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Understanding the Causes and Seasonality of Malnutrition in Karamoja: An Agro-Pastoralist Case Study Using Participatory Epidemiology

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Abstract
Karamoja is characterized by high levels of acute malnutrition in children. Despite substantial aid investments in nutrition and food security programs, levels of acute malnutrition increased in the sub-region between 2010 and 2017. Reasons for the limited impact of programs with nutrition objectives could include a failure to directly address the root causes of malnutrition, or design activities that recognize the seasonal variation in nutritional status and related factors in pastoralist areas. This paper presents the findings of a study that used participatory epidemiology to understand the seasonality and causes of malnutrition from the perspective of agro-pastoralist women in Kotido and Moroto districts of Karamoja. The results showed that child malnutrition peaks in January these districts, and is associated with limited access to animal milk at the end of the dry season, coinciding with depletion of grain stores. Malnutrition declines at the onset of the main rains, and is associated with improving availability of cow and goat milk. Women also described and explained seasonal variations in their workloads, and in the timings of pregnancies and births. Women consistently identified the two main root causes of malnutrition as low livestock assets, leading to insufficient animal milk, and gender norms that made them responsible for household meals, and any related food production or income. These two root causes were interlinked, as low livestock ownership placed additional workloads on women, which had negative impacts on child care. Nutrition programs are unlikely to impact on malnutirion unless these root causes are addressed.

Introduction

Malnutrition in Karamoja

In common with many other East African countries, high levels of acute malnutrition have persisted in Karamoja, Uganda, despite large-scale development programs and in some cases, improvements in human development indicators nationally. In Karamoja, a recent food security and nutrition surveillance report included a review of global acute malnutrition (GAM) prevalence estimates and noted that between 2010 and 2017, the point prevalence of global acute malnutrition increased from 11.5% to 13.8% when measured in June, and from 9.8% to 10.4% when measured in December (Government of Uganda, UNICEF, UK aid and World Food Programme, 2018). Simultaneously, there are numerous nutrition programs in Karamoja and a substantial aid investment in nutrition. For example, in 2016 there were 24 nutrition projects or programs in Karamoja implemented by 17 organizations (Karamoja Resilience Support Unit, 2016).

Concerns about malnutrition and health in Karamoja are not new. For example, from the mid-1990s, a long-running research program on human adaptability in Karamoja included specific studies on child and maternal health, child growth and breastfeeding, and dietary change Gray, 2010; Gray et al., 2008; Gray and Sundal, 2017). It provided a highly plausible explanation for the persistence of child malnutrition, viz., a decline in agro-pastoralist production and falling herd sizes due to raids, diseases and disarmament; the multiple responsibilities of women as child carers, meal providers and income generators; and the weak provision of health services. Examining diets in 2004 (two years before the most recent disarmament program of 2006 to 2011), milk accounted for only 3.2% to 4.2% of energy intake in Moroto and Napak over a period of 4.5 months (August to mid-December 2004). This was compared to 10 other African pastoralist groups before 1995, in which no group consumed less than 16% milk intake. In 2011, further decline in diets was linked to limited availability of milk and *"serious changes to diets and subsequent nutritional status among the populations of Karamoja have been noted since the 1970s. These changes have been shaped not only by environmental pressures, but by politics of marginalization and structural inequality, a history of cattle raiding, an influx of weapons, and more recently escalating insecurity and military presence"* (Stites and Mitchard, 2011).

Consistently, the social science literature on Karamoja has explained malnutrition by reference to pressures on agro-pastoralism and the importance of animal milk in the diet. In general terms, factors that cause a decline in livestock ownership and access to milk have direct impacts on the nutrition of mothers and children. Up to 2006 and the start of disarmament, these factors included violent cattle raiding, livestock disease and drought. During the disarmament of 2006 and 2011, further dramatic livestock losses were associated with disease outbreaks in forced kraals. Since 2011, security has improved, but livestock losses due to disease remain high and livestock ownership is reported to be more skewed towards wealthier households. Across these three periods of time, primary human health care systems have remained weak.

