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**EXAMINING THE COMPLEX DYNAMICS INFLUENCING
ACUTE MALNUTRITION IN SAMBURU COUNTY—A
LONGITUDINAL MIXED-METHODS STUDY TO SUPPORT
COMMUNITY-DRIVEN ACTIVITY DESIGN**

WAVE 2 SURVEY REPORT

April 21 2022



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CONTENTS

Executive Summary	1
1. Background	4
2. Methods	4
2.1 Study Design and Methodology.....	4
2.2 Data Collection and Management Procedures	4
2.3 Dependent and Independent Variables	5
2.4 Data Analysis.....	6
2.5 Ethical Considerations	6
3. Results	7
3.1 Response Rate.....	7
3.2 Household and Mother/caregiver Characteristics	7
3.3 Household Experiences with Shocks, Coping Strategies and Economic Safeguards.....	10
3.4 Water, Hygiene and Sanitation	13
3.5 Child Nutritional Status, Feeding Practices and Morbidity, and Mother/Caregiver Food Consumption.....	15
3.6 Mother/Caregiver Decision-Making, Employment and Experience with Domestic Violence.....	21
3.7 Factors Associated with Acute Malnutrition	23
4. Discussion	24
4.1 Implications for Programming/Recommendations	25
4. References	27
Annexes	28
Annex A. Samburu Longitudinal Study Core Team	28
Annex B. Independent Variables Included in Bivariate Analysis	29
Annex C. Household response rate at Wave 2, Samburu.....	30
Annex D. A comparison of the baseline characteristics of participants surveyed at Wave 2 and those lost to follow-up, Samburu	31
Annex E. Prevalence of acute malnutrition among children under 5 years by survey wave and background characteristics, Samburu	33
Annex F. Prevalence of stunting and underweight among children under 5 years by survey wave and background characteristics, Samburu.....	35
Annex G. A comparison of food groups consumed by children 6 months and above by survey wave, Samburu.....	37
Annex H. Multivariable logistic regression analysis of factors associated with acute malnutrition among children at Wave 2 based on MUAC, Samburu County.....	38

List of Tables

Table 1: Percentage distribution of households by demographic and socioeconomic characteristics and by livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	8
Table 2: Percentage distribution of mothers/caregivers by socio-demographic characteristics and livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	9
Table 3: Percentage distribution of households according to experience of shocks by livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	10
Table 4: Percentage distribution of households according to coping strategy by livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	11
Table 5: Percentage distribution of households according to savings, loans and financial support/cash transfer by livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	12
Table 6: Percentage distribution of households according to source of drinking water, time to obtain drinking water, person who usually collects drinking water and treatment of drinking water by livelihood zone at Wave 2 and comparison by survey waves, Samburu	13
Table 7: Percentage distribution of households according to sanitation facilities and handwashing practice by livelihood zone at Wave 2 and comparison by survey waves, Samburu	15
Table 8: Percentage distribution of children according to acute malnutrition (WHZ \leq 2 SD and MUAC \leq 125mm) transition between survey waves by livelihood zone, Samburu.....	17
Table 9: Percentage distribution of children according to Infant and Young Child Feeding Practices by livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	18
Table 10: Percent distribution of caregivers by food consumption and dietary diversity according to livelihood zones at Wave 1 and comparison by wave, Samburu	20
Table 11: Percentage distribution of children according to morbidity and health seeking behavior by livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	20
Table 12: Percentage distribution of caregivers according to participation in decision making by livelihood zone at Wave 2 and comparison by survey wave, Samburu.....	21
Table 13: Percentage distribution of caregivers who were currently married or living with a man according to employment by livelihood zones at Wave 2, Samburu	22
Table 14: Percentage distribution of currently married caregivers by experience of domestic violence in the past 4 months by livelihood zone at Wave 2, Samburu	23
Table 15: Multivariable logistic regression analysis of factors associated with acute malnutrition among children at Wave 2 based on WHZ, Samburu	23

Table A-1: Samburu County Longitudinal Study Core Team	28
Table C-1: Household Response Rate (Wave 2)	30
Table E-1: Prevalence of Acute Malnutrition Among Children Under 5 Years.....	33
Table F-1: Prevalence of Stunting and Underweight Children Under 5.....	35
Table H-1: Multivariable Regression Analysis Associated with Acute Malnutrition	38

List of Figures

Figure 1: Prevalence of acute malnutrition (WHZ < -2SD) among children by livelihood zone and survey wave, Samburu.....	16
Figure 2: Prevalence of acute malnutrition (MUAC <= 125mm) among children by livelihood zone and survey wave, Samburu.....	17
Figure G-1: Comparison of Food Groups Consumed by Children 6 months and Older	37

Acronyms and Abbreviations

AMREF-ESRC	AMREF Ethical and Scientific Review Committee
aOR	Adjusted Odds Ratio
APHRC	African Population and Health Research Center
BMI	Body Mass Index
CI	Confidence Interval
rCSI	Reduced Coping Strategy Index
EFF	Egg and/or Flesh Food
GAM	Global Acute Malnutrition
HAZ	Height-for-Age z-Score
HWISE	Household Water Insecurity Experiences (scale)
MAD	Minimum Acceptable Diet
MDD	Minimum Dietary Diversity
MDD-W	Minimum Dietary Diversity for Women
MMF	Minimum Meal Frequency
MMFF	Minimum Milk Feeding Frequency
MUAC	Mid-Upper Arm Circumference
PAM	Persistent Acute Malnutrition
PPI	Probability Poverty Index
RTI	International (registered trademark and trade name of Research Triangle Institute)
SD	Standard Deviation
SwB	Sweet Beverage
UFC	Unhealthy Food
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
WAZ	Weight-for-Age z-Score
WHO	World Health Organization
WHZ	Weight-for-Height z-Score
ZVF	Zero Vegetable or Fruit

EXECUTIVE SUMMARY

This report summarizes the results from survey data collected during Wave 2 of a 24-month longitudinal, mixed-methods observational cohort study of children less than 3 years old at baseline and their mothers or caregivers, in Samburu County, Kenya. The longitudinal study, part of the USAID Nawiri research agenda, aims to generate evidence for the development of overarching solutions as well as micro-solutions for sustainably reducing global acute malnutrition (GAM). Its two main objectives are to:

- Understand and map how a variety of immediate, underlying, and basic/systemic drivers interact to influence GAM over time, geography, and livelihood zones among infants and young children; and
- Identify and prioritize opportunities and barriers to achieve sustained reductions in GAM.

Study design and analysis

The study sample was population-based, with stratification by sub-counties. Stratification of findings by livelihood zones was done through post-analysis stratification. The Wave 2 survey included 556 households out of 594 households enrolled in Wave 1, representing a response rate of 94%. The longitudinal study is collecting data every 4 months over a 2-year period for a total of 6 waves across seasons. Wave 1 data collection was carried out from June 14 to July 31, 2021, during a continental rainy season, and Wave 2 data collection was carried out from November 15 to December 3, 2021, during a drought. Wave 2 anthropometric data were collected from one sampled child per household and the primary caregiver of the child in the sampled household. We summarized data using descriptive statistics by livelihood zone and county level overall and used chi-squared tests to compare key findings at Waves 1 and 2. Logistic regression was used to assess factors associated with acute malnutrition at Wave 2.

Results

Household water and food security, experiences with shocks, coping strategies and economic safeguards

There was no statistically significant change in the percentage of households experiencing water and food insecurity between Wave 1 and Wave 2.

Experience of household shock in the past 4 months was almost universal and statistically significantly increased between survey Waves 1 and 2 (93.8% to 99.9%). Economic shocks and climatic shocks were the most frequently experienced shocks, with both statistically significantly increasing between Wave 1 and Wave 2. Reducing food consumption by adults, obtaining food on credit, and reducing non-essential expenses were the most common methods of coping with shocks, with the latter two statistically significantly increasing between survey Waves 1 and 2 (62.1% to 80.9% and 67.1% to 79.3%, respectively). The proportion of households with a member who regularly saves cash statistically significantly declined between survey Waves 1 and 2 (34.9% to 23.5%). There was no statistically significant change in the percentage of households taking a loan or receiving any financial support between Wave 1 and Wave 2.

Water, sanitation, and hygiene

There was no statistically significant change in source of drinking water, time to obtain drinking water, and appropriate treatment of drinking water between survey Waves 1 and 2. The percentage of households with an improved toilet facility statistically significantly increased (12.5% to 22.7%). A majority of households did not practice handwashing with soap, with no statistically significant change between survey Waves 1 and 2 (81.6% to 83.7%).

Child nutritional status, feeding practices, and morbidity, and mother/caregiver food consumption

The prevalence of acute malnutrition between Wave 1 and Wave 2 slightly declined when measured by weight-for-height z-score (WHZ) (19.3% to 15.8%) but slightly increased when measured by mid-upper arm circumference (MUAC) (8.4% to 11.9%), although these changes were not statistically significant. There was a consistent reduction in acute malnutrition prevalence based on either WHZ or MUAC in the urban/peri-urban zone.

The percentage of children with acute malnutrition at both survey waves was 9.4% based on WHZ and 5.9% based on MUAC. Overall, 6.6% of children who were free from acute malnutrition at Wave 1 became acutely malnourished at Wave 2 based on WHZ, and 4.7% based on MUAC. Most children (72.1 % based on WHZ and 86.7% based on MUAC) were not acutely malnourished during either survey.

Complementary feeding indicators were generally poor at Wave 1 and deteriorated at Wave 2. There was a significant decrease in minimum meal frequency (30.0% to 16.6%), minimum dietary diversity (6.1% to 1.3%), and minimum acceptable diet (2.2% to 0.1%). The percentage of children who consumed no vegetables or fruits increased (95.9% to 98.5%), but consumption of unhealthy foods decreased (11.8% to 5.0%). Consumption of sweet beverages (sodas, juices, other liquids with added sweeteners) remained high and unchanged between survey Waves 1 and 2 (73.7% to 75.1%).

The prevalence of child morbidity (cough, fever or diarrhea) in the previous 2 weeks statistically significantly increased from 62.6% at survey Wave 1 to 71.5% at survey Wave 2.

Mother's/caregiver's food consumption was generally poor and deteriorated between survey Wave 1 and Wave 2. There was a statistically significant decrease in the percentage of mothers/caregivers who had minimum dietary diversity (5.7% to 2.4%) and the mean number of food groups consumed in the past 24 hours (2.5 to 1.9) between survey waves. Regarding individual food groups, there was a statistically significant reduction in consumption of dairy products (59.2% to 19.9%), dark green leafy vegetables (12.3% to 7.5%), and eggs (4.5% to 1.6%) between survey Waves 1 and 2.

Mother/caregiver decision-making, employment, and experience with domestic violence

The proportion of women involved in making decisions in all six key areas assessed did not change between survey Waves 1 and 2, but varied by livelihood zone, with the highest percentage in the urban/peri-urban zone (86.1%) and lowest in the pastoral zone (27.3%).

Slightly more than a third of caregivers were formally or casually employed in the past 4 months, with this indicator being highest among agro-pastoralists (75.6%) and lowest among pastoralists (29.6%). The type of employment varied by livelihood zone with formal

employment/casual labor dominating among urban/peri-urban dwellers and petty trading dominating among pastoralists and agro-pastoralists.

Forty-five percent of married caregivers reported having experienced some form of domestic violence in the past 4 months, with the highest percentage recorded among the agro-pastoralists (50.8%). Emotional violence (31.8%) and physical violence (30.0%) were the most common types of violence reported.

Factors associated with acute malnutrition

When assessed using WHZ, the odds of acute malnutrition among children in the non-pastoral zones (urban/peri-urban and agro-pastoral) were lower compared to those in the pastoral livelihood zone (adjusted odds ratio [aOR]=0.24, 95% confidence interval [CI] 0.06 – 0.86). Moreