegetables such as cabbages, meat, <i>ugali</i> , and rice	<u>Types of food</u> - Strong tea - Posho - Diluted milk ( <i>arer</i> )
4–6 months (second trimester)	<u>Types of food</u> - Milk, fruits (sugar cane, oranges), vegetables, porridge, meat and meat soup, <i>ugali</i> , and rice	<u>Types of food</u> - Strong tea - Posho - Maize and beans - Diluted milk ( <i>arer</i> )
7–9 months (third trimester)	<u>Types of food</u> - Milk - Fruits (oranges, mangoes) - Porridge, meat, <i>ugali</i> , rice, and meat soup	<u>Types of food</u> - <i>Posho</i> - Diluted milk ( <i>arer</i> ) - Strong tea - Maize and beans

**Table 5. Diets of healthy vs. malnourished lactating mothers**

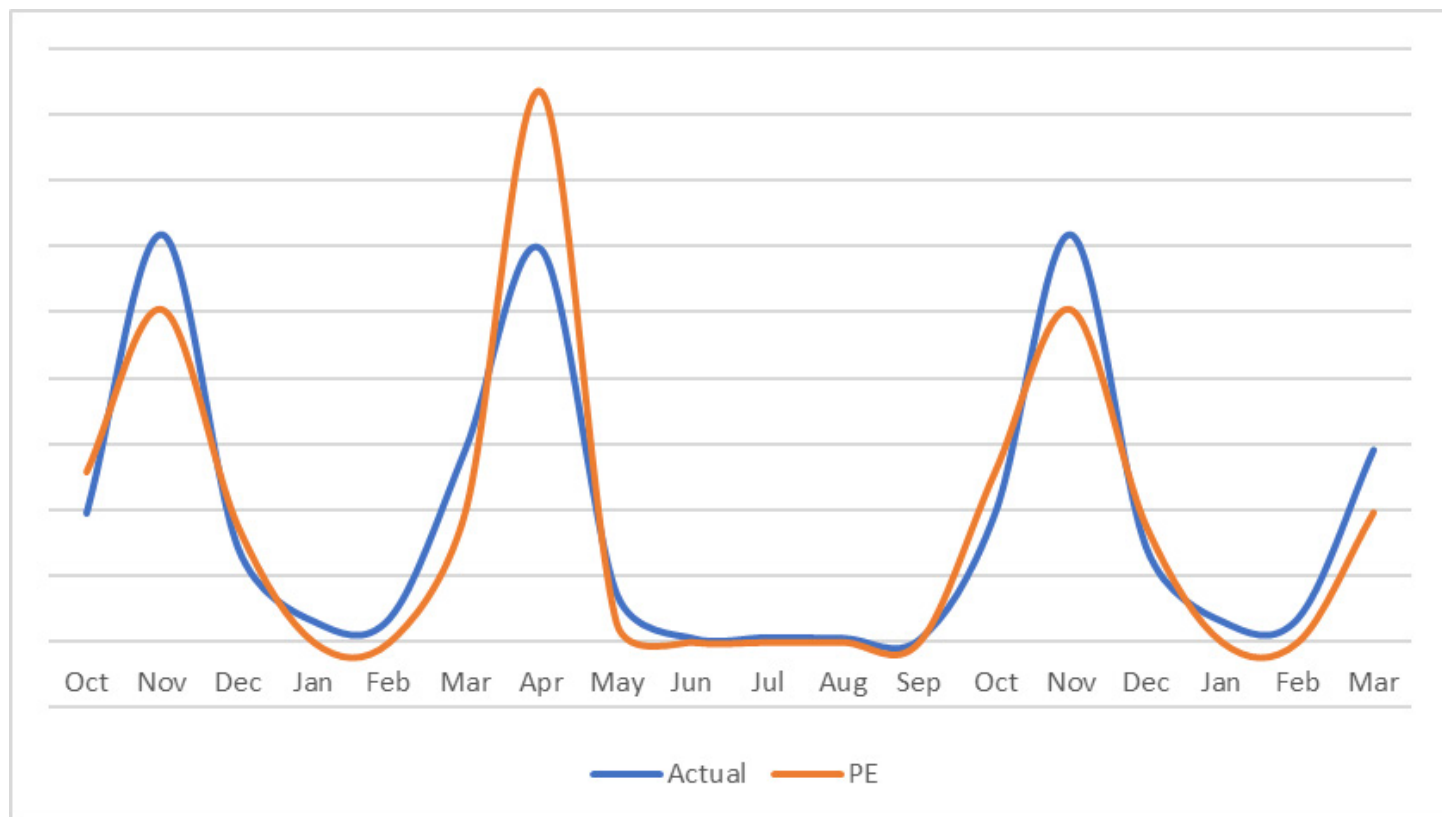
Age	Healthy lactating mother	Malnourished lactating mother
Just given birth (first 2 weeks)	<u>Types of food</u> - Milk (both cow and goat milk) - Vegetables (cabbages) - Fruits (oranges, mangoes) - <i>Ugali</i> , rice, beans, <i>anjera</i>	<u>Types of food</u> - Porridge, <i>posho</i> , strong tea - Diluted milk ( <i>arer</i> ) - Maize and beans
From 3 weeks to 2 years	<u>Types of food</u> - Meat soup - Vegetables (cabbages) - Fruits (oranges, mangoes, banana) - <i>Ugali</i> , rice, beans, <i>anjera</i> - <i>Ititu</i> (fermented milk)	<u>Types of food</u> - Strong tea, <i>posho</i> , porridge, maize and beans - Diluted milk ( <i>arer</i> )

### 3.1. Detailed explanations of monthly patterns

Communities in the assessment area practice mobile livestock production in which the livestock move between wet and dry season grazing areas. However, some of these dry season grazing areas (*fora*) are close to the Ewaso Ngiro River, and some of the selected villages are actually located in the *fora*. During the wet season, if security permits, households will split their herds, with some being moved to kom ("rich," high-quality rangelands) where the animals can rely on water pans and surface water. However, they can still keep a good number of animals at home to provide milk. The selected villages that were not in the *fora* are still fairly close to them, and milk (when available) can be accessed by *bodaboda* (motorcycle) or on foot.

For the monthly calendars, participants were asked to show the rainfall distribution pattern as the first indicator. As the participant-generated rainfall pattern can easily be compared to actual rainfall data, it helps to make sure that the participants understand the method. Rainfall is also a useful starting point for the exercise given its critical influence on livelihoods in pastoralist areas, especially livestock production and mobility. In terms of monthly rainfall distribution, the results from the monthly calendars show the exact same pattern as long-term objective measures of rainfall. In both cases, rainfall peaks during both the long and short rains in April and November respectively.

**Figure 6. Objective rainfall pattern vs. rainfall pattern from PE.**



**Notes:** Figure 6 shows a comparison of rainfall distribution from the PE results and objective rainfall data. The objective rainfall data show the long-term average monthly rainfall.<sup>1</sup> The PE rainfall data show the average scores from 13 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: World Food Programme (ND) Vulnerability Analysis and Mapping (VAM) unit, cited by the National Drought Management Authority; Isiolo County Drought Early Warning Bulletin, February 2020..

The results from the monthly calendars were supported by explanations by the participants on the patterns of the different indicators depicted. Across all informant groups, the results show child malnutrition increasing during the dry season, which participants largely attributed to the lack of livestock products during this period. The results show milk availability from both cattle and small stock increasing during the rains from March to May and October to December and decreasing during the dry seasons in between these periods. During the dry season, participants are more dependent on purchased food, including maize, rice, and beans. Other seasonal factors contributing to malnutrition during the dry season include an increase in diarrhea and an increase in women's work. The results show two peaks of child malnutrition, with the highest peak occurring towards the end of the long (cool) dry season in August and a smaller peak towards the end of the short (hot) dry season in February.

### 3.1.1 Availability of cow milk

The communities in the assessment area specialize in cattle production, and participants specifically identified the lack of cow milk as the most important factor contributing to child malnutrition. Milk production is largely determined by rainfall and the associated availability of pasture. The results show cow milk is most plentiful from March to May and then again from October to December, following an almost identical pattern as rainfall. Cow milk is still available during the dry season but in much smaller quantities. Although livestock are moved between wet and dry season grazing areas, all the participating communities either lived in or near the main dry season grazing areas (*fora*) along the Ewaso Ngiro River.

The women explained that babies are gradually introduced to cow milk as they grow, and they consider cow milk to be essential for the child's health and growth. Participants were aware of exclusive breastfeeding but indicated that in some circumstances where the mother is sick and can't produce sufficient breastmilk, they will supplement the baby's diet with cow milk.

During the dry season, women will regularly walk to the *fora* to collect milk for consumption. The frequency of these visits is determined by how

close a given settlement is to the *fora*. However, as the dry season progresses, the animals are moved farther away in search of pasture, and access becomes more difficult. Participants indicated that they each typically only collect about 1 liter of cow milk from the *fora* during this period. Milk is also collected from the *fora* by *bodabodas* and delivered to all the larger settlements in the area on a daily basis, including during the dry season. Participants explained that some families that own cattle have an arrangement with the *bodaboda* riders whereby they will deliver milk to the household first, and then the surplus will be taken to larger towns and sold.

Cow milk was also identified as one of the most important sources of income. Milking is primarily done by women, so they have some control over this income. During the dry season, the women indicated that they could sell a liter of milk in Merti for Kenya shilling (KES) 80 (approximately United States dollar (USD) 72 cents) whereas in the wet season this price will go down to KES 50 (approximately USD 45 cents). The women explained that they prioritize milk for children over sales and will only sell a surplus after they have set aside enough milk for the children, as well as for their own tea.

Participants frequently stressed that milk has become scarcer in the villages due to high livestock losses as a result of cattle raiding and, to a lesser extent, drought. The women explained that in the past it was not uncommon for wealthier households to own hundreds or even thousands of cattle whereas now it's rare for a single family to own over a hundred head of cattle. Some families no longer own cattle at all. To illustrate this point, they explained that nowadays the community pools their herds, and only a few men go to the *fora* to look after the livestock in shifts, while most of the men remain behind. In the past, all the men would go to the *fora* for the duration of the dry season. Participants indicated that households with sufficient cattle share milk with relatives. It is also a common practice for wealthier households to lend a milking animal to households that have lost their cattle due to raids or drought.

In addition to the importance of cow milk for children, participants using the causal diagram method explained that cow milk is one of the most

important nutritious food sources for mothers as well. For adults, both fresh and fermented milk is mixed with other foods such as maize meal (*ugali*) and beans.

### 3.1.2 Availability of goat milk

The results from the monthly calendars show that the availability of milk from small ruminants follows the same patterns as cow milk and rainfall. Although sheep and goats produce much smaller quantities of milk than cows, the women explained that their importance for both child and maternal nutrition cannot be underestimated, as most people own small stock, and wealthier households own quite large numbers of up to several hundred sheep and goats. For this reason, they explained that goat milk is often more readily available for consumption in the household than cow milk. Surplus goat milk is also shared with relatives.

However, in most villages visited, the lack of goat milk was identified as the second-most important factor contributing to child malnutrition after lack of cow milk. The women explained that goat milk is most plentiful during the rainy season when there is good browse. At this time, they can produce a surplus that can be sold. However, during the dry season, participants maintained that there is only enough goat milk for tea.

In addition to cow and goat milk, participants using the causal diagram method emphasized that meat from cattle and small ruminants is also important for nutrition, particularly for mothers. However, meat is typically only consumed during certain ceremonies when livestock are slaughtered. The women explained that the meat is prepared into a broth that can then be fed to the young children. Some participants were also engaged in small-scale poultry production. For these households, their diet is complemented with chicken meat and eggs, which the women also considered important for child nutrition.

