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Vulnerability, Risk, and Resilience:

The implications for the drivers of
malnutrition in Isiolo and Marsabit
Counties, Kenya

USAID Nawiri Longitudinal Study Learning Brief 3

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The resilience of pastoralism as a livelihood system stands out, even with the challenges posed by the prolonged drought. This learning brief explores the continuity and changes to livelihoods in select sites in Isiolo and Marsabit Counties, Kenya, and reviews the implications—both beneficial and detrimental—of the continuity and the changes on the drivers of child acute malnutrition.

This brief is part of 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, which is led by Catholic Relief Services. The mixed methods research study is a collaboration between Tufts and Kenyatta Universities, Catholic Relief Services, and Caritas.



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Key Messages

- 1. Continuity and change in people's livelihoods.** Pastoralism remains a central part of people's livelihoods and continues to predominate for a significant portion of the population. The prolonged drought spanning from 2020 to 2022, following other severe droughts in 2010/11 and 2016/2017, has contributed to livestock losses and substantial disruptions to seasonal livestock reproductive cycles. Nevertheless, pastoral systems are dynamic, with herders adapting their practices in response to drought conditions and evolving institutional changes that influence the ways in which pastoralism operates. Compared to previous generations, there is increasing livelihood diversification within these populations.
- 2. Livelihood diversification has a dual impact on nutrition.** The ways in which people diversify their livelihoods have both positive and negative effects on the underlying drivers of child malnutrition, which are often interconnected. Notably, the growing livelihood diversification for women, partly driven by widespread food insecurity, involves engagement in low return, labor-intensive, and precarious activities, impacting childcare. Consequently, the repercussions of food insecurity lead to a broader and interconnected set of drivers of acute malnutrition. Conversely, some forms of diversification yield positive outcomes and support resilience.
- 3. Vulnerability, risks, and resilience are interconnected.** In Isiolo and Marsabit Counties, dealing with the repercussions of the prolonged drought, the effects of subsequent rains, as well as addressing insecurity and conflict, will continue to be top priorities. Nonetheless, these predominantly external interventions should not divert attention from the importance of strengthening resilient livelihood systems. Local institutions and agencies play a vital role in tackling child malnutrition and require greater recognition and bolstering. External responses must cut across sectors, embrace a collaborative evidence-based learning approach, and be seamlessly integrated into governance strategies.

Introduction

Efforts to prevent child malnutrition must address not only the immediate and underlying causes (dietary intake, disease, food security, care environment, health services, and broader environment) but also the basic drivers of malnutrition.¹ This approach requires looking beyond the individual child to consider their community and the context in which they live. Environmental variability—including temperature fluctuations, variable rainfall, frequent droughts, and floods—characterizes the Kenyan arid and semi-arid lands (ASALs). Climate change is exacerbating these climatic extremes, which is also affecting the various habitats that provide the necessary environmental conditions and resources for different plant and animals species. Livelihood systems in the Kenyan ASALs continue to demonstrate the flexibility that enables them to adapt and at times thrive within a context of environmental uncertainty (see [“Mobility Matters” Learning Brief](#)).² The heavy rains across Marsabit and Isiolo Counties from March to May 2023 broke the extended drought of more than two years (2021 to 2023), although with mixed effects on lives and livelihoods. Beyond climate stresses, livelihood systems and community resilience in the region also face increasing pressures from resource competition, intergroup conflict, urbanization, and demographic changes. These factors relate to

the climate and environment, livelihood systems, formal and informal institutions, and the policy context. Taken together, these form the basic and systemic drivers or root causes of child acute malnutrition, which in turn determine the underlying and immediate drivers relating to food, health, and care at the household and individual child level.

This learning brief investigates the continuity and change in people’s livelihoods and related institutions in selected sites in Isiolo and Marsabit Counties, Kenya, and the implications for the drivers of child malnutrition. The selected study sites are characterized by persistently high rates of acute malnutrition in children under five years of age; rates that have continued throughout the first year of the longitudinal study.³ The longitudinal study (see [“The State of Malnutrition” Learning Brief 1](#) and [“USAID Nawiri Quantitative Longitudinal Study Report”](#)⁴) shows that the underlying drivers of child acute malnutrition affecting the individual child or household vary by sentinel site and by season and emphasizes the importance of understanding the wider basic drivers of malnutrition that affect communities. An understanding of these patterns potentially allows a response to be tailored to the problem and implemented by the appropriate actor(s) at the right time, and in the right place. This type of evidenced-based approach to programming and policy will be both more effective and less wasteful of resources.