Seasonality and malnutrition

It is widely recognized that agriculture systems often show marked seasonality, with distinct periods of land preparation, planting, weeding, harvesting and other activities, driven mainly by rainfall patterns. Typically, food insecurity in agricultural areas of low-income countries peaks before the main harvest, due to the limited availability of cereals at this time, combined with high food prices, high labour demands, and diseases such as malaria and diarrhea (e.g. Chamber et al., 1981). However, it is important to note that this seasonality in crop-based livelihoods does not apply to many pastoralist areas of Africa, where the main rainy season is often described not as a time of stress, but as a time of plenty. This is when livestock produce the most milk, and milk is associated with good nutrition and health. In contrast to agrarian areas, pastoralists describe livelihoods and nutritional stress towards the end of long dry seasons. This is the time of year when livestock milk supply is declining, herders are forced to sell animals in exchange for cereals and livestock are moved long

distances from home settlements to find grazing and water. Also, at this time livestock prices tend to be low (because animals are in poor condition) and cereals prices are high (due to limited availability and high demand)(Sadler et al., 2009). This seasonality of pastoralist livelihoods explains why acute child malnutrition can peak in dry seasons and fall in wet seasons.

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 (Allepuz et al., 2017). 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 (Catley et al., 2012), and an understanding of complex syndromes involving multiple infections (Catley et al., 2001). A measure of the uptake of PE by veterinary researchers is that PE is now often reported as a method in peer-reviewed papers and postgraduate dissertations (Allepuz et al., 2017). 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. Rare examples include a participatory assessment of women's health in southern Ethiopia (Tezera and Desta, 2008) and studies on malnutrition in the Somali Region of Ethiopia (Sadler and Catley, 2009) and in Karamoja (Stites and Mitchard, 2011).

This paper describes an analysis of the seasonality of acute child malnutrition in selected agro-pastoralist areas of Karamoja. The research examined: women's accounts of malnutrition in children by reference to the diets of healthy and malnourished children; the seasonality of malnutrition and related factors; women's descriptions and prioritization of the causes of malnutrition in children and mothers; and women's suggestions and priorities for improving malnutrition.

Design and methods

The study used two main stages: an initial ethnographic approach to understand the language of nutrition and related issues used by women, followed by standardization of PE methods and repetition of methods with groups of women informants.

Initial ethnographic stage

The first stage of the analysis used an ethnographic approach to gain insights into women's general awareness and understanding of malnutrition and related issues, and how they described the causes of malnutrition in children and mothers. Central to the approach was understanding local language and the extent to which specific words or phrases were used in relation to malnutrition, and why. This produced useful information in its own right but also guided the design of PE methods (section 2.2) by ensuring that relevant and appropriate language was used with the methods and that some potential non-sampling errors were limited. This work was conducted in three districts, viz., Moroto, Kaabong and Kotido (language: Ngakarimojong) in May and June 2018 and used 16 focus group discussions with between 5 to 8 women in each group.

Participatory epidemiology methods

Participatory epidemiology methods were used with 16 groups of women in Kotido and Moroto districts, with 8 to 12 women per group; specific locations were selected purposively and differed from the locations visited during the ethnographic stage.

- **Monthly variations in malnutrition and related indicators**

A monthly calendar is a visualization method showing the pattern of selected "indicators" against months. Local names were used for the months. Information gathered during the ethnographic stage indicated some variation in local names for months within and between locations in Kotido and Moroto (language: Ngakarimojong). However, the women agreed on the use of pictures or local symbols/objects, to represent each month. These pictures or local symbols/objects were drawn from work activities undertaken in each month, which the women were very familiar with.