### 3.1.3 Consumption of other foods

In addition to consuming livestock products, communities in the area purchase various other foods that are consumed throughout the year. However, the results from the monthly calendar show a marked increase in the consumption of

purchased foods during the dry season (Figure 3). The women explained that consumption of purchased food is to compensate for the limited milk availability from their livestock during this period. The most commonly purchased foods include maize, rice, beans, sugar, and cooking oil. These are typically combined with livestock products such as milk, chicken, meat soup, and eggs, when available. Participants also mentioned that they consume more non-livestock-based foods during festivities. For example, during the month of Ramadhan, charities provide food items such as rice, wheat flour, tea sugar, and cooking oil.

The women explained that they prefer livestock products, including chicken meat and eggs, to purchased foods. They consider livestock products to be more nutritious than purchased foods, particularly for children. For this reason, participants indicated that they mostly feed their children milk and meat when these are available and only resort to feeding their children non-livestock foods during the dry season. However, participants using the causal diagram method frequently mentioned the importance of fruit and vegetables for women's health. These items are available in some of the larger centers such as Merti and are also grown on a small scale in the assessment area along the Ewaso Ngiro River. However, participants from the more remote villages explained that they can't afford to eat fruit or vegetables given the high cost of transport to Merti. Although availability of purchased foods did come up as a minor factor contributing to malnutrition in the causal analysis (Figures), the main issue the women identified was the cost of purchasing these foods due to the high transport costs involved. Consistent with this finding, lack of income was identified as the second-most important factor contributing to both child and maternal malnutrition (Figures 4&5). This lack of income was largely associated with an inability to purchase nutritious foods during the dry season.

Foods are mostly purchased with income derived from the sale of livestock and milk. However, during the dry season, foods are often purchased on credit and then debts are repaid with the income from the sale of a sheep or goats. There is a thriving livestock trade in the area, with large numbers of small ruminants being sold at the twice-weekly livestock market in Merti. Cattle are



also sold periodically, but sale of cattle is less common. For example, the PE team observed large numbers of small stock being sold in the livestock market in Merti but saw no cattle being sold.<sup>36</sup> Decisions around livestock sales are largely made by the male head of the household, and the women frequently associated malnutrition with families where the husband refused to allow his wife to sell an animal to purchase food or pay for medical expenses. Participants indicated that this situation was more common in polygamous households. However, women were observed actively engaged in the sale of small stock, suggesting that they do have some control over the income derived from these sales. Another issue that arose consistently was that because they now have fewer animals, some households don't have enough animals to sell; these households are the ones that are more likely to have malnourished children.

Women have more control over milk sales, but participants explained that the quantities sold locally are small, and, with limited income from these sales, they can't justify the transportation costs of selling milk in larger centers such as Merti. Although milk prices improve during the dry season, households don't have as much surplus milk to sell at this time. Therefore, participants explained that many women engage in firewood and charcoal sales during the dry season to supplement their income. Some women also earn small amounts of income from doing domestic work for wealthier households.

### 3.1.4 Disease

Participants using the causal diagram method scored human disease as the third-most important cause of malnutrition in both children and mothers (Figures 4&5). In many cases, when participants were shown a photograph of a malnourished child or mother, they immediately associated it with one type of disease or another. However, the same participants also explained that inadequate food intake lowers immunity to disease in the first place. The disease causes a loss of appetite that

then leads to malnutrition. Some participants also mentioned that when a child or mother is sick, the body is unable to absorb nutrients.

The most commonly mentioned disease associated with malnutrition were diarrhea, malaria, typhoid, HIV/AIDS, pneumonia, chickenpox, and kala-azar. The women also identified anemia in relation to maternal malnutrition. The women specifically mentioned that malaria and diarrhea lead to dehydration, weakness, and emaciation in children. The results from the monthly calendars show that malaria is most common during the wet seasons. Participants explained that stagnant water and the growth of thick vegetation after rain provide breeding grounds for mosquitos. Conversely, the women stated that from June to September there are fewer mosquitoes due to the strong winds at this time. They did qualify that malaria occurs throughout the year but that it is more common during the wet seasons.

In contrast to malaria, the results from the monthly calendar show diarrhea increasing during the dry season (Figure 3). The women explained that diarrhea occurs throughout the year, but it is more common during the dry season. Several of the groups directly associated diarrhea with a scarcity of milk and an increase in the consumption of what they consider to be less-nutritious foods such as *ugali* (maize meal) and black tea. Participants also attributed the increase in diarrhea to poor hygiene practices during the dry season, as water has to be used sparingly during this period. Where the main source of water was from open water such as water pans or the river, participants explained that the quality of the water deteriorates as the dry season progresses and dirt in the water becomes more concentrated. Participants also associated diarrhea with increased food contamination caused by wind and dust during the dry season. In children, the women specifically linked diarrhea with worms (parasites) that are ingested from eating soil or dirt during the dry season. The women explained that, due to their increased workload at this time of year, they have to leave their young children for long periods of time with

<sup>36</sup> This lack of cattle sales may have been partly due to an increase in the demand for sheep and goats leading up to Ramadhan, which started right after the study. Key informants mentioned that cattle are also sold periodically when livestock traders come to the area, but it's less common for cattle to be sold in the market.

limited supervision. For example, they might leave four or five children with an elderly grandmother who is unable to effectively manage them all. So some of the children invariably end up eating soil. When asked why the children eat soil, the women suggested that it's like the cravings that expectant mothers get when their body lacks minerals, and that it is not uncommon for pregnant women to sometimes eat soil.

Although participants across most villages reported an increase in diarrhea during the dry season (Figure 3), they also recognized small spikes during the rains and gave logical reasons for these. For example, the women attributed an increase in child diarrhea to children playing in and drinking contaminated surface water, given that many of these communities still practice open defecation. In four out of the sixteen villages visited, the results showed diarrhea peaking in March during the long (heavy) rain season, then rapidly decreasing in May, then increasing again as the dry season progresses, and then tapering off during the short (light) rains in November (Annex I). All four of these villages were located in a flood-prone zone close to the Ewaso Ngiro River, with increased exposure to water-borne disease following heavy rains.<sup>37</sup>

Kala-azar was also frequently identified as a direct cause of child malnutrition. The disease, locally known as *shable*, is common in the area. The women explained that it is caused by flies, and leads to weight loss, protruding stomach, loss of hair, weakness, emaciation, and in some cases death.<sup>38</sup>

Although disease was scored as the third-most important cause of both child and maternal malnutrition, interestingly only three groups identified the need for improved health services. These groups were in some of the more remote villages. Another group did request mosquito nets as well as water filters to prevent diarrhea and other water-borne diseases.