Findings and Discussion

The centrality of pastoralism

While pastoralist communities in Marsabit and Isiolo have long practiced various forms of livelihood diversification, the predominant livelihood continues to be based on livestock production, which in turn depends on environmental resources.⁵ In the four study sites,⁶ pastoralism has been fundamental to people’s ways of life for as long as these communities can remember. Mobile livestock herding continues to predominate as the main and most sustainable livelihood system. The principles of pastoralism based on strategic livestock mobility are common to all (see [“Mobility Matters” Learning Brief](#)), although species preferences, mobility patterns, and management practices differ between herders and by locale, year, and season.

Table 1 compares household livestock ownership by species in Laisamis, Ngaremara, and Garbatulla.⁷ The predominance of pastoralism is strongly evident in Laisamis. More than 85% of households own sheep or goats, 54% own cattle, and almost half own camels. Ownership of goats and sheep is also high in Garbatulla (above 75% for both species), indicating a preference for shoats over cattle and camels. In Ngaremara, livestock numbers are far smaller (as measured using Tropical Livestock Units⁸), although around half of households reported owning sheep (45%) or goats (58%), showing their continuing importance.

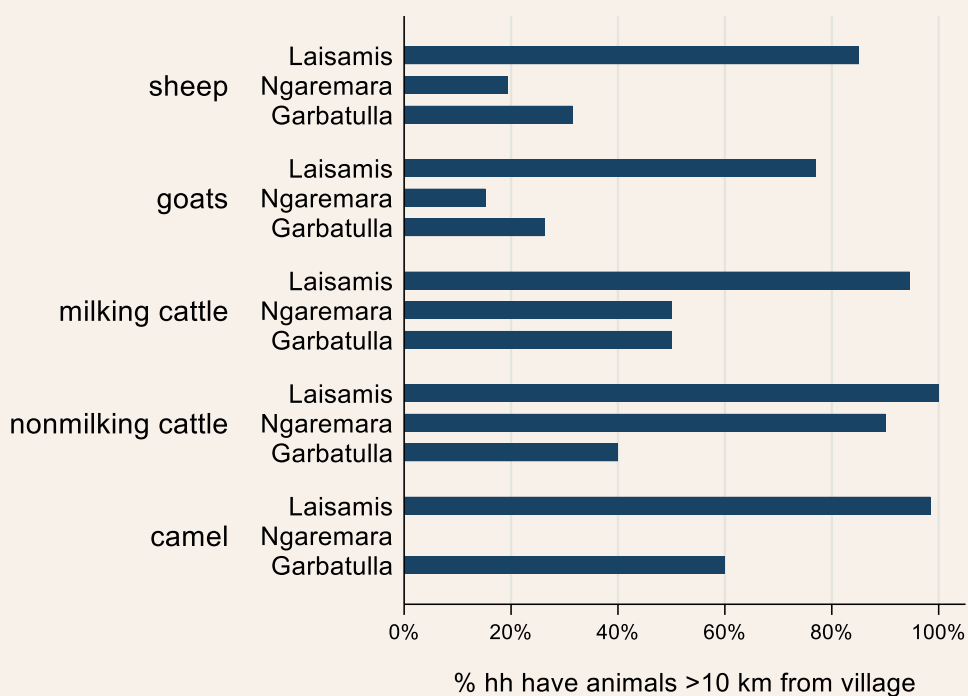
Table 1. Household livestock ownership by species in Laisamis, Ngaremara, and Garbatulla

<i>variable</i>	<i>Laisamis n=712</i>	<i>Ngaremara n=786</i>	<i>Garbatulla n=640</i>
own cattle	54% (50-57%)	6% (5-8%)	9% (7-11%)
own camels	48% (44-52%)	1% (0-1%)	2% (1-3%)
own sheep	86% (83-88%)	45% (41-48%)	75% (71-78%)
own goats	88% (85-90%)	58% (54-61%)	78% (74-81%)
Tropical Livestock Units (average)	5.83 (4.36-7.31)	0.18 (0.11-0.25)	1.33 (0.77-1.88)