Key features of the method were as follows:

- The calendar is constructed on the ground, using diagrams to represent months and other diagrams to represent the indicators. The use of diagrams means that illiterate informants can participate; no written materials are used.
- Rainfall was selected as the first indicator and informants were asked to show the pattern of rainfall against each month; local names were used for the months. The rainfall pattern was illustrated using 100 stones that were distributed across the months. The use of rainfall as the first indicator ensures that informants understand the method because the rainfall pattern can easily be cross-checked against actual rainfall data.
- During the placing of the stones, informants are asked to show the pattern of rain distribution rather than count the stones to be assigned to each month.
- The informants were asked to consider a "typical year."
- After the rainfall pattern is illustrated, informants are asked to explain the pattern; this further questioning ensures that the method has been understood.
- The method was used with groups of women; the "scoring" of rainfall by month is done based on discussion within the group.
- After rainfall had been scored, the stones were left in place and further indicators were scored, one by one, with discussion and further questions for each indicator. Nine further indicators were selected based on the ethnographic work and a literature review. This number of indicators was also considered to be appropriate in terms of the amount of time we felt that women should spend on the method. The full list of indicators was as follows:
  - Rainfall;
  - Availability of cow milk for children;
  - Availability of goat milk for children;
  - Availability of own sorghum (agro-pastoralist areas) or own maize (pastoralist areas);
  - Women's work in their own gardens;
  - Women's other work, especially work for income;
  - Occurrence of child malnutrition;
  - Occurrence of child malaria;
  - Occurrence of child diarrhea;
  - Occurrence of human births.

  To make the child malnutrition indicator age-specific, women were asked to focus on a 2-year-old child.

The final calendar showed the patterns of all 10 indicators, enabled further questions across indicators and showed the relationships between indicators. A total score was calculated for each month and indicator, by summating the scores from the 16 groups. Further analysis used the Kendal coefficient of concordance to assess the level of agreement between groups.

- **Participatory causal diagrams**

The interviews with women during the ethnographic stage of the analysis (section 2.1) showed they explained malnutrition by reference to specific causes. In an attempt to capture this information more systematically, diagrams were used to represent each cause and a malnourished 2-year-old child. The diagrams of causes were placed on the ground in a circle around the diagram of the child in the center and women were asked to show the relative importance of each cause using a pile of 100 stones (i.e., proportional piling). This visualization and scoring of the causes enabled further questions and discussion on the relative importance of the causes and how different causes related to each other sequentially. The method was then repeated with a malnourished mother at the center of the diagram.

Results

Monthly variations in child malnutrition and related indicators

Data from monthly calendars were summarized in the form of graphs. To prevent too much information being shown on a single graph, four graphs were used, with each graph showing malnutrition, rainfall and selected indicators. The graphs lack a y-axis scale because although 100 stones were used to score each indicator against 12 months, this number is arbitrary and has no absolute meaning. When a line shows a peak, the peak represents the highest level of that indicator during the year; when a line shows a trough, it represents the lowest level of the indicator during the year, although this level might not necessarily be zero in absolute terms. Monthly patterns of child malnutrition and related indicators are shown in Figure 1.

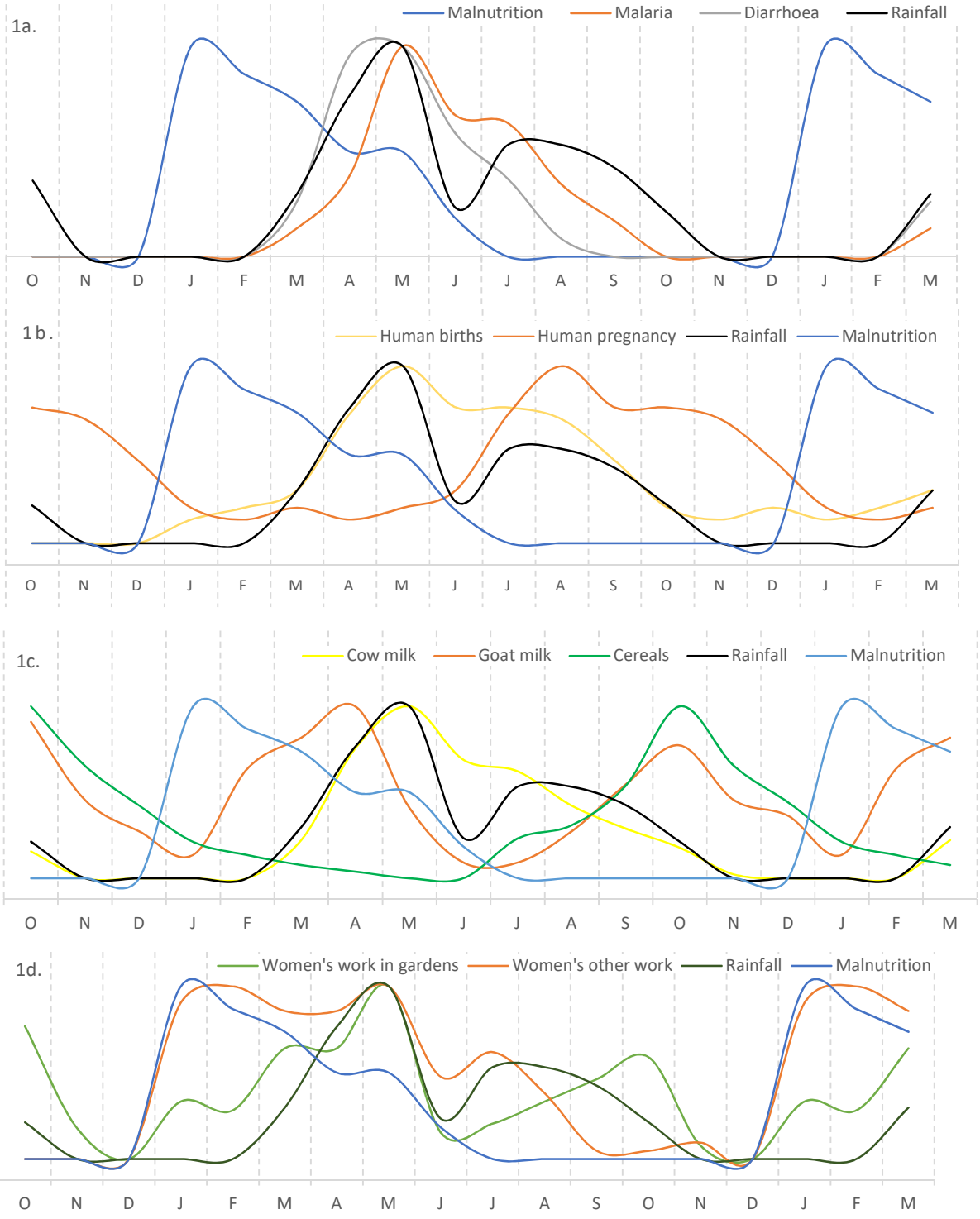
In terms of an initial validation of the method, the rainfall pattern (Figure 1a) described by the women's groups strongly agrees with meteorological (rainfall gauge) data for Karamoja, indicating that the groups understood the monthly calendar method. Furthermore, child diarrhea and malaria peaked with rainfall in April and May (Figure 1a); this relationship has a strong technical plausibility.

Child malnutrition peaked in January following a sharp increase from December; child malnutrition slowly declined during February to June and reached its lowest levels from July to November. As malnutrition peaked four months before diarrhea and malaria, these health problems seemed unlikely to be primary causes of malnutrition earlier in the year but might contribute to malnutrition between March and June (Figure 1a).

Moving through a year, peak malnutrition in January corresponds with very low availability of cow milk and goat milk, and declining availability of sorghum. Falling malnutrition then corresponds with the increasing availability of goat milk from February to April and then later, with a gradually increasing availability of cow milk from March to June. An increase in sorghum availability corresponds with low levels of malnutrition from August to November, before the annual cycle repeats itself. However, as shown in Figure 1d, a sharp increase in women's workload in December due to "other work" is closely correlated with the increase in malnutrition at that time, and workload then broadly follows a similar pattern to malnutrition. In addition, comparing Figures 1b and 1d shows that peaks in both women's work in gardens and other work in May corresponds with a peak in births, also in May. This temporal analysis, tracking monthly patterns of milk and sorghum availability, women's other work and births indicates that malnutrition results from the interplay of these three factors.