### 3.1.5 Gender issues

Various gender-related issues emerged during the PE methods. Many of these issues were interlinked. The women talked about psychological stress, referred to as *uil* (stress) or *yadh hammaa* (bad stress), which can lead to malnutrition, particularly for mothers. Participants explained that “stress” can be caused by negligence from the husband/father, infidelity, domestic violence, substance abuse, or a combination of these or other issues. The women described negligence in various forms. Sometimes this negligence was linked to infidelity or polygamy, whereby the husband no longer takes responsibility for providing for the family. The women said the husband doing so often leads to domestic violence, separation, and divorce, resulting in almost certain destitution for the mother and her children.

Negligence was also associated with substance abuse, mostly chewing of *miraa* (*Catha edulis*), which is commonly used in the area.<sup>39</sup> The women explained that when men chew *miraa* they just sleep all day and don't contribute to the household in any way. Men who become addicted to *miraa* prioritize buying the drug with the little money they have rather than purchasing nutritious food for the family. Women indicated that men will often sell their livestock in order to satisfy their addiction and will no longer pay for food or school fees for their children.<sup>40</sup> In the event that the wife confronts the husband or asks for money to buy food, the women explained this will most likely result in domestic violence and possibly lead to abandonment or divorce. The women also explained that when mothers become addicted to *miraa*, the resulting negligence will almost certainly result in her children becoming malnourished. However, participants explained that it's uncommon for women to chew *miraa*. Although participants made a strong connection between malnutrition and substance abuse, the women scored this indicator relatively low in comparison

37 Two of these villages were excluded from the analysis as they actually turned out to be agro-pastoral.

38 Kenya Ministry of Health national guidelines on kala-azar do not mention the seasonality of the disease and note that the status of the disease in northern parts of the country is not well understood (Ministry of Health, 2017).

39 Participants also mentioned the use of alcohol and cannabis, but these appear to be used less commonly.

40 To illustrate how addiction to *miraa* can impact on household economies, we might assume that *miraa* addiction leads to daily use of the drug. The PE team noted that a small bundle of *miraa* costs KES 80 in Merti. Using an estimated annual income of KES 20,000 for a poor household in Garbatula and Kinna wards of Isiolo (Achiba, 2018), a daily *miraa* habit would cost KES 29,200 annually, i.e., it would use more than the household's entire annual

to other factors (Figure 5). The low scoring of substance abuse might suggest that it is only a factor, albeit an important one, for a relatively small proportion of the population.

Domestic violence was mentioned by women independently of issues such as infidelity or drug abuse. Some of the women complained of abusive and controlling husbands and explained that when a woman is in an abusive relationship, she is unable to take care of her own health, let alone that of her child. The women often made a connection between domestic violence and decisions around household expenditures as well as around issues such as family planning or exclusive breastfeeding. This partly has to do with the limited control women have over livestock and therefore income, which makes them dependent on their husbands for money to buy food. But at the same time, it's the women's responsibility to prepare and, by extension, provide food for the family. Participants explained that this burden caused a perpetual state of anxiety, particularly for women who might expect a violent response from their husbands when they ask for money. In one group, the women suggested that this situation is often worse in polygamous households where resources are shared between the wives; often the husband will prioritize one wife over another. The women also said that domestic violence resulted in stress for the children. A participant from one focus group even commented that "the child looks miserable and stressed" when describing the condition of a malnourished two-year-old in a photograph.

Participants frequently mentioned non-spacing of pregnancies as a cause of both child and maternal malnutrition, stating that women who frequently give birth appear weak, anemic, and emaciated. Non-spacing of pregnancies appeared to be more of an issue in some villages than others. For example, in one village the women scored it as the second-most important factor contributing to malnutrition in mothers, whereas in another village it was not even considered an issue. But overall, the women across all the groups scored it as an important factor in its own right (Figures 4&5) and provided various reasons for doing so. For example, some women explained that non-spacing results in more mouths to feed on limited resources, and the mother's care and attention

become divided among more children. They also stressed that when a woman gets pregnant while nursing, attention will shift to the new baby, and the older sibling will be neglected. Participants also suggested that consecutive, short-spaced pregnancies can be detrimental to a mother's health, as she will not have enough energy to sustain both herself and the new baby. However, the women qualified that this was only the case when the mother did not have access to a good, balanced diet.

Most of the participants were aware of the benefits of exclusive breastfeeding. It was frequently mentioned that a malnourished child was less likely to have been exclusively breastfed for as long as a healthy child. The women explained that there is a local belief that breastmilk from a pregnant mother is *dala* (unclean) and therefore detrimental to the nursing infant. Due to this belief, the women said that they come under immense pressure from their husbands to stop nursing as soon as they become pregnant. The majority of the women interviewed were aware of family planning but were reluctant to use birth control, partly due to disapproval from their husbands and partly due to fear of side effects. Some of the participants suggested that if their husbands caught them using birth control it could lead to divorce. There is another common belief that breastfeeding acts as a form of natural birth control, and mothers will try to use this strategy to reduce the frequency of births. Again, however, their husbands discourage this practice, which creates another barrier to exclusive breastfeeding. Interestingly, in one of the more remote villages visited, participants stated that non-spacing of pregnancies was not an issue as family planning services were readily available in the local clinic.

Participants suggested that non-spaced pregnancies are becoming more common nowadays as the men now spend more time at home, since there are fewer animals to take care of in the *fora*. In addition, the grazing areas have recently become relatively accessible due to an increase in the number of *bodabodas* in the area. As such, the women explained that their husbands can visit on a regular basis. In the past, longer absences in the *fora* served as a natural form of birth control.

