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Understanding Child Acute Malnutrition in Isiolo and Marsabit Counties, Kenya

USAID Nawiri Longitudinal Study Learning Brief 4

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Child acute malnutrition remains high in northern Kenya, especially among older children (ages 3–5). Few individual- and household-level variables are consistently associated with child acute malnutrition, pointing instead to the role of basic drivers that affect communities. Pastoralism plays a key role in supporting nutrition, food security, and resilience, but faces challenges in adapting to changing pressures. This brief examines the drivers of malnutrition in Isiolo and Marsabit Counties and their implications for policy and programs.

This brief is the last in a series of learning briefs on the mixed-methods USAID Nawiri longitudinal research study, which took place in Marsabit and Isiolo Counties, Kenya, from September 2021 to September 2023. The research study is one component of the USAID Nawiri program implemented by a consortium led by Catholic Relief Services (CRS). The mixed-methods research study is a collaboration between Tufts and Kenyatta Universities, CRS and Caritas.



Key Messages

- 1. Critical linkages exist between pastoralism and human nutrition, but these linkages are under pressure.** Pastoralism remains the bedrock of most livelihoods even as the system of pastoral production continues to evolve. Strategic mobility is critical to pastoral livelihoods and livestock productivity, and—when pastoralists are able to be mobile—this translates directly into food security, nutrition, and health benefits, particularly for children.
- 2. Livelihood diversification occurs for many reasons and can both benefit and undermine nutrition.** The increasing diversification of livelihoods has created a mix of adaptive, coping, and maladaptive strategies affecting nutrition and resilience, resulting in both benefits and detriments for child nutrition. Women are increasingly involved in marginal economic activities and time-consuming survival strategies, which can incur risk and may have adverse physical effects on women and have negative nutritional impacts for children.
- 3. Many institutions underpin the pastoralist system and indirectly support human nutrition.** The dynamic relationships between people, livestock, and the environment determine the resilience of livelihood systems and address vulnerabilities. Despite pressures, pastoralist institutions are continuing to evolve and adapt, while social support networks provide vital sharing of food, assistance, and childcare.
- 4. Children in the study sites in Marsabit and Isiolo Counties persistently experience above the emergency threshold of acute malnutrition (15%).** Across the two years of study, on average, wasting prevalence varied from a minimum of 15% (September 2023) to a maximum of 21% (November 2022), with an overall average of 18.6% (95% CI: 18.0–19.1%). Despite these alarming results, our study shows that achieving a prevalence below 10% is possible, as evidenced by the significant seasonal reductions in two of the four study sites.
- 5. Child age, sex, and female caretaker nutritional status were most consistently associated with acute malnutrition (weight-for-height/WHZ).** Older children (36–59 months), boys, and children with a female caretaker with lower mid-upper arm circumference (MUAC) were significantly more likely to be wasted.
- 6. Few individual- and household-level variables were consistently associated with acute malnutrition, pointing to the role of basic drivers at the community level.** Other than diarrhea, no other immediate or underlying driver was found to be significantly correlated with wasting across all four sites. Additional, *but site-specific*, drivers included consumption of specific foods, disease such as malaria and respiratory illness, food insecurity, and open defecation.

Introduction

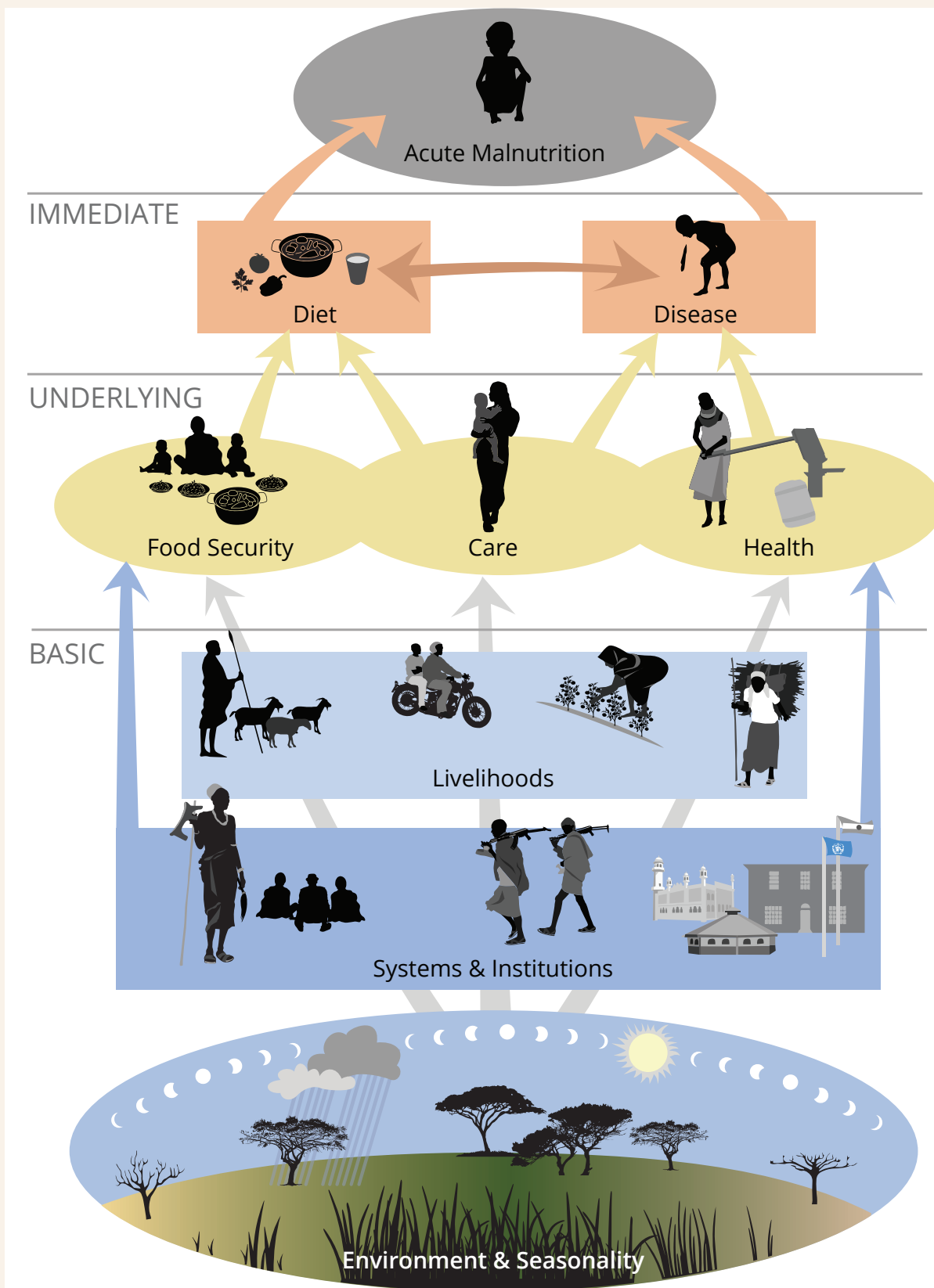
For over two decades, geographic “hotspots” where child acute malnutrition¹ exceeds emergency thresholds have been pervasive and recurring throughout the Kenyan arid and semi-arid lands (ASALs). Humanitarian actors have repeatedly responded, but despite this continuous attention and commitment of resources, high levels of acute malnutrition continue, in contrast with the general improvements in prevalence rates elsewhere in Kenya.

In recognition of this persistent problem, the United States Agency for International Development (USAID) Nawiri project took a different approach to sustainably reduce rates of child acute malnutrition by supporting and strengthening systems and institutions. This approach aligns with recent international nutrition strategies and contrasts with short-term, siloed interventions addressing problems at the individual and household level.

The USAID Nawiri project uses the drylands malnutrition causal framework to identify drivers of child acute malnutrition (Figure 1). This framework builds on the UNICEF causal framework, highlighting the interconnectedness of immediate, underlying, and basic drivers of malnutrition from local to global levels. Basic drivers are systemic in nature but have received less attention compared to immediate and underlying causes, which are addressed by nutrition-specific and nutrition-sensitive interventions. Basic drivers of acute malnutrition include environment and seasonality, systems and institutions, and livelihood systems. Although requiring more complex efforts and longer-term commitments, understanding and addressing these structural basic drivers is critical because they influence the underlying causes of malnutrition related to food security, health, and care of women and children.

¹ All analysis was run on wasting (defined as having a weight for height z-score < -2). However, as we found only 7 cases of oedema across the entire 2 years of data collection, acute malnutrition and wasting in this context are fairly equivalent. Hence, we will use the term of ‘acute malnutrition’ when discussing the implications of the study more broadly and ‘wasting’ when specifically discussing the analysis of the sample.

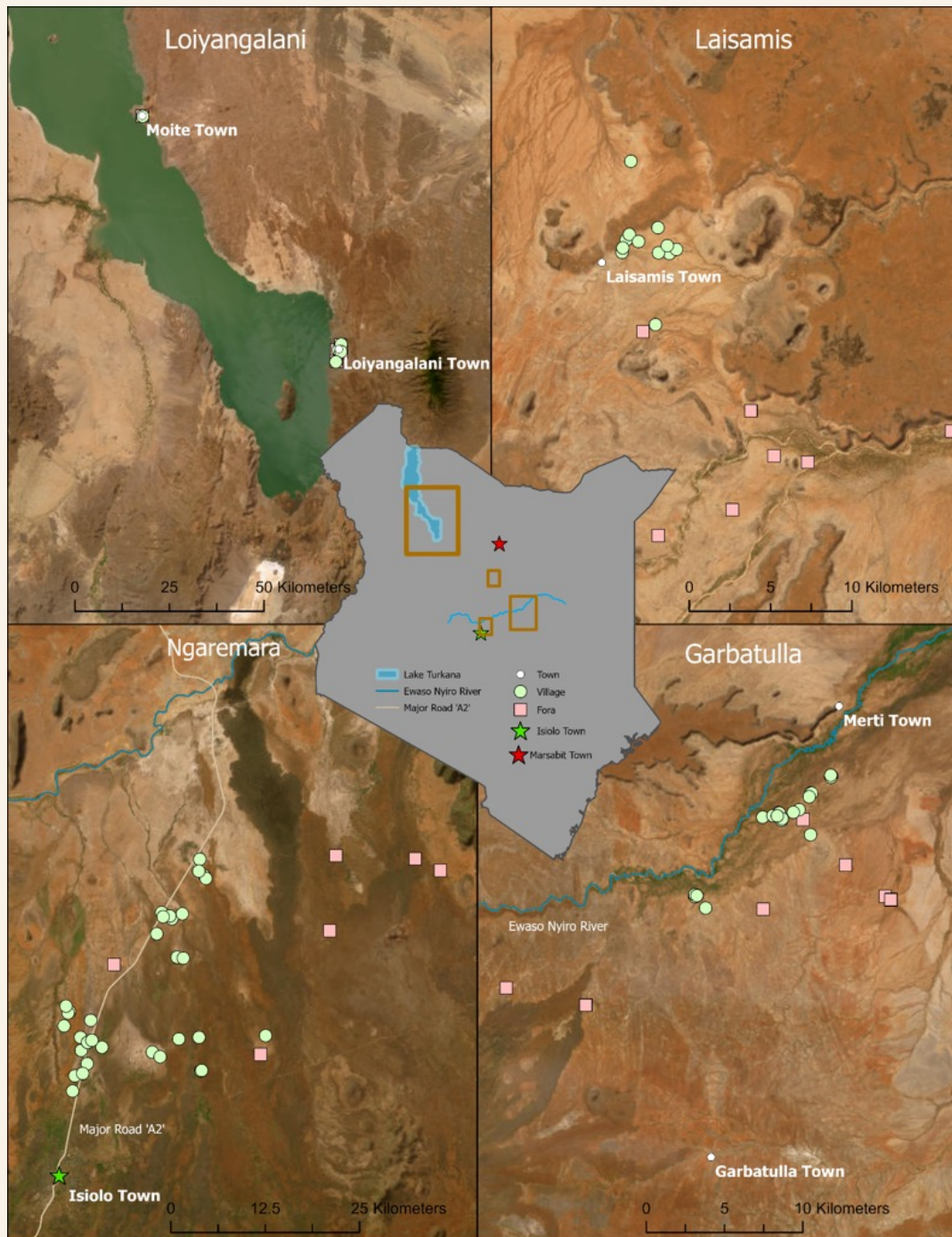
Figure 1. An adapted malnutrition causal framework showing the immediate, underlying, and basic drivers of child acute malnutrition (with visualizations designed for northern Kenya)