Pressures of the extended drought have led to significant livestock losses and seriously impacted seasonal reproductive cycles and productivity. During extended droughts, livestock reproduction is reduced, often in a controlled way by the herder to conserve the condition of the herd, which in turn limits the availability of milk for human consumption. Camels are to some extent an exception to this rule, as they have longer gestation periods and are more drought resistant. In addition, during drought periods, herds are farther from the villages in order to access dry season pasture and water (Figure 1). For example, in Laisamis, the majority of the animals are in the *fora* (rangeland area for animal grazing), many as far as the Ewaso Nyiro River near Archers Post. During the time of the annual survey (September 2022) 95% (85–99%) of all milking cattle from Laisamis were farther than 25 km from the village.⁹

Consequently, fresh milk is unavailable in the villages in the dry season, and only small amounts of camel milk are available in the *fora*, which is prioritized for consumption by the youngest children. Milk is a vital food for these pastoralist communities, especially for the diet of infants and young children. In Laisamis, consumption of dairy products, and animal milk specifically (in the past 24 hours), was significantly associated with lower odds that that child was acutely malnourished.

Figure 1. Proportion of households who reported that animals (by species) were more than 10 km distance from the village, by sentinel site.



Livestock owners and herders employ a wide range of drought management strategies that have contributed to the sustainability of pastoralism over time, albeit with variable productivity, especially in the face of protracted drought and other challenges. For example, herds stay in the *fora* and away from the village for extended periods of a year or more. Other pastoralist drought adaptations include restricting herd reproduction, night grazing to reduce heat stress (and also to access prohibited grazing reserves), and cooperation

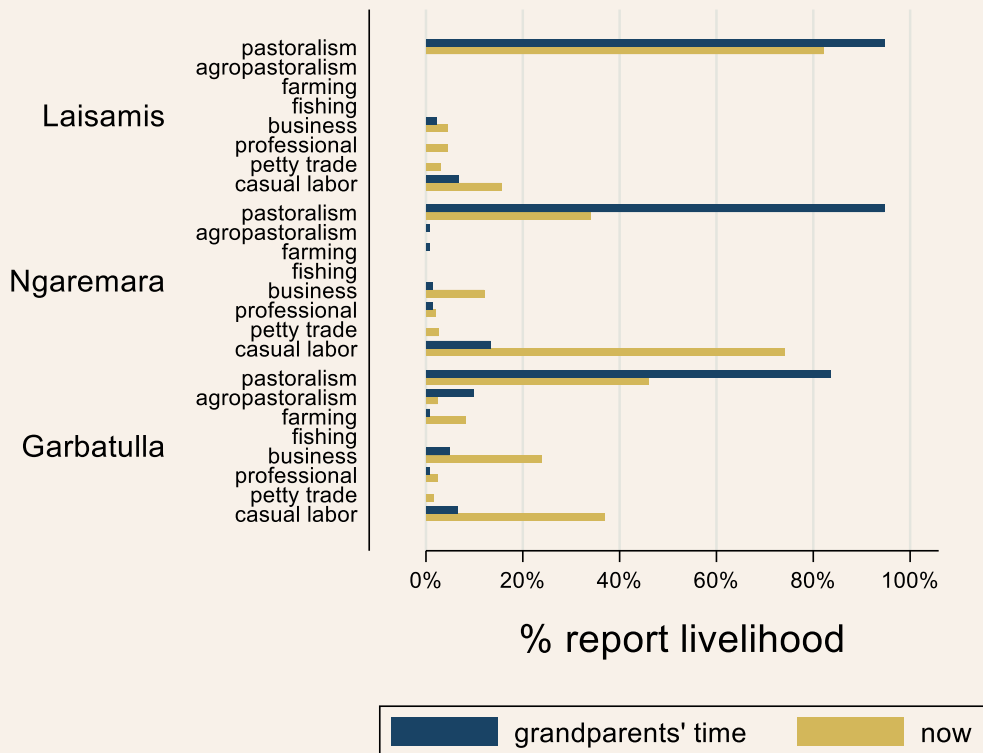
by combining herds that allows goat herders to benefit from some of the milk available from camels (usually camels are herded separately). In the *fora*, families generally “cook from the same pot” and share their food (Tirgamo, Marsabit). Similarly, some women reported sharing family meals with kid goats and collecting wild foods as fodder to help their few kid goats survive.

The recent rains following an extended drought led to new challenges, including localized flooding and significant livestock deaths due to the abrupt shift to cool, wet conditions, which many weakened animals could not withstand. Furthermore, the typical increase in livestock births during the rainy season was tempered because herders refrained from breeding their weakened animals, anticipating further rain delays. This disruption in the usual seasonal pattern of livestock reproduction and fresh milk availability is expected to cause delays of up to five months or more in the usual seasonal pattern of livestock reproduction and fresh milk availability, thus prolonging the shortage of fresh milk and lack of consumption by young children.