### 3.1.6 Women's work (neglect)

This indicator relates to the amount of time women spend away from home and specifically away from their children when they are engaged in various livelihood activities, earning income and engaging in domestic tasks. The women explained that they are always busy ("We never get time to rest") but that certain activities keep them away from their children for longer periods of time. The results from the monthly calendar illustrate this by showing women's work increasing during the dry season (Figure). The women explained that during this period they spend long hours engaged in firewood collection and charcoal production, fetching water for domestic use (*dhacha*), taking small livestock to water points (*oba*),<sup>41</sup> and collecting hay (fodder) for the young sheep and goats (*okha*) based in the village. The women collect firewood and fodder and produce charcoal for sale as well as for domestic use. In addition to these activities, the women will regularly walk to the *fora* to collect milk for domestic consumption.

The time spent on these activities varies depending on the location of the resources, but it is not uncommon for women to spend up to 13 hours on a single activity. For example, women in Dololo Dakiye village maintained that during the dry season, a journey to collect domestic water can start at 3 am. They don't return home until 4 pm. As the dry season progresses, time spent on activities such as fodder collection and collecting milk from the *fora* increases as browse and graze start to diminish. In Basa village, the women said that a milk run to the *fora* involved a ten-hour round trip towards the end of the dry season.

Women's work was scored as the fourth-most important factor contributing to both maternal and child malnutrition during the causal analysis (Figures 4&5). In the case of mothers, participants attributed it to energy spent on strenuous activities with little or nothing to eat all day. For the children, the main reason is that they are left at home for long periods without proper care. The women explained that children will often

be left with siblings, or sometimes with elderly grandparents, or even neighbors, often with little supervision. As mentioned, (see section 3.1.4 on disease), the women made a connection between children being neglected and the consumption of soil, which exposes them to parasites and other infections. The women explained that when the mother is not around to prepare food for the children, they don't eat balanced meals and might be fed only tea and *anjera*, a type of pancake made just with maize meal flour, water, salt, and sometimes oil. Participants also indicated that, in some cases, the children might skip meals altogether when the mother is away for long periods.

### 3.1.7 Insecurity

The results from the monthly calendars show that insecurity in the form of livestock raiding increases during the dry season (Figure 3). Participants indicated that raids mostly occur when the livestock migrate to the *fora*, with the main perpetrators being Somali and Samburu raiders from Wajir and Samburu Counties respectively. Participants from Mata Arba and Reeg villages specifically mentioned the dry season grazing areas of Chari, Yamicha, and Horri as being hotspots for livestock raids. For example, the women from Reeg reported that their village lost over 1,600 cattle to Somali raiders in the Horri grazing area in 2018. Kurow, Kom, Quri, and Dhogogicha were also mentioned as insecurity hotspots by participants from other villages.<sup>42</sup>

The women explained that close to the river they are relatively safe from raids, but when the animals migrate to wells close to the borders of Wajir or Samburu County, this is the time when most incidents occur. In some cases, human lives are lost as well. Although livestock raids increase during the dry season, the women from one community suggested that raids taper off towards the end of the dry season because "everyone is busy trying to save their own animals from drought."<sup>43</sup> Participants from three of the villages in Cherab ward identified a spike in raids during

41 Note these are the animals that remain behind in the homesteads, not the majority that go to the *fora* during the dry season.

42 Interviews with women from Bisan Biliqo and Dima Ado villages.

43 Focus group discussion with women from Godd Rupa village.

the wet season in April.<sup>44</sup> The women explained that raids occur at this time because their enemies know the livestock are healthy and there is plenty of water along their escape routes. One group mentioned that incidents sometimes occur when the Samburu move into the same wet season grazing areas during the rains.<sup>45</sup>

Although insecurity was not specifically scored as an important factor contributing to malnutrition in the causal analysis (Figure 5), indirectly it was always mentioned by participants in relation to the loss of livestock and the associated decrease in milk production.

### 3.1.8 Human births

The results from the monthly calendar show that most births occur towards the end of the dry season in August and September (Figure). Participants maintained that most conceptions take place when “the animals are full, there’s lots of milk, so we are full, we don’t have too many chores, and our husbands are around.” In other words, most babies are conceived during the rains when the men are back from the *fora*. The results suggest that most conceptions take place around November and December during the short rains when milk is plentiful, and the women are least busy (Figure 3). The women also pointed out that in November and December, the children are back from school, so the boys help with herding livestock and the girls help with domestic chores, giving the parents more quality time together. The results also show a slight increase in births in February, suggesting a small increase in conceptions during the long rains. However, as discussed, fewer men now go to the *fora* given the decrease in livestock numbers, and those who do go can easily visit their wives due to the availability of motorcycles. As such, conceptions and births are no longer as strongly determined by seasonal livestock movements.

## 3.2 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 3-5). The main difference is that healthy children and mothers belong to better-off families who own more livestock. These families have greater access to livestock products and can afford to purchase a greater variety of foods, such as fruit and vegetables, with income derived from the sale of livestock and their products.

44 Lakole, Saleti, and Dololo Dakiye villages.

45 Focus group discussion with women from Korbessa village.

**Table 6. Women's preferences for nutrition-related interventions**

Type of support (n = 13 groups)	Responses
Credit/cash transfers	12
Restocking (including livestock credit)	11
Water infrastructure/equipment (pumps/tanks/boreholes)	8
Support to income-generating activities (training)	7
Alternative livelihoods support (farming/beekeeping/fish farming)	6
Market linkage support (including transport) for milk, hay, livestock, incense	4
Health services (mobile clinics, construction of hospital)	3
Drought support (commercial destocking, fodder provision)	2
Provision of chilling units and containers for milk	2
Control of invasive species ( <i>Prosopis juliflora</i> )	2
Construction of latrines	2
Veterinary services	1
Security services (to combat livestock raiding)	1
Awareness/training on family planning	1
Provision of water guards (filters)	1
Provision of mosquito nets	1
Other (no obvious link to nutrition or causal analysis)	2

Table 6 shows the different types of intervention preferences women identified for addressing both child and maternal malnutrition based on the causal analysis exercises. The chart shows the frequency of responses.