A summary of methods is provided on page 14, and a map of the sampled sites is shown in Figure 2.

The findings begin with a review of the basic drivers to contextualize the sentinel sites, a critical step for interpretation of both the nutritional outcomes and immediate and underlying drivers. Understanding how the basic drivers manifest differently in each site and over time helps explain the variations in factors driving or mitigating child acute malnutrition.

Figure 2. Map showing the sentinel site locations in Isiolo and Marsabit Counties



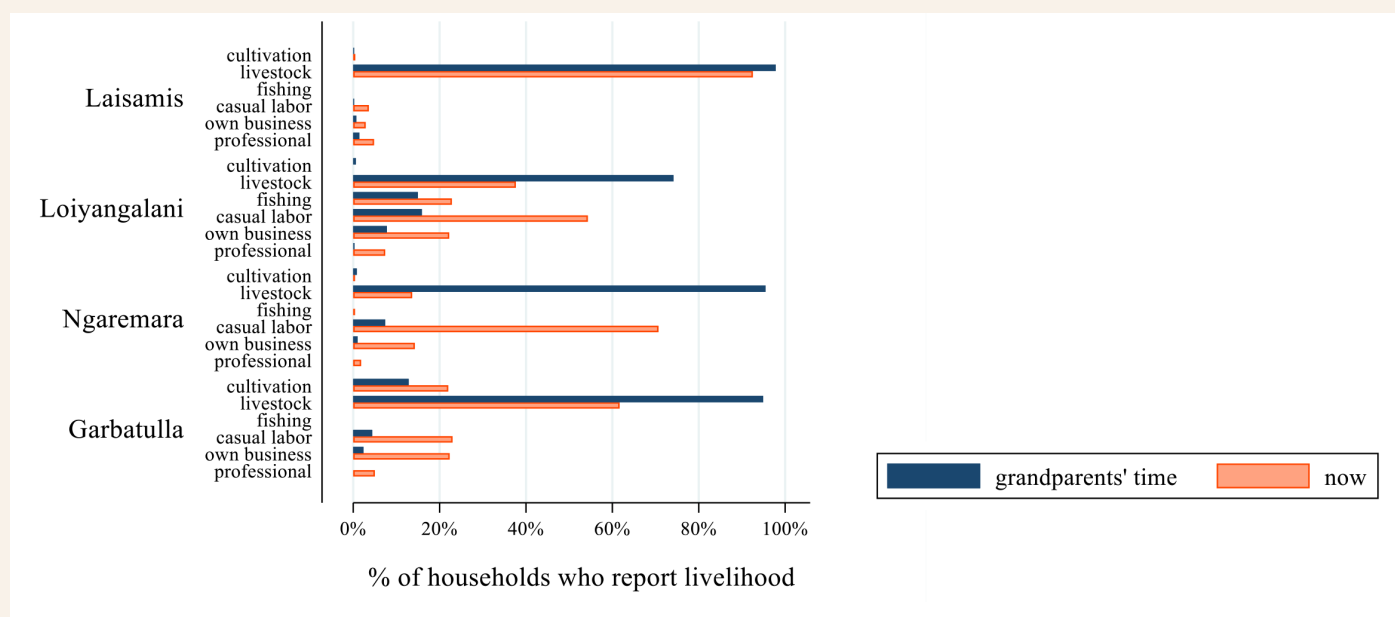
Findings and Discussion

This study provides insights into the basic drivers of child acute malnutrition in the Kenyan ASALs and contextualizes the consistently high prevalence rates. The complex results reveal seasonal and spatial differences in child acute malnutrition linked to livelihoods, climate, and environment and—most importantly—the institutions that are foundational to resilient livelihoods.

Critical linkages between pastoralism and human nutrition are under pressure

Livestock and pastoralism remain the bedrocks of most livelihoods even as the system of pastoral production continues to evolve, change, and at times struggle to adapt. Figure 3 shows how the relative importance of pastoralism as the main source of livelihood has changed compared to participants' grandparents' time.

Figure 3. Main livelihood now versus grandparents' time by sentinel site (annual survey, September 2023)



Pastoralist systems are adapted to manage extreme climate variability. While one or even two poor rainy seasons may not overstretch the system, the increasing frequency of droughts and consecutive failed rains, combined with multiple external pressures, have placed increasing strains on these systems. Growing pressures and constraints—combined with innovations and opportunities—have led to the evolution and transformation of pastoralism. Privatization of land tenure undermines sustainable resource management, restricts livestock movements, and increases resource competition, while the weakening of customary authority hampers sustainable land use norms. Encroachment of urban settlements and conservation areas further limits access to pastures. Economic development has led to sedentarization but has provided minimal benefits due to limited market access and high transport costs, forcing many into marginal economic activities. The commercialization of livestock has weakened traditional kinship systems and livestock redistribution, increasing vulnerability and undermining social support institutions, which impacts child nutrition and well-being. At the same time, the expansion of infrastructure, services, and economic opportunities means that households have diversified and adapted their strategies to take advantage of these potential opportunities.