Livelihood diversification: implications for the drivers of child malnutrition

There has been an increase in livelihood diversification, particularly when comparing the range of livelihood activities and sources of food and income today with those of the grandparents’ generation, which were almost entirely based on pastoralism (Figure 2).

Figure 2. Changes in source of livelihood over time in Laisamis, Ngaremara, and Garbatulla.



Patterns of livelihood diversification vary between the study sites, depending on the opportunities that are available and the risks involved. For example, Ngaremara's location on a main highway close to Isiolo, the county capital, provides opportunities for casual labor and petty trade. Loiyangalani's location on the shore of Lake Turkana offers the possibility of fishing and tourism. The location of the Garbatulla villages on the Waso Nyeru River has allowed a few households the chance to practice irrigated farming. Laisamis generally has less diversification, not only because of fewer opportunities but also because of the steadfastness and resilience of pastoralism.

Diversification strategies vary, and broadly encompass activities such as farming, casual labor, collecting and trading natural resources, other petty trade, running one's own business, and pursuing formal employment (see Box 1).

Box 1. Livelihood diversification activities within study sites

Crop farming: Cultivation is a practice that began decades earlier in some locations, in part through development programs, but with overall limited and varied success. In our data, crop farming was most widespread among households in Garbatulla, but results are mixed due, in part, to constraints on inputs such as diesel for the water pump and destruction of crops by elephants. Crop farming in Garbatulla is concentrated in the flood plains of the Waso Nyeru River, where villagers farm along the river and its tributaries. Own cultivation is less common in Laisamis and Ngaremara, although there is some farming day labor in Ngaremara.

Casual labor: Ngaremara's proximity to Isiolo town provides opportunities for casual labor, and 47% (44–50%) of women report that "casual labor" is their main source of food and income. This compares to less than 20% of women reporting engagement in casual labor in Laisamis and Garbatulla. Casual labor includes working as domestic servants, doing laundry, carrying water, and construction activities, among others.

Business opportunities: Relatively few households (around 5%) report running a small business in Laisamis and Ngaremara; the rate is only slightly higher in Garbatulla. Examples of small businesses include selling a range of foodstuffs and other essentials at kiosks (all sites), *boda boda* (motorbike) transportation of people and goods (reported in Ngaremara and Garbatulla), and guesthouse owners or food preparation (Loiyangalani and Ngaremara).

Employment: Reliable employment is extremely limited in all sites, with only a handful of people reporting engagement in consistent and/or salaried employment as security guards, teachers, health workers, or local officials. This lack of employment opportunities increases the dependence of most households on a wide range of marginal, low-return, and risky activities.

Box 1. (continued)

Natural resources: Collection and trade in firewood by women is common in Ngaramara and Garbatulla but less so in Laisamis. Women in Ngaramara also produce charcoal and sell it, either along the roadside or by working with *boda boda* drivers who sell on the women's behalf in Isiolo town.

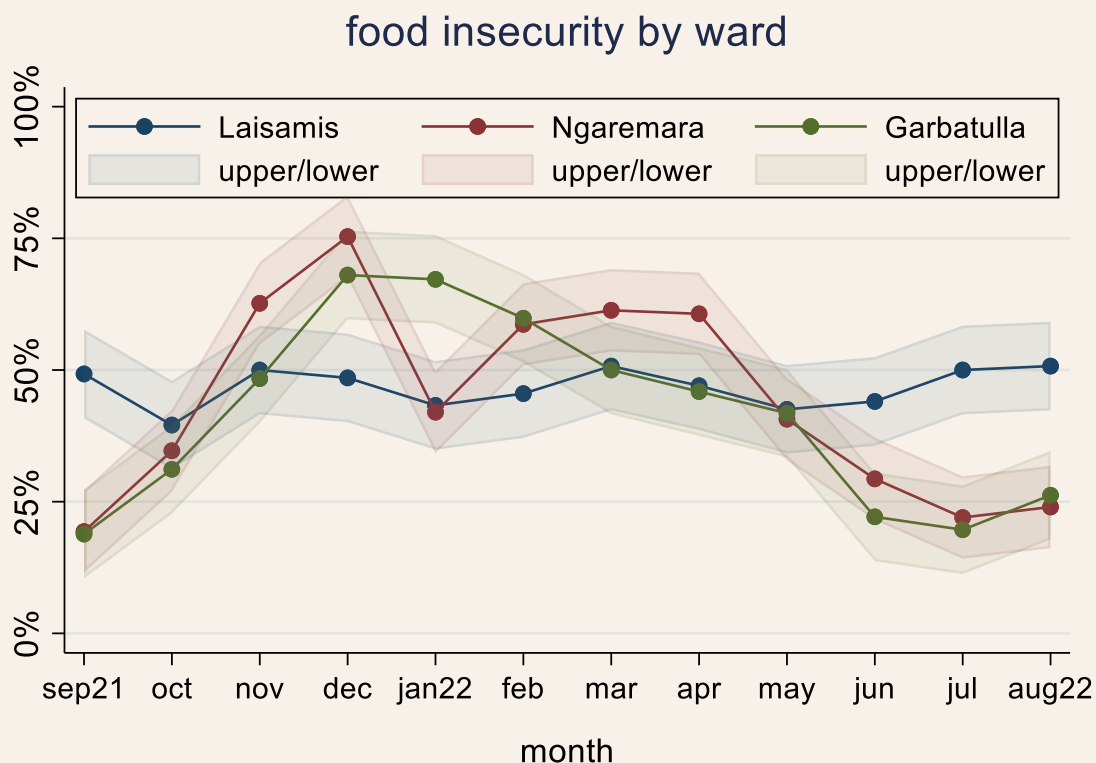
Fishing: Fishing existed as a livelihood activity only in the Loiyangalani site and is done predominantly by Turkana. While fishing has been practiced by some Turkana for more than 50 years, it has grown recently as more people—predominantly young men—have expanded into fishing in response to a loss of livestock. Only a few individuals own motorized boats, and those that do provide employment for a limited number of skilled fishermen. Otherwise, men use rafts made of doum palm trunks. Women receive income from mending nets, and drying and selling fish. Shared fish are an important part of the social safety network in Loiyangalani.

Wide-ranging pressures on pastoralism and related livelihoods, combined with the increasing need for cash to cover household needs,¹⁰ compel households to diversify their sources of food and income. The increasing diversification increases the risk of “**maladaptive**” or **negative livelihood diversification**, which entails people taking risks (fishing when unable to swim, traveling to unsafe areas), engaging in illicit activities (brewing, poaching), or pursuing actions that directly or indirectly harm others (banditry).

For women, increased livelihood diversification often means engagement in an array of marginal, low-return, and precarious activities. Such engagement normally entails an increased workload, longer working days, less time to care for their own children, and greater dependence on secondary caregivers. Such types of economic diversification not only provide marginal benefits to households, but are also **maladaptive**, given the associated burdens and hazards faced by women. For example, several young women in Nawapa in Loiyangalani ward were chipping stones to sell to construction companies. This is difficult and dangerous labor with a high rate of injury; reportedly only women engage in this activity. Gathering and selling firewood can take all day and entails walking to areas where there is a high risk of physical or sexual violence. These conditions have a profound impact on the physical and mental well-being of mothers. To pursue such strategies, women must often leave their children in the care of others for up to twelve hours a day, frequently without being able to provide adequate food in their absence.

The growth of livelihood diversification over time is, to some extent, driven by rising household food insecurity, which impacts not just a handful of households but extends across all study sites (see Figure 3). This escalating food insecurity potentially has far-reaching ramifications, as it triggers other drivers of child acute malnutrition. Food insecurity at the community level also undermines communal social support systems related to sharing and childcare arrangements, as discussed in the next section.

Figure 3. Months of inadequate household food security.



The effects of food insecurity are neither finite nor fixed (predetermined), nor are they independent: acute food insecurity triggers a larger and interconnected set of drivers of child acute malnutrition (explored in the next section). A better understanding of the relationship and interaction between drivers may allow food insecurity to be more effectively addressed.

Risks, vulnerability, and resilience are interconnected.

Populations in all study sites experienced severe challenges and risks during the first year of the longitudinal study. In particular, the impact of drought-induced pressures on pastoral systems was widely apparent in the qualitative data, including the weakened condition of animals, abandonment of animals too weak to walk, high rates of distress sales of livestock, saturation of the livestock market, and increased livestock deaths.

As described above, the pressures on pastoralism and dependence on an array of marginal strategies have contributed to household food insecurity. The bimonthly surveys found that going hungry and resorting to only one meal a day were common coping strategies. Over the first year of the study, between 26% and 43% of respondents reported going a whole day without eating due to lack of food. Women in one focus group discussion explained that they eat their single meal in the evening to ensure that they and their children can sleep, but some women reported fainting from hunger during the day. As explained above, women are engaged in an array of marginal, low-return, and precarious activities, many of which are characterized by heavy labor, likely increasing caloric needs.

Persistent food scarcity has led to the reversal of certain customary practices. For example, in Laisamis, it is traditional for infants and young children to go to the *fora* during the dry season, where milk is more readily available. However, the prolonged drought led to insufficient food availability in the *fora* and increased the number of young children living in the villages in this time period. Another indication of the prevailing food insecurity linked with the drought limiting availability of fodder for wildlife is the rising frequency of wildlife attacks on both livestock and people, leading to severe injuries and, in one case, the death of a child in Laisamis.

However, these signs of distress, risks, and vulnerabilities provide partial insights into understanding the drivers of child acute malnutrition. **Some drivers of child malnutrition can also yield positive effects on nutritional outcomes when systems and institutions are functioning effectively or are structured to promote food security, health, and adequate childcare.** Furthermore, the research findings reveal factors that are associated with positive impacts in particular sites (see below).

Although pastoralism is under pressure, the situation would be manifoldly worse if it were not for the tenacity of pastoralist social support systems and the versatility and adaptability of local institutions. Pastoralism continues to underpin community resilience in the longer term. Resilience is demonstrated in herder drought management strategies (discussed earlier), institutional drought management strategies, and the social support systems associated with pastoralism.

An enduring feature of the resilience of the pastoralism system is the role of social support systems, networks, and practices. Traditionally, pastoralists relied on extended family and kinship networks for support, including sharing food and providing assistance as needed. Food and cash were shared within households in all study sites despite household members being divided between permanent settlements and *fora* locations. In Laisamis and Garbatulla, sharing food and cash seem robust at the household level but weaker at the community level, likely because of poverty and diversification into nonpastoral activities. Recently, exchanges have been facilitated by growth in *boda boda* transport and mobile phone communication, allowing household members to stay connected and provide support, ensuring continued interactions between the settlements and the *foras*.

Another positive aspect of social support systems is the crucial role of grandmothers and mothers-in-law in providing childcare. While this continues to take place across the study communities, the increased workload and time burden for women has placed pressure upon these systems and stressed the ability of older women to consistently provide the needed care. Some respondents explained that they rely more heavily on non-related childcare providers, in exchange for firewood, water, or other commodities. Variations in preferred care provider (i.e., grandmother versus neighbor versus older child) existed across the study sites.

While earlier sections discussed how livelihood diversification can bring burdens (especially for women), marginal returns, and high risks, some forms of diversification can be positive and contribute to resilience. This would include examples of diversification into fishing, crop cultivation, or forestry when such activities are based on sustainable natural resource management practices and participatory structuring of access rights. Positive instances of institutional support for diversification also exist. An example of successful collective action comes from Moite, where numerous young men (and some women) who lost their animals have diversified into fishing. Two examples illustrate the use of bottom-up collective action institutions to regulate behavior and manage resources in the context of drought and other risks. In Laisamis, local and migrating herder groups cooperate to manage water use and security during the dry season, taking turns managing livestock

watering schedules, safeguarding water points, and finding better pastures by sending joint scouts. In Kiwanja, Loiyangalani, about 20 women formed a self-help group that has evolved into a livelihood diversification strategy. These women, from the Samburu and Rendille ethnic groups, buy fish from local fishermen and sell their stocks to traders in Busia and Lodwar. Notably, despite cultural practices against consuming fish, these women engage in this collective action to supplement their income for purchasing food and starting small businesses (*duka*).

At the local level, risks, vulnerabilities, and resilience are intertwined and originate from the environment, systems, institutions, and livelihoods: these are the same factors that shape the basic drivers of malnutrition. In other words, the sources of strength and sustainability occur at the same level as the sources of risk and vulnerability. A strategy or framework for response that illustrates and encompasses these different aspects is discussed below.

Implications

Differences between study sites matter.

The findings reveal that livelihood systems in the study sites differ markedly, even though all sites share a history and continuing dominance of pastoralism. Differences exist in herder practice and natural resource management. Importantly, these practices and institutions help to mitigate the effects of drought on the pastoralist system (by protecting the herd) but are effective only to a certain degree given the extent of the drought and associated losses of income and animal productivity, including milk. This has contributed to widespread food insecurity.

Differences within study sites also matter. For instance, Ngaremara consists of many dissimilar smaller villages, with high degrees of livelihood diversification from one to the next. In contrast, in the predominantly pastoral site of Laisamis, the villages are broadly similar. The significance of drivers of malnutrition at the household level differ accordingly: in Ngaremara, wealth differences affect who is malnourished, as does use of mosquito nets and household dependency ratios. Beyond these household-level factors, the qualitative analysis identifies additional drivers of malnutrition, including urbanization, diversification into maladaptive livelihood activities, and the shrinking and loss of social networks. In other study sites (Laisamis and Garbatulla), there are far fewer significant household-level variables, which suggests a contrast in the relevance of these variables across locations (see [Learning Brief on “The State of Malnutrition”](#)).

Local social and institutional support systems have helped address some of the worst impacts of drought and food insecurity on the most vulnerable households, especially in Laisamis. The social support systems, networks, and practices that are characteristic of pastoralist systems also play an important role in mitigating the impact of drought on nutrition. Such systems include sharing of milk and food across households, a broad approach to childcare, and cooperation on grazing decisions among herders. The effectiveness of these local practices may explain the small number of individual and household-level factors associated with child acute malnutrition in the study data (see [Learning Brief on “The State of Malnutrition”](#)). In other words, the systems of sharing risk and mitigating vulnerability may help to equalize the effects of the drivers of acute malnutrition across the study population, albeit at a worryingly high global acute malnutrition (GAM) rate and elevated mean weight-for-height z-score (WHZ).

Overall, the mixed methods data from the USAID Nawiri longitudinal study show that persistent acute malnutrition is not generally caused by differences between households or individuals and is more likely due to differences in basic drivers at the community level (see [Learning Brief on “The State of Malnutrition”](#)). Part of the solution, therefore, lies with upholding existing positive social support systems and in recognizing and supporting the potential of pastoralism as a source of food security, income, and social stability.

From evidence and analysis to a strategy for addressing the basic drivers of malnutrition

To achieve a sustained reduction in persistent acute malnutrition, it is imperative that any approach actively addresses the basic drivers of acute malnutrition. As outlined in this brief, these basic drivers encompass sustainable livelihoods, along with the systems and institutions that exert direct and indirect influence on livelihoods and nutrition, in the context of the drylands climate, environment, and ecology. An understanding of these systems, and of institutions and livelihood dynamics, provides a clearer picture of the trajectory for livelihoods and nutrition. For example, because of the disruption to livestock reproduction linked to the drought and unanticipated return of the rains, livestock breeding was delayed, as was seasonal fresh milk availability. Given the importance of these reproductive cycles, it is widely expected to take more than one rainy season for herds to resume the usual seasonal pattern of births, thus continuing to limit fresh milk consumption of young children.

Beyond merely identifying the pathways and relationships through which these basic drivers worsen nutritional outcomes, the analysis can also shed light on how systems and institutions can play a more effective role in enhancing food security, public health, and maternal and child care.

In addition, a strategy or framework aimed at addressing persistent acute malnutrition should take into account not only the risks and vulnerabilities faced by individuals and households but also the resilience of their community's livelihood systems and institutions. While tackling this complexity may appear daunting, it can be facilitated by empowering stakeholders at all levels, starting from the community level and extending upward, to engage in problem analysis for informed policy and decision making. Only disaggregation of the analysis to the community level will allow community differences to be accounted for, and, where relevant, take account of household- and individual-level differences.

Incorporating stakeholders into the learning, uptake, and decision-making processes is essential for a comprehensive and effective approach. This necessitates making research findings accessible and understandable to stakeholders at all levels and across all interest groups.

A framework for response or strategy needs to consider and combine:

- i. **Learning and uptake** on malnutrition trends, context-specific drivers, and evidence on what works;
- ii. **Improved food and nutrition information systems** that account for the basic drivers of malnutrition and how they play out at community level;
- iii. **Strengthening of systems and institutions** in order to promote good governance and secure sustainable livelihoods;
- iv. **Effective responses to shocks and seasonal stresses** for addressing emergency levels of global acute malnutrition.