### 3.3 Intervention preferences

Women's priorities for nutrition-related programming (Table 6) were identified based on the results of the causal diagram method. These largely focused on support to livelihoods and income-generating activities. Most groups identified access to credit or start-up capital to invest in new or existing businesses. In most cases, participants were interested in loans to women's groups. Over half of the groups interviewed were also interested in business skills training, including support to the formation of women's groups.

Many of the ideas for businesses and livelihoods focused on the livestock sector and included livestock trading, milk and ghee sales, poultry production, fodder sales, and the establishment of agro-vet shops. Some of the participants maintained that they are already involved in goat rearing and sales but can only do this activity on a small scale as they have limited savings. The women are also involved in milk sales, and two groups identified the need for milk chilling units and containers to support this enterprise. Four groups identified market linkage support, including transport to take livestock, milk, and fodder to existing markets. The women identified the cost of transport as one of the major challenges in starting up and sustaining new businesses. Cost of transport also came up during several of the monthly calendar activities. Participants identified the need for improved road infrastructure to boost trade within the area and to attract traders from outside so as to bring down the cost of food and other products.

Other business ideas included the establishment of shops to sell groceries and used clothes, renting of tents and chairs for events, and establishing guest houses. Some women were interested in buying vegetables and petrol for motorbikes from Isiolo and selling these commodities locally. Some groups wanted to use loans to establish farms and, in one case, a greenhouse.

Eleven of the groups identified restocking of both cattle and goats as a priority intervention. Participants reasoned that restocking would improve both milk availability and income from the sale of milk and livestock. Overall, there was a preference for small stock, as women have greater control over these and they reproduce quickly.

They can easily be sold in times of need. However, some groups prioritized cattle, as they produce more milk.

Some of the groups were interested in diversifying their livelihoods. Four groups living close to the Ewaso Ngiro River were interested in support in establishing farms to grow fodder, vegetables, and fruit trees. This support included training and the provision of seeds. In one community, groups mentioned the need for an electric fence to protect an area that had previously been farmed by members of their community. The crops in that area had been destroyed by wildlife. Other groups mentioned that in the past members of their community had started farming but that the river had since dried up, and so they had had to abandon this activity.

Half the groups identified water interventions, mostly for the provision of clean, safe drinking water. In many cases, water interventions involved the repair of existing pipes, pumps, and boreholes. For example, one group explained that the water piping in their village had broken, and they now had no choice but to collect dirty water from the river. As mentioned, in some communities the river has receded or dried up. Participants suggested that they needed either boreholes or solar water pumps to address this issue, and that these would allow them to start farming. One group suggested installing water storage tanks that could be filled up from the river during the rainy season. The water could then be used during the dry season. Although the groups prioritized clean water for human consumption, one group mentioned the need to repair piping to a livestock water trough. One group suggested installing strategic boreholes for livestock in the *fora*.

Participants identified other services, including health services, veterinary services, and security as well as commercial destocking and provision of fodder during droughts. Control of *Prosopis* was identified, as this invasive species is responsible for destroying both rangeland and farmland. It should be noted that there was not enough time during the fieldwork to engage in detailed discussions of each intervention preference at the community level, and priorities did vary across the different communities. However, by and large, preference was given to income and livelihoods support interventions.

# 6. Discussion

## 4.1 Seasonality of malnutrition and related factors

The results from the monthly calendars show that malnutrition increases during the dry season. Participants largely attributed this increase to the limited availability of milk during this period. As such, the results show the availability of both cattle and goat milk corresponds almost directly with rainfall patterns and the availability of pasture. This finding is consistent with the PE findings from Marsabit as well as with other studies from pastoralist areas in the region.<sup>46</sup> A nutrition causal analysis from Isiolo showed similar findings around the seasonality of malnutrition as well as admissions for severe acute malnutrition (SAM).<sup>47</sup> Notably, the findings from the PE analysis in North Horr in Marsabit County differ in that the availability of milk during the dry season was largely limited by the animals being in distant dry season grazing areas where women and children cannot access the milk.<sup>48</sup> In contrast, in Merti where the *fora* are relatively close and easily accessed by motorcycles, availability is largely determined by rainfall and production (which relates to levels of livestock ownership). The key difference in these two contexts is that the Gabra communities in North Horr specialize in camel husbandry, and rainfall has less influence on milk production in camels than in cattle. However, camel production in North Horr involves extensive migrations in search of browse during the dry season. Nonetheless, despite these contextual differences, the seasonality of malnutrition is almost identical in both areas and directly linked to the availability of milk for consumption.

During the dry season, people increase their consumption of purchased foods to offset the decline in milk availability from their own animals. However, food prices are high relative to other parts of the county given the remoteness of these areas, poor road infrastructure, and limited transport services. For example, in March 2021 1 kg of maize cost KES 40 in Isiolo town and KES 60 in Merti; 1 kg of beans sold for KES 90 and KES 120 respectively.<sup>49</sup> Therefore, although purchased foods are available throughout the year, poorer households are unlikely to be able to afford more nutritious foods, particularly food containing high-quality protein.

Women's workload increases during the dry season, as they spend more time on activities such as herding animals. As the dry season progresses, more time is needed, as animals have to be moved farther due to diminishing pasture and water. Women also have to fetch water for domestic use, collect small amounts of milk from the *fora*, and collect firewood and fodder. Activities such as firewood and charcoal sales are necessary to enable them to purchase foods to compensate for the limited availability of animal-sourced foods at this time of year. These time-consuming activities mean that children are left alone for long periods of time, with little or no adult supervision. In turn, there may be nobody at home to prepare proper meals for children or make sure they observe proper hygienic practices.