Numerous institutions support the pastoralist system and the dynamic relationships between people, livestock, and the environment; these dynamic relationships underpin positive human nutrition. Strategic mobility is critical to pastoral livelihoods, influencing human nutrition by allowing herders to take advantage of the nutrient distribution in the rangelands, thereby maintaining animal productivity, which translates directly into food security, nutrition, and health benefits for humans, particularly children. For example, in Laisamis and Ngaremara the presence of camel and cattle (respectively) in the village was associated with significantly lower odds that a child was malnourished.

The interaction between permanent settlements and mobile *fora* also plays a crucial role in managing nutrition, with women and children moving to the *fora* to access milk and other resources. The study found significantly higher odds that a child was acutely malnourished in the sedentary settlements compared to children in the *fora* (in Laisamis), illustrating the nutritional benefits of spending time in the *fora* even during severe droughts. Extended droughts reduce the productivity of the herd while also increasing the distance between homesteads and the *fora*, thereby further reducing access to available milk for those in settlements.

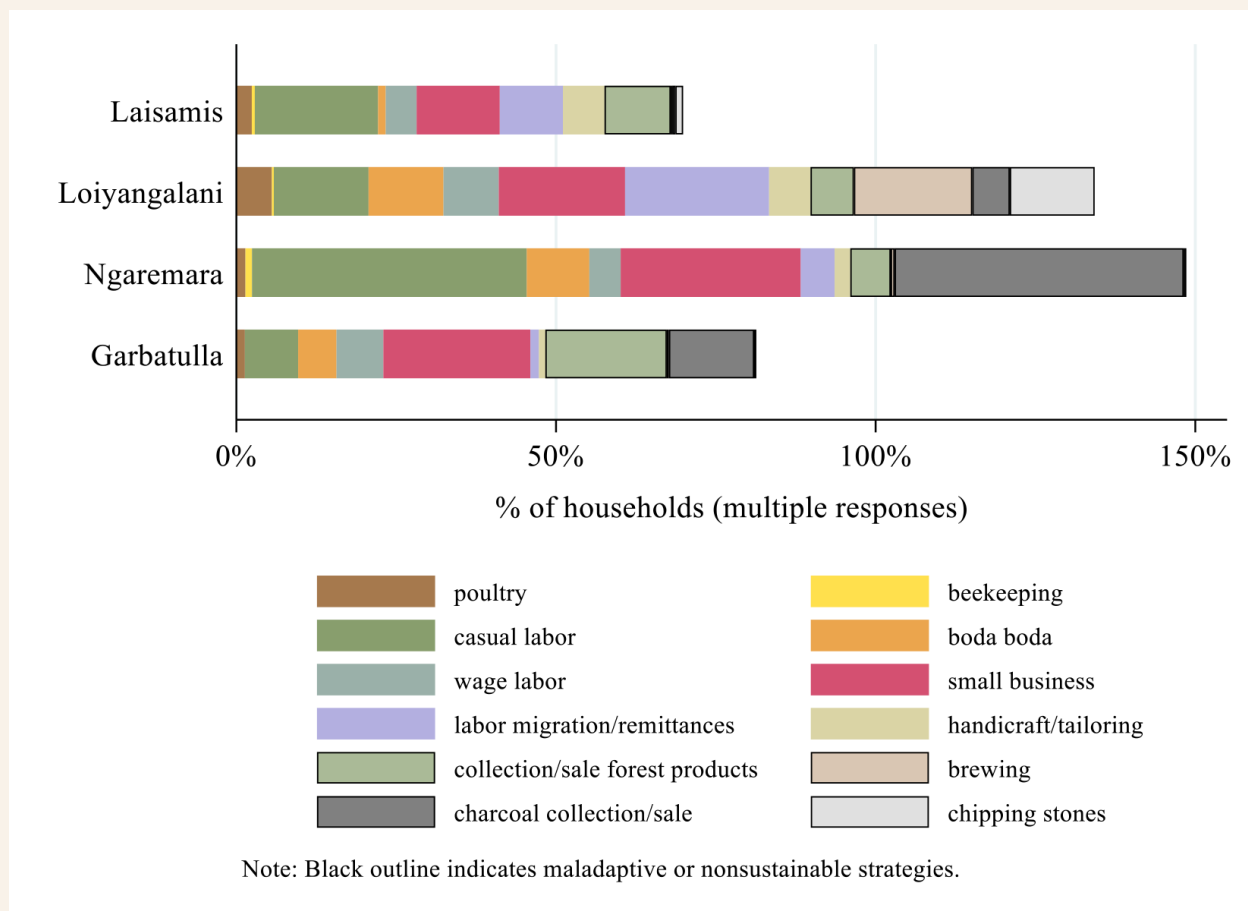
Social institutions, particularly reciprocity-based networks for sharing and support, are critical for managing human health and nutrition. Children in Loiyangalani (where global acute malnutrition (GAM) rates are highest) were significantly less likely to be malnourished if the household reported that members of the community shared additional resources with them. Childcare by secondary caregivers enables women to engage in labor to cover household needs, while the sharing of milk supports vulnerable households. However, these institutions are vulnerable to the pressures upon pastoralism and the impacts of protracted drought, including fewer available resources (including milk) for sharing with other households and increased time burdens on women, which increases the responsibilities for secondary caregivers.

Pastoralist institutions have shown remarkable adaptability in addressing challenges through customary environmental governance and herder drought management strategies, which have extended livestock mobility and maintained intergroup relations. Despite the strain on community social support systems, sharing and reciprocity remain prevalent, providing essential food, assistance, and childcare across all sites. These institutions are not only foundational to resilient livelihoods but also serve as the front line of disaster response.