In conclusion

Emergency programs need to continue to respond to the extremely high rates of malnutrition in hotspot areas during certain periods. However, achieving sustainable solutions for acute malnutrition requires a more comprehensive strategy. This strategy should aim to rectify systemic shortcomings and recognize and fortify the institutions that bolster the resilience of livelihood systems, social support networks, and essential community-level services. Additionally, this approach should involve ongoing initiatives to tackle socioeconomic and gender disparities, ideally led by stakeholders at the relevant levels.

Addressing basic drivers of acute malnutrition requires working at the administrative level at which each driver operates. For example, systemic failures in essential services cannot be solved at the level of household or local institutions, as this occurs at the county level. Although communities can and do actively mitigate the effects of basic drivers, they are not in a position to radically change the system, except through the ballot box. It is hoped that the findings from this study can be used to influence and inform the policy context and programming environment, strengthen systems and institutions, and empower communities in the decision-making process, all of which are needed to address persistent acute malnutrition in the Kenyan ASALs.

¹ H. Young, “Nutrition in Africa’s Drylands: A Conceptual Framework for Addressing Acute Malnutrition” (Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2020).

² E. Stites, A. Gargule, P. Iyer, and H. Young, “Mobility Matters. The Benefits of Pastoralist Mobility for Nutrition in Marsabit and Isiolo Counties, Kenya,” USAID Nawiri Longitudinal Study Learning Brief No. 2 (USAID Nawiri program, Catholic Relief Services, Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2023).

³ The study used purposeful sampling to select three wards in the first year of the study—Garbatulla and Ngaremara wards in Isiolo County and Laisamis ward in Marsabit County—that were identified as “hotspots” of acute malnutrition and represented a diversity of livelihood sub-systems: agropastoral, peri-urban, and pastoral respectively. Within those three wards, neighboring villages were selected, within which we randomly selected households for the panel study. Thus, throughout the brief we refer to our three research locations as sentinel sites. A fourth ward—Loiyangalani ward in Marsabit County—was added at the end of year 1.

⁴ A. Marshak, A. Ezaki, E. Odundo, J. Munga, A. Gargule, E. Stites, S. Ochola, and H. Young, “WHAT is the state of acute malnutrition in Marsabit and Isiolo Counties and WHO is at risk?” USAID Nawiri Longitudinal Study Learning Brief No. 1 (USAID Nawiri program, Catholic Relief Services, Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2023); A. Marshak, A. Ezaki, E. Odundo, J. Munga, A. Garbule, E. Stites, S. Ochola, and H. Young, “Nawiri Quantitative Longitudinal Study Report (Year 1). Part 2: Factors Associated with Child Acute Malnutrition and Seasonality Analysis” (Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, May 25, 2023).

⁵ I. Birch, “Nawiri Desk Study: Natural Resource Management and Nutrition” (Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2021).

⁶ In year 1, study sites included Laisamis in Marsabit County, and Ngaramara and Garbatulla in Isiolo County.

⁷ Figures and tables are based on year 1 data; hence, they do not include the Loiyangalani study site.

⁸ The Tropical Livestock Unit (TLU) was calculated using the following coefficients based on Jahnke 1982: donkeys 0.5, chicken 0.01, sheep 0.01, goats 0.01, milking and nonmilking cattle 0.7, camels 1. H. Jahnke, “Livestock Production Systems and Livestock Development in Tropical Africa. (Kieler Wissenschaftsverlag Vauk, 1982)

⁹ In Garbatulla, 38% of milking cattle were more than 25 km from the village, and in Ngaremara this figure was 20%, reflecting the differences between sites in herd ownership, species preference, and mobility patterns.

¹⁰ Households need money to pay for basic services (school fees, medicines, domestic water) as well as for their livelihood inputs (water, fodder).

About the USAID Nawiri Longitudinal Study

The USAID Nawiri longitudinal study is a mixed methods research study titled “The Seasonality of Child Acute Malnutrition and its Drivers in Marsabit & Isiolo.” This collaborative study took place in Ngaremara and Garbatulla wards in Isiolo County and Laisamis, and Loiyangalani wards in Marsabit County between September 2021 and September 2023. The quantitative component entailed twelve rounds of data collection (including anthropometric measurements) with a cohort of households with children under five years of age and two annual surveys. The qualitative component consisted of iterative rounds of data collection using participatory approaches in all study sites. The goal of the study was to increase the understanding of the causes of persistent acute malnutrition in the counties through a collaborative learning and research process which 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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