The results from most of the villages showed an increase in diarrhea during the dry season. This increase was attributed to various factors, including deteriorating water quality in some water sources, a lack of water for washing and cleaning, food contamination, and the consumption of

46 See Sadler et al., 2012; Catley et al., 2018; FAO et al., 2020; Burns et al., 2021b.

47 Action Against Hunger, 2014.

48 Burns et al., 2021b.

49 National Drought Management Authority, March 2021.



certain types of food. A study from 2014 showed similar patterns of diarrhea prevalence among pastoralist communities in Isiolo.<sup>50</sup> The monthly calendar did not include the seasonality of other human diseases, except for malaria, which increases during the rains. Participants made an association between malaria and a rapid loss of weight. It is possible that other disease such as pneumonia or kala-azar may also have seasonal health implications for mothers and children.<sup>51</sup>

In very similar findings to the PE analysis in Marsabit, a combination of factors that potentially contribute to malnutrition occur during the dry season. Protein-rich animal-sourced foods, specifically milk, are in short supply, women spend more time away from home on essential livelihoods activities (leaving their children without proper care or adult supervision), and there is an increase in diarrhea. All these factors occur at the same time and coincide with a corresponding increase in malnutrition.

## 4.2 Causes of malnutrition in children and mothers

The results from the causal diagrams show that from the perspective of the women, malnutrition in children and mothers is primarily associated with insufficient milk and meat from livestock. Although the availability of these products is seasonal, there is also the issue of declining livestock ownership, which participants mostly attributed to conflict in the form of livestock raiding, as well as drought.

Similar findings emerged from the PE analysis in Marsabit and fit with a broader trend of declining livestock ownership and growing destitution among pastoralists in the East Africa region.<sup>52</sup> In Isiolo, this trend can be traced back to the 1960s, when conflict, drought, and government policies of livestock containment resulted in an estimated 40% decline in the cattle population.<sup>53</sup>

Although anecdotal, prior to this period, average cattle and small stock holdings were estimated in the thousands.<sup>54</sup> In contrast, estimates from Merti sub-county from 2013 indicate that 89% of households now own between 5–30 head of cattle, with only 1% owning more than a 100 head of cattle.<sup>55</sup> This massive loss, or redistribution of livestock wealth, not only has implications for milk and meat availability, but also for income given that the majority of household income is likely derived from livestock production and sales. For example, a study from neighboring Garbatula sub-county showed between 47% and 58% of income for household heads was derived from livestock-related activities.<sup>56</sup> This finding suggests that a decline in livestock ownership would directly lead to a decline in household income. Lack of income was identified as the second-most important factor contributing to malnutrition by participants. This contributing factor would be even more pronounced for women, given their limited control over livestock assets and sales.

Limited income was largely framed in terms of people's inability to purchase food, particularly nutritious foods during the dry season. These findings are consistent with another study from Isiolo that showed lack of food as the second-most important risk factor relating to malnutrition identified by pastoralists, the first being lack of livestock.<sup>57</sup> As discussed, the cost of basic foods can be up to 50% higher than in other parts of the county and therefore prohibitive for poorer households. Not surprisingly, most of the interventions identified by participants involved support to income-generating activities.

Human disease was identified as the third-most important factor contributing to both child and maternal malnutrition. The women associated several different diseases with malnutrition, including malaria, HIV/AIDS, pneumonia, kala-azar, and diarrhea. The women made a connection between disease and people becoming

50 Action Against Hunger, 2014.

51 For example, see Somali Federal Government Ministry of Health, 2012. The Somali guidelines for diagnosis, treatment and prevention of visceral leishmaniasis indicate that kala-azar transmissions typically occur during the dry season.

52 See Hogg, 1980; Catley and Akilu, 2013; Mburu et al., 2017.

53 Hogg, 1985.

54 Hogg, 1980.

55 Adaptation (ADA) consortium, 2013.

56 Achiba, 2018.

57 Action Against Hunger, 2014.

malnourished. But they also made a connection between undernourished people and vulnerability to disease.

Several gender-related issues were identified as contributing to child and maternal malnutrition. These included issues around the work burden placed on women, particularly during the dry season, which in turn is linked to poor child hygiene. Similar to the findings of the PE analysis in Marsabit, women described a form of psychological stress, which they associated with malnutrition. While difficult to unpack, this condition was associated with multiple, often interlinked factors. These include negligence from a husband in various forms, which might be associated with domestic violence, infidelity or polygamy, substance abuse, or a combination of these or other issues. These problems can lead to separation, divorce, or abandonment of the mother and her children by the husband. But even in less extreme cases, various degrees of negligence by husbands/fathers appear to be commonplace, thus adding to the burden on women to support and provide for their families. Participants equated the stress and anxiety this burden places on women to a debilitating illness. Some participants maintained that this stress condition associated with malnutrition is not just limited to mothers but can also extend to children. There is even a specific word in Borana, *hiyyum*, to describe malnutrition in children because of a poor relationship between parents.<sup>58</sup> The same word is also associated with poor-quality or insufficient breastmilk, as well as poverty.<sup>59</sup> Many of these factors relate either directly or indirectly to social norms, cultural practices, and gender roles, including the lack of control women have over assets and income as well as in decisions around pregnancy spacing and breastfeeding.

The relationship between gender and malnutrition has been well documented in the context of the Kenyan ASALs.<sup>60</sup> A recent analysis conducted by Nawiri indicates that livelihoods transformations,

specifically the decline in livestock wealth, may be exacerbating many of the gender issues described.<sup>61</sup> The analysis revealed that social norms dictate that men who own sufficient livestock are obligated to provide for their families.<sup>62</sup> This social norm might suggest that those who have lost their animals no longer have the same obligations, explaining the different forms of negligence and associated stress described by participants. The same study describes how men have “abdicated” their role in providing for their families, which is attributed to declining livestock herds.<sup>63</sup> Consequently, the men spend less time in the *fora* and are often engaged in negative behaviors such as alcohol abuse.<sup>64</sup> This example illustrates the inter-relationship between livelihoods transformations, negligence, and possibly even issues around use of alcohol or *miraa*, and domestic violence. As men no longer feel obligated to support their families, women are forced to take on new roles, including those that were traditionally done by men such as trading and charcoal production. These new roles increase the work burden on women.<sup>65</sup>

In the case of Merti, participants associate the decline in livestock wealth with an increase in non-spaced pregnancies, as men now spend more time at home.<sup>66</sup> Participants identified non-spaced pregnancies as an important factor contributing to both child and maternal malnutrition (figure X). There was also a connection between non-spaced pregnancies and cultural beliefs around breastfeeding and birth control, largely imposed on women by men.