Livelihood diversification—the pros and cons for child nutrition

The shift towards sedentarization and diversification in pastoral systems has created a mix of adaptive, coping, and maladaptive strategies affecting nutrition and resilience. The study highlights site-specific diversification, such as fishing in Loiyangalani, farming in Garbatulla, and casual labor in Ngaremara (Figure 4). Some activities—such as fishing—may be both a survival strategy and longer-term adaptation. Diversification differs by gender, with many women taking on labor-intensive, low-return economic activities that increase their workload and time away from young children, negatively impacting caregiving and child nutrition. Not having a primary caretaker (particularly in Garbatulla) present to take the child for measurements was significantly associated with greater odds that a child was acutely malnourished.

Figure 4. Livelihood diversification activities in the sentinel sites (multiple responses possible, annual survey, September 2023)



The study distinguishes between diversification for survival, such as some casual labor and collection and sale of firewood during drought, and strategic adaptations, such as trade and small business, which spread risk and enhance resilience. Hence, in Loiyangalani we see that fishing is protective for acute malnutrition while casual labor is protective in Ngaremara but has the opposite effect in Laisamis. Thus, diversification has varying impacts on child nutrition and requires careful evaluation to ensure positive contributions.

Pathways to recovery and resilience

Some stakeholders may perceive the crisis to be over with the return of the rains in 2023. For pastoralists, however, rain can bring additional problems and more livestock losses when animals are severely weakened from extended droughts. The resumption of reproduction and re-establishment of herds is a slow process. This lack of or slow recovery is reflected in the acute malnutrition data: as late as September 2023, the data showed no significant improvement in acute malnutrition levels in all the sites except Laisamis six months after the return of the rains, and also indicated the continuation of critical and emergency levels of GAM. Effective and sustainable recovery requires time as well as effective environmental governance, adaptive drought management, and a shift in women’s livelihoods from high-risk, marginal endeavors to sustainable, adaptive opportunities.

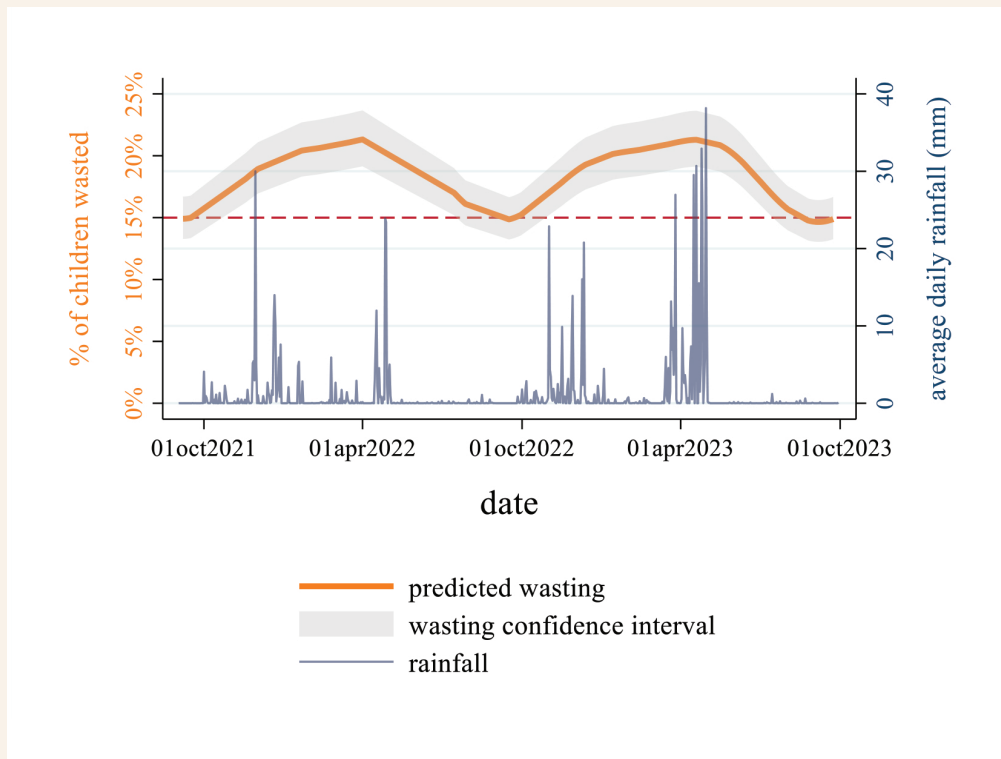
The basic drivers of child acute malnutrition—climate and seasonality, systems and institutions, and livelihoods—affect entire communities, not just specific households. Both drought and conflict impact food security, water access, and disease for broad populations. Given that these crises increase vulnerability for all,

effective humanitarian and preventative action requires a community-wide response strategy. Ensuring the resilience and recovery of pastoralist systems involves a comprehensive approach that addresses immediate needs, supports long-term positive adaptation strategies, and fosters sustainable livelihoods for drought-affected communities.

Acute malnutrition outcomes and seasonality

Across the two years of the study, on average, acute malnutrition prevalence varied from a minimum of 15% (September 2023) to a maximum of 21% (November 2022), with an overall average of 18.6% (95% CI: 18.0–19.1%) (Figure 5). These findings correspond to earlier trends identified in an analysis of malnutrition hotspots, indicating long-term, structurally embedded drivers of child acute malnutrition. Despite this alarming outlook, our review of seasonal variability in child acute malnutrition shows that achieving a prevalence below the emergency threshold and even below 10% is possible, as evidenced by the significant seasonal reductions in two of the four study sites (Laisamis and Ngaremarara).