Figure 1b shows a very close correlation between rainfall and human births, and Figure 1c shows a similar correlation between rainfall and the availability of cow milk; the latter has a strong technical plausibility. Comparing the two figures shows a very close correlation between human births and availability of cow milk.

Figure 1. Monthly pattern of malnutrition and related indicators, agro-pastoralist areas



Notes

Figures are derived from monthly calendars with 16 women's groups and total scores; the monthly calendar method used a 12-month period; the figures show an 18-month period to clarify trends between December and January. The method included human births but not pregnancies; pregnancy patterns were derived by subtracting 9 months from the birth data.

The same 10 indicators were used in the monthly calendars with each group of women. There was strong (significant) agreement between the women's groups for 9/10 indicators, and weak (not significant) agreement on the availability of goat milk for children (Table 1).

Table 1. Level of agreement on monthly calendars

Indicator	Kendal coefficient of concordance *W* (n = 16 groups)
Rainfall	0.73**
Availability of cow milk	0.86**
Availability of goat milk	0.10^{ns}
Availability of own sorghum or maize	0.80**
Women's work in gardens	0.59**
Women's other work	0.46**
Child malnutrition	0.60**
Child malaria	0.83**
Child diarrhea	0.72**
Human births	0.50**

Notes
The Kendal coefficient of concordance *W* measures the level of agreement between the groups and provides a coefficient of between 0 (no agreement) to 1 (perfect agreement). For example, when the 16 independent women's groups scored rainfall across 12 months using a total of 192 scores, a *W* value of 0.73 represents a high level of agreement. Assigning probability (p) values to *W* allows the agreement to be expressed in terms of its statistical significance; **$p < 0.001$; *$p < 0.01$; ns–not significant. *W* values reflect the reliability of the seasonal calendar method and specifically, the method's reproducibility.

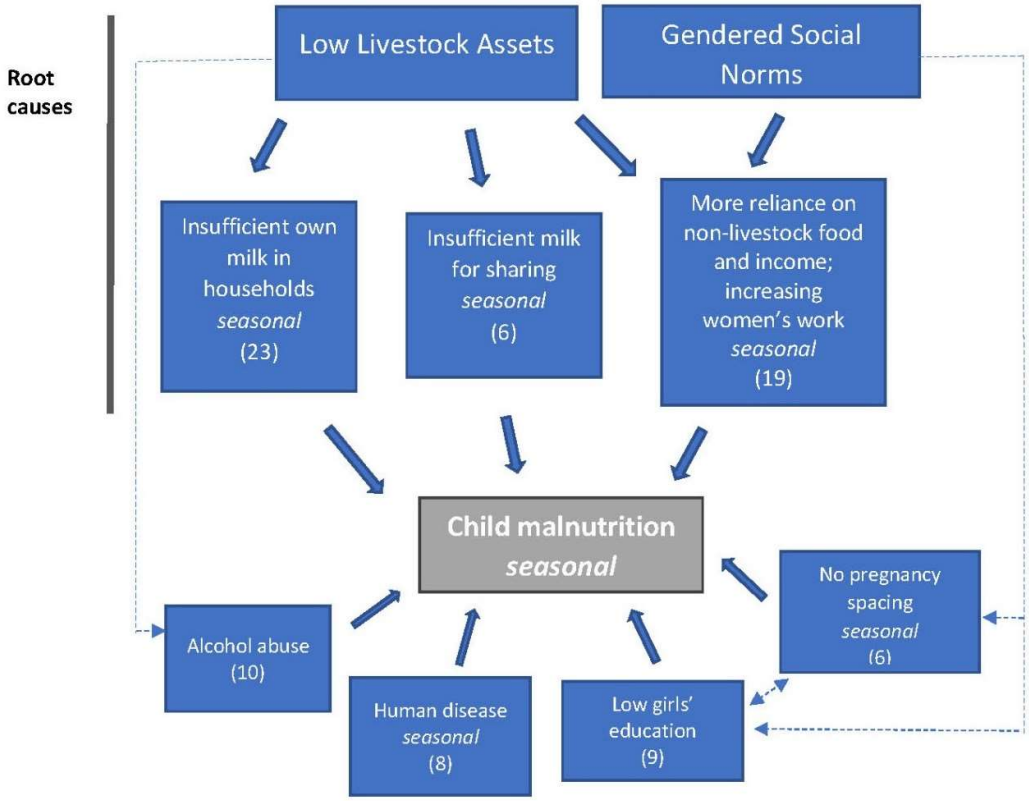
Participatory causal analysis

The results from the participatory causal analysis were summarized in the form of a diagram showing the root causes and other causes, with scoring of each cause (Figure 2). There was a high level of agreement between the 16 groups for their scoring of the causes of malnutrition in children ($W=0.62$, $p < 0.001$).

Figure 2 shows that the root causes of malnutrition were low livestock ownership and gender issues. The problem of livestock ownership has a direct impact on malnutrition because households and communities with insufficient animals will have limited milk for home consumption or sharing. Low livestock ownership also combines with gender norms to create a situation whereby households are forced to rely more on non-livestock sources of food and income. The responsibility for this food and income resides largely with women. This increases women's workload and especially women's "other work," e.g., see Figure 1d. Although not captured in the diagrams, in addition to the responsibility to provide food and income, women also risk violence from husbands if they fail to fulfil these roles and so there is an element of psychological stress adding to the burden of responsibilities.

Milk was widely viewed as important in the nutrition of children. In the absence of milk at home, a child may even steal from the neighbors; this act causes inter-family quarrels. When milk is not available, children are fed on a poor diet with no variety, such as local brew residue or plain porridge, i.e., porridge prepared with water, not milk. Lack of food or being forced to feed children a poor diet is worse during drought or famine, when the husband is irresponsible or when the mother has insufficient or poor-quality breast milk or is not breastfeeding a child frequently due to her work. This situation is also exacerbated when food markets are too far away, when a family has few or no animals and when relatives are not supportive. Some families or mothers do not prepare in advance how the child will be cared for after birth. Some mothers do not know how to prepare nutritious food. Nowadays, Government and NGOs try to restrict the use of animal milk, alleging that milk is a source of disease for children. Due to insufficient milk, children eat sorghum/maize bread, with some milk when available.

Figure 2. Causes of child malnutrition



Notes
Figure derived from interviews with agro-pastoralist women in Moroto and Kotido, followed by proportional piling of causes with 16 women's groups. Numbers in parentheses are the median scores from the proportional piling. Causes and problems that are annotated as "seasonal" show significant monthly and seasonal variation—see Figure 1.

Women described differences in diets between healthy and malnourished children (Table 2). In the first month after birth, mothers from both wealthier and poorer families receive support from husbands, friends and relatives. However, differences in this support appear in the second month. Mothers from wealthier families continue to receive support from relatives and friends in the form of gifts, while this support wanes for mothers from poorer families. This is the beginning of nutrition challenges for mothers and children from poorer families. These mothers sometimes have to leave the child at home when they look for work. The mothers commonly feed the child on local brew and the residue of local brew (which people in the community offer for free), sometimes when the child is only about 2 months old.

Women's involvement in "other work" is purposely to raise income to supplement food needs, especially in the dry season. Such work includes the sale of firewood and charcoal, casual labor in towns, and *Aloe vera* processing and harvesting. These activities keep mothers away from children for many hours, the amount of time away depending on the activity. For example, charcoal burning can keep the mother away from the child for up to two days. This deprives the child of breast milk unless the mother carries the child with her, but doing so is difficult. Poor breastfeeding stresses the child and predisposes him/her to diseases. Often, mothers have to go to work with children below the weaning age (younger than 5 to 6 months). When carried on the back while working (e.g., burning charcoal), these children are exposed to heat from the sun, and the burning wood and smoke. Children at or after weaning are often left at home with older children, grandmothers or neighbors. In poorer families, children are left at home as early as 1 to 3 months of age, and in families with irresponsible

parents (e.g. high alcohol consumption), children are left behind even at 1 week of age. In the absence of food, the child is fed on local brew (*kwete*) or local brew residue (*adakae*), or another breastfeeding mother is persuaded to breastfeed the child. Older children may not pay much attention to the child they are supposed to be caring for. Some families do not have older children. All of these practices predispose a child to malnutrition but have their root cause in insufficient food and income from livestock.