These findings very much align with the Nutrition Framework for Africa’s Drylands, which brings new emphasis to the role of livelihoods transformations in understanding malnutrition.<sup>67</sup> The framework also specifically recognizes the gendered dimension of these transformations, which often result in increasing women’s workloads and a greater dependency on low-return economic activities.<sup>68</sup>

58 Mahmoud, 2020.

59 Ibid.

60 See Stites and Dykstra-McCarthy, 2020 and CRS, 2021.

61 CRS, 2021.

62 Ibid.

63 Ibid.

64 Ibid.

65 Ibid. See also Fratkin and Smith, 1995.

66 This has also been facilitated by the recent availability of motorcycles.

## 4.3 Programming implications

The intervention preferences to address malnutrition in children and mothers identified by participants logically followed on from the causal analysis. The women identified lack of livestock and their products and lack of income as the two main factors contributing to malnutrition. Consequently, most of the interventions identified involved different types of support to income-generating activities, including credit and training, and support to livestock production. Restocking was frequently mentioned, both to improve the availability of milk for consumption as well as to improve women's income from the sale of milk and small stock. There was interest from several groups in support to alternative livelihoods including fruit, vegetable, fodder, and fish farming as well as beekeeping. Some groups also mentioned market linkage support, including transport to help them sell products such as livestock, milk, hay, and incense. In many cases, participants prioritized access to credit or capital to invest in many of the livelihoods and economic activities mentioned. Some groups were hoping to start up group businesses including guest houses, retail shops, and tent and furniture rentals. Water infrastructure or equipment such as solar pumps, piping, boreholes, and water was identified for both human and livestock as well as to allow people to start farming. A few groups in more remote villages prioritized health services.

These intervention preferences were very similar to those identified during the PE analysis in Marsabit,<sup>69</sup> largely focusing on livelihoods and income generation. The priority for women is to increase their income to allow them to cover essential expenses, including food, health, and education for their children. These priorities underscore the increasing responsibility placed on women and their dependency on activities that yield low income or nutritional benefits. Projects like Nawiri are unlikely to address malnutrition in places like Merti unless Nawiri provides women

with reliable and meaningful income-earning opportunities that at the same time allow them to take care of their children.

Also consistent with the PE findings in Marsabit, intervention preferences varied across the different communities depending on location and based on specific contextual challenges and opportunities. For example, communities living farther away from urban centers were more likely to prioritize health services than those closer to towns like Merti. Communities living closer to the river were interested in support to start farming whereas those farther away were interested in support to livestock production or security services. This difference highlights the importance of designing context-specific interventions. What might work in one village may not necessarily work in another village, even if the villages are in fairly close proximity to each other. However, a more diverse set of ideas emerged from Merti, such as support to crop farming and more innovative business ideas for women's groups such as selling petrol to *bodaboda* operators. In part, these reflect the different context and opportunities in Isiolo given the existence of permanent rivers, and proximity to major markets and crop-producing areas, which give Merti a more mixed livelihood profile than Marsabit.<sup>70</sup>

As mentioned, there was not enough time during the study to engage in detailed discussions of each intervention priority at the community level. These ideas should therefore be considered illustrative. Each intervention needs to be interrogated with communities to assess the feasibility and likely impacts. For example, will support to farming or restocking increase women's work burden or their exposure to risk? Or alternatively, are the business ideas proposed by participants viable given the high operational costs associated with remote areas with limited infrastructure and services? To be effective, Nawiri interventions will need to be guided by in-depth dialogue at community level, and careful joint analysis of the feasibility, anticipated benefits, and other issues.

67 Young, 2020.

68 Ibid.

69 See Burns et al., 2021b.

70 Birch, 2021.

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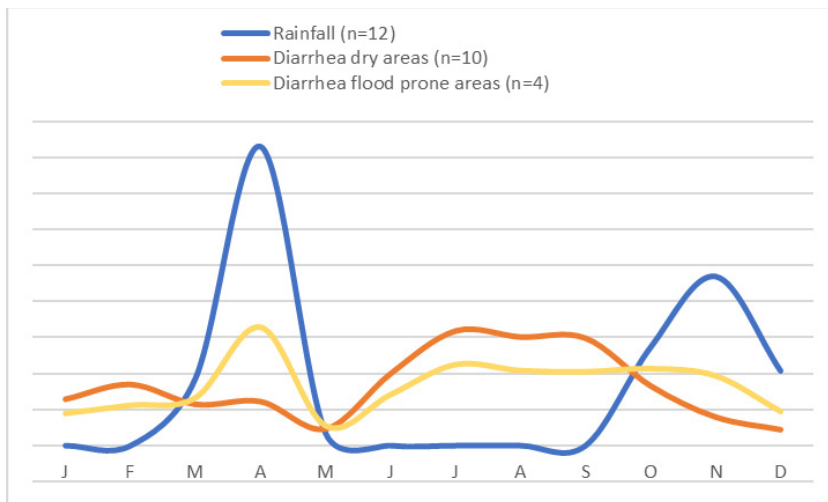
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# Annex 1

## Comparison of diarrhea occurrence in dry vs, flood prone areas



**Notes** - the results show the occurrence of child diarrhea in relation to rainfall in Merti sub-county in Isiolo and compares villages in flood prone areas along the Ewaso Ngiro river and those living further away from the river. Although the patterns are similar, the flood prone areas show a spike in diarrhea in April during the long heavy rains.