Figure 5. Seasonal patterns of child acute malnutrition in Laisamis, Loiyangalani, Ngaremarara, and Garbatulla sentinel sites

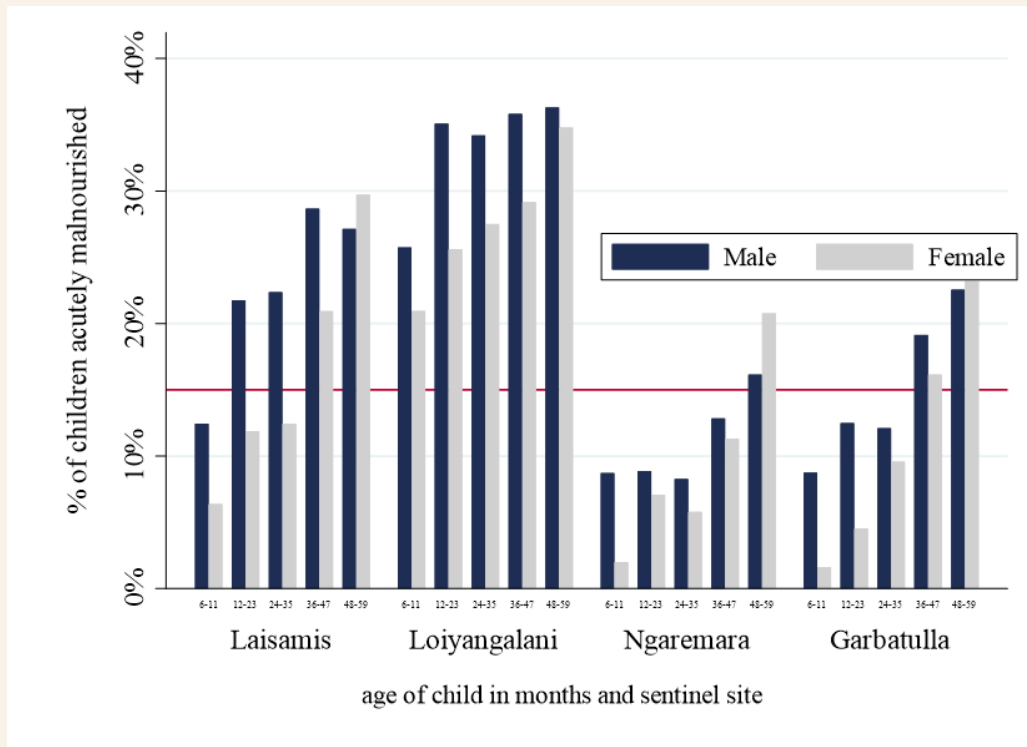


The study reveals that seasonal variability in child acute malnutrition is significant, with an average difference of six percentage points between peak and nonpeak seasons, which is greater than the difference between the two years of study. For Laisamis, Ngaremarara, and Garbatulla, two general peaks in acute malnutrition occur during the rainy seasons (November/December and April/May), with the lowest prevalence in the long dry season (August/September). In contrast, Loiyangalani shows different patterns, with peaks in February and June corresponding to temperature peaks, and the lowest prevalence in September. Each site has distinct primary peaks, with Laisamis showing a significant peak in April/May, Ngaremarara having two significant peaks, with November/December being greater than the April/May peak, and Garbatulla showing the least seasonal variability. The presence of two peaks in three sentinel sites and the differences between these sites and Loiyangalani indicate different drivers and protective factors across sites. Understanding these patterns is crucial for developing targeted interventions to address the drivers of malnutrition.

Consistent characteristics of a wasted child—age, gender, and female caretaker nutritional status

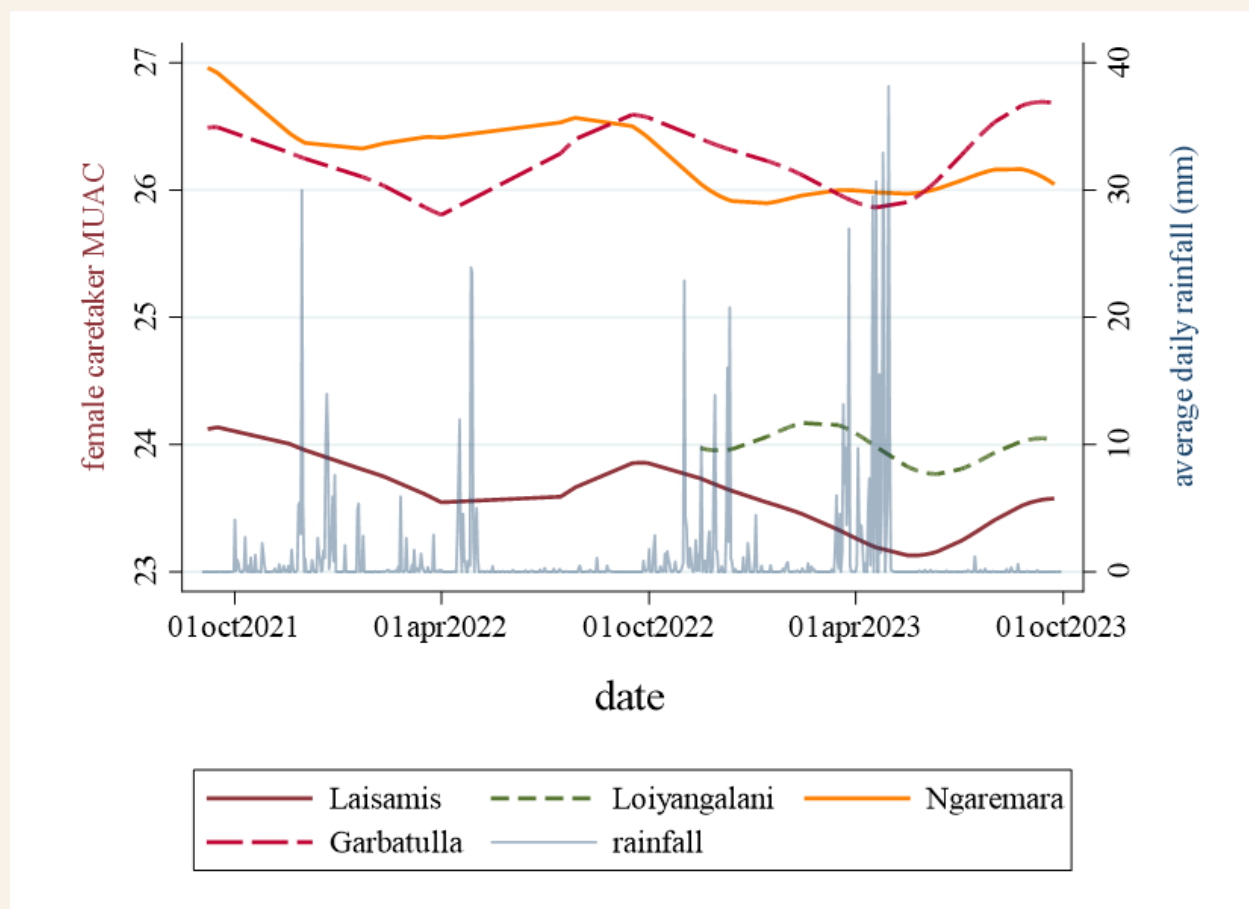
The study consistently found that children aged 3–5 years have much higher odds of being wasted than younger children (Figure 6). This was unexpected because global trends show that these older children tend to have lower rates of acute malnutrition compared to younger children; however, the most recent Kenya Demographic Health Survey (2022) shows a similar reversal of the expected relationship between age and acute malnutrition. Qualitative data from our study suggest that younger children are less likely to experience acute malnutrition due to having more time with their mothers as compared to older children. Increased women’s workload means that older children are often with caregivers who lack sufficient food, thereby raising the malnutrition risk for this group. The accumulation of multiple acute malnutrition episodes over time may also explain the higher risk of acute malnutrition in older children. Additionally, the study data show that boys are generally at greater risk than girls of acute malnutrition, stunting, and being underweight (Figure 6).

Figure 6. Seasonality of acute malnutrition by sex (male vs. female) and age category (< 24 months vs. 24–59 months)



The study also underscores the link between the nutritional status of female caretakers and child acute malnutrition wasting, highlighting the vulnerability of households with lower caretaker mid-upper arm circumference (MUAC) (Figure 7).

Figure 7. Predicted female caretaker MUAC over time by sentinel site



A synthesis of the immediate and underlying drivers in each site

Overall, the study found that the immediate and underlying drivers of wasting varied by site and time of year, with the lowest prevalence of wasting consistently occurring during the long dry season. Diarrhea was the only driver consistently correlated with wasting across all four sites, but it was present in only 16% of wasting cases, indicating that most episodes of wasting did not coincide with diarrhea. A table of summary statistics of program indicators for Years 1 and 2 is shown in Table C3 of the report annexes, although these were not found to be significant drivers.

In Laisamis, significant seasonal drivers included fever, malaria (not confirmed), diarrhea, and the absence of camels in the village. Fever and diarrhea consistently follow the same seasonal pattern as wasting. Seasonal patterns suggest malaria (not confirmed) is an important contributor towards the end of the rainy season, and the presence of camels contribute to lower wasting during the dry season (possibly due to access to camel milk).

In Loiyangalani, significant drivers included fever, malaria (not confirmed), diarrhea, open defecation, and lack of cereal consumption. The lowest wasting rates in August/September correspond to reduced food insecurity, and the lowest prevalence of malaria (not confirmed), fever, and diarrhea.

Ngaremara's significant drivers included diarrhea, lack of cereal consumption, and absence of cattle, with individual caretaker and household characteristics (such as caretaker disability and monogamous as opposed to polygamous households) also being important predictors of child wasting.

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Garbatulla's significant drivers included diarrhea, respiratory illness, use of informal water sources, lack of fruit, vegetable, and meat consumption, and household food insecurity, with the consumption of roots and tubers indicating reliance on less preferred, lower-nutrient foods.

Despite improvements since the end of the drought, as of September 2023 most sites still faced critical or emergency levels of acute malnutrition, highlighting the need to address not only immediate and underlying drivers but also basic systemic factors contributing to persistently high malnutrition rates.

Conclusions and implications of the findings

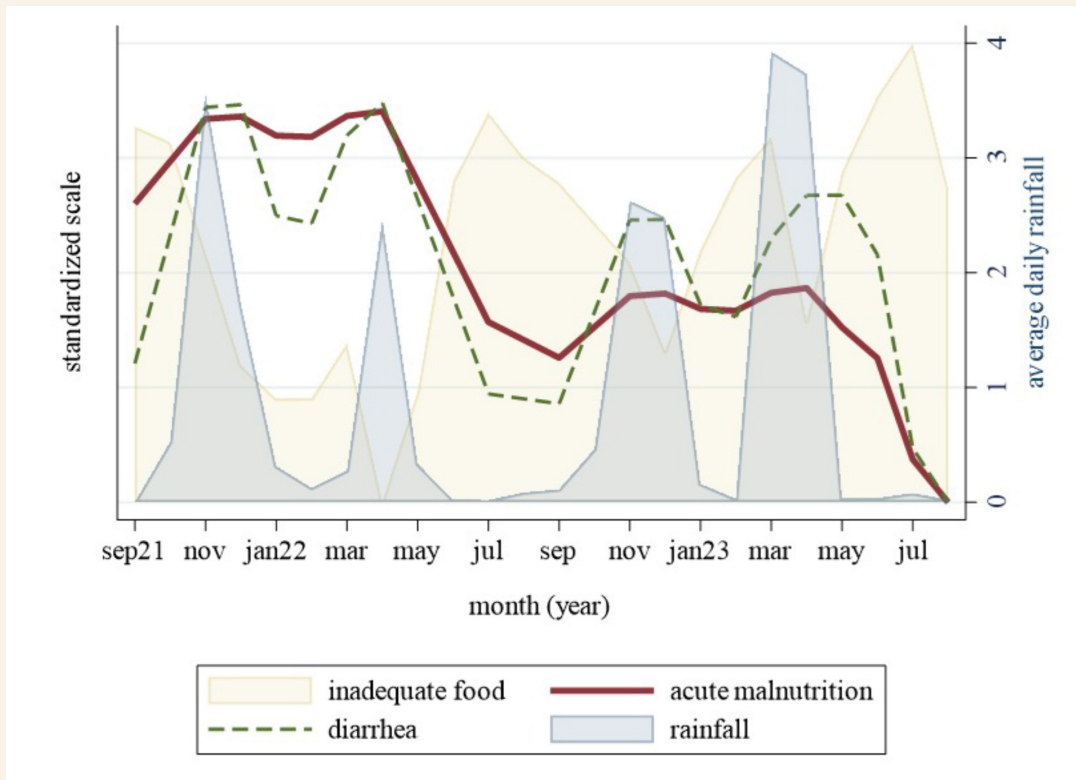
In conclusion, child acute malnutrition persists in these sentinel sites and reflects deeper systemic failures and missed opportunities in both development and humanitarian realms. The analysis of basic drivers contextualizes the consistently high rates of child malnutrition, demonstrating seasonal and spatial differences linked to livelihoods, climate, and environment, and shaped by formal and informal institutions. The sustainable prevention of child acute malnutrition is a collective responsibility, from the village level to the highest levels of government. The report concludes with implications for a range of stakeholders, summarized below and with full details in the research report.

1. Implications for assessments, surveys, and surveillance: The study emphasizes the need for disaggregating acute malnutrition rates by sex, age, and geography, incorporating additional anthropometric variables, understanding the implications of data aggregation, avoiding simplistic seasonal assumptions, timing data collection appropriately, improving survey representation of households who have migrated to distant pasture (*fora*), and enhancing variables for assessing food security, livelihoods, nutrition, and health.

2. Implications for effective responses to shocks and seasonal stresses (treatment and prevention of malnutrition): Recommendations include reviewing age-specific project targeting criteria, extending malnutrition programs and policies to include children up to 5 years, expanding targeting in known malnutrition hotspots, enhancing screening and treatment coverage, using simplified protocols for treating malnutrition, considering the needs of mothers, monitoring relapse rates, and tailoring response strategies to specific community drivers of acute malnutrition.

3. Implications for sustainable livelihoods and adaptive diversification: Global nutritional programs have increasingly focused on food systems. However, food insecurity alone is insufficient to understand why wasting is so high (Figure 8). In Isiolo and Marsabit, a food systems approach should build on existing pastoral livelihoods and support strategic, sustainable diversification to enhance nutrition and resilience, while considering community-specific livelihood profiles and ensuring interventions are well coordinated and contextually adapted.

Figure 8. Standardized and predicted diarrhea, food insecurity, acute malnutrition, with non-standardized rainfall



Note: standardized across wards: $(value - mean(value))/standard\ deviation(value)$ to allow us to visualize all the different climatic variables on one graph despite different units of analysis

4. Implications for strengthening systems and institutions: Resilience in pastoral communities is largely due to institutions that support mobility, manage environmental resources, and facilitate social safety nets, all of which are associated with nutritional benefits. However, these institutions are vulnerable to protracted and compounded shocks (e.g., extended drought overlaid with intergroup conflict), necessitating interventions and actions at every level to ensure that these institutions can function effectively.

5. Implications for learning, uptake, and systems strengthening: To drive effective policy and institutional change, evidence must be integrated into an uptake strategy that promotes evidence-based learning and systems strengthening. Dissemination and uptake must be driven by stakeholder interests and concerns. Local dissemination with strong participation is crucial to facilitate debate and priority setting among local development actors and communities to achieve sustainable solutions to malnutrition.

6. Methodological insights and research priorities: Longitudinal data are vital in highly variable climates, where climate affects household activities and exposures. Analyzing climate data is crucial rather than relying on predefined seasons. Additionally, a mixed-methods sentinel site approach provides detailed data on livelihood systems and institutions. These findings also affect how and when we measure acute malnutrition. Further research is recommended on: the relationship between *fora* migration and missing data; anthropometric indicators and functional outcomes for children aged 2–5 years; and quantitative livelihood variables. Follow-up studies should include representative samples of migrating households as they are often excluded, risking biasing data and misrepresenting ASAL populations.

About the USAID Nawiri Longitudinal Study

The USAID Nawiri longitudinal study is a mixed-methods research study that investigated the drivers of child acute malnutrition—immediate, underlying and basic—and their temporal distribution (seasonality and change over time) across four sentinel sites in Isiolo and Marsabit Counties. This collaborative study took place in four sentinel sites (Ngaremara and Garbatulla wards in Isiolo County and Laisamis and Loiyangalani wards in Marsabit County) between September 2021 and 2023. Each of the sentinel sites corresponds to the predominant livelihood system in each of the locations: Laisamis (pastoralism) and Loiyangalani (fisher pastoralism) in Marsabit County, and Garbatulla (agro-pastoralism) and Ngaremara (mostly mixed peri-urban with pastoralism) in Isiolo, each comprising multiple villages and *fora*. The study collected 12 rounds of quantitative survey data (including anthropometric measurements) with a cohort of households with children under 5 years, combined with iterative qualitative inquiries using participatory approaches. The goal of the study was to increase understanding of the causes of persistent acute malnutrition in the counties through a collaborative learning and research process that involved local actors, including communities, county institutions, civil society, and the private sector. More details on the research study can be found at <https://fic.tufts.edu/research-item/research-and-capacity-building-support-to-the-nawiri-project/>



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