Table 2. Diets of healthy vs. malnourished children

Age	Healthy children	Malnourished children
0–5 months	Types of food: - Good-quality breast milk - Mother feeding on good diet Other factors - Mother is healthy (no cases of sickness)	Types of food - Low-quality breast milk - Insufficient breast milk - Mother feeding on poor diet Other factors - Mother is sick
6–9 months (up to 1 year)	Types of food - Fresh cattle/goat's milk - Beans (*emaret*) soup - Meat soup and chapati - Meat + butter + groundnut paste - Silverfish (Dodoth—*ngakachede*) - Eggs - Mandazi - Melon seeds (*ngaadekala*) - *Uji* (porridge) + milk + butter	Types of food - Wild vegetables (*edea*)—*ekorete, eejor, ekiliton* - Local brew residue (*adakae*) - Plain porridge (no milk) - Plain posho - Vegetables + salt (no oil/butter) - Plain pumpkins - Mother feeding on poor diet, e.g., plain beans, plain porridge + salt (no oil/butter or other ingredients) Other factors - Sicknesses - Early pregnancy - Mother irresponsible due to overconsumption of alcohol - Poor family—no cows
1–5 years	Types of food - Milk—from animals and purchased - Beans (*emaret*) + meat + oil + onions + butter - *Uji* + sugar + milk + oil - Rice + meat - Macaroni + beans + cabbage + meat + chapati - Eggs - Sour porridge (from fermented sorghum) - Posho + melon seeds + vegetables + sunflower - Milky tea - Vegetables (*edea*) + butter - Blood - Plain butter - Mother feeding on good diet Other factors - Mother knows how to prepare food well - Parents are rich, with many animals -	Types of food - Local brew residue (*adakae*) - Wild greens (either plain, with posho alone or just with salt) - Plain sorghum flour - Plain porridge (no milk) - Plain vegetables - Plain beans - Mother feeding on poor diet Other factors - Mother overconsuming alcohol - Family is poor—have no animals; do not do crop farming; mainly dependent on charcoal burning and firewood collection - Children feeding from the neighbors most of the time - Eating once a day or feeding from neighbors - Note: feeding on poor diet leads to diarrhea

Discussion

Monthly variations in malnutrition and related factors

In general, the findings from the monthly calendar (Figure 1) show strong technical plausibility but also show at least three patterns and relationships that have not been previously reported in Karamoja to our knowledge.

Peak in malnutrition—the results show a peak in malnutrition in January to February that is not currently detected by bi-annual food security and nutrition surveys in Karamoja. If these surveys aim to detect the highest and lowest levels of malnutrition in agro-pastoralist areas the surveys would need to take place in January/February and again in October/November.

Birth patterns—the pattern of births in Karamoja is highly seasonal, with births corresponding closely to rainfall and the availability of cow milk (Figures 1c). This adaptation has probably evolved in response to the rainfall pattern and the high reliance on livestock milk, and so has a clear biological logic. However, the problem of persistent malnutrition in Karamoja can be partly explained by the persistence of this birth pattern as livestock ownership has declined. Instead of children now being born into a time of milk abundance, they are born into a time of milk scarcity. The "peak" in cow milk availability is only a peak for those with enough cows or other access to cow milk. Also, children are born into a period when milk is limited, but also when grain stores are low and grain prices are relatively high; for children reaching weaning age in the dry season, this coincides with low availability of milk and own cereals. At present, women have limited control over birth spacing.

Disease and malnutrition—the peak of child malnutrition at the end of the dry season does not coincide with peaks in diarrhea or malaria, which are most prevalent in the wet season (Figures 1a). Furthermore, a decline in malnutrition between March and May coincides with rising incidence of diarrhea and malaria. This timing of events indicates that these health problems are not root causes of malnutrition. From a clinical perspective, cases of malnutrition would be exacerbated by malaria or diarrhea and vice versa, and diarrhea and malaria are important health problems irrespective of malnutrition.

Causes of malnutrition and programming implications

The causal diagram shows that women explain child malnutrition mainly from the perspective of the limited availability of livestock and milk, and social norms that make them overburdened with the work of childcare and finding food for the family (Figure 2). These two root causes of malnutrition are interlinked and cascade down into various other issues and problems. In particular, the limited livestock ownership has a direct impact on food availability because milk supply is insufficient and also forces households towards more non-livestock sources of food and income, which traditionally are the domain of women. These non-livestock activities include crop production, but on small plots and with high risk of rain failure (Cullis, 2018), and a range of other activities that often involve considerable effort for limited reward, and which often hinder childcare. This situation then creates another layer of nutritional risk for unweaned children, because while their mothers are away working, they are cared for by siblings or other relatives. For these children, cow or goat milk would be an important replacement for breast milk during these periods of separation, but livestock holdings are few and milk is absent or in short supply; women might be separated from their children for up to two days. Further problems have their roots in livestock-gender issues such as loss of cattle affecting men's self-identity and sense of purpose, men spending more time in villages than in the past and more consumption of local brew and hard liquor (Iyer et al., 2018). In turn, this leads to even more violence towards wives and a continued non-spacing of pregnancies. For women, increasing workloads, the stress associated with finding food and income, and the risk of violence from husbands also leads to alcohol abuse.

Looking specifically at livestock ownership, a recent KRSU study estimated a livestock threshold for agro-pastoralist households in Karamoja; the threshold is the minimum level of livestock ownership per person needed to sustain the household with food and income independently of external support or non-livestock/crop activities (Catley and Ayele, 2018). For the estimated livestock threshold of 3.3 Tropical Livestock Units (TLU) per person, 56.5% of households in agro-pastoralist and pastoralist areas of Karamoja owned less than the threshold and so could be categorized as "livestock poor." Among poorer households, below the 3.3 TLU/capita livestock threshold, livestock ownership was skewed away from the threshold. For example, 47% of these households owned only 1.2 TLU/capita

or less. The findings in the causal analysis of malnourished children (Figure 2) are broadly consistent with the livestock threshold analysis. While the low and skewed livestock ownership reported in the latter was discussed in terms of poverty traps affecting households with insufficient livestock assets, the concept of a "malnutrition trap" might also apply to these households. Pressures on agro-pastoralism in Karamoja have been reported for decades (e.g. Muzaale, 1987; Sandford, 1988), and include conflict-livelihoods research with descriptions of changing diets and limited milk availability (Stites and Mitchard, 2011).

Women's suggestions for programs to support nutrition reflect their causal analysis of malnutrition. They emphasize food, livestock assets and income generation, followed by health and education, and reducing alcohol consumption. While women also mentioned activities to sensitize men, their relatively low preference for this activity might relate to its limited presence in Karamoja to date; women have not observed a large-scale men's sensitization program around gender issues nor are they familiar with the potential impacts of such a program. For agencies currently implementing nutrition programs in Karamoja, the analysis raises the question of consistency between women's preferences for nutrition-related support and what the current programs actually provide. The analysis also raises the question of the impact of nutrition programs and to some degree explains the persistence of GAM in Karamoja despite substantial investments in nutrition. An understanding of the seasonality of livelihoods and nutrition, and the interplay between livestock ownership, milk, and gender and work explains the persistence of "malnutrition traps" in Karamoja. It indicates the need for an area-wide nutrition strategy that places greater emphasis on the root causes of malnutrition and far greater participation of women in the analysis of malnutrition and program design.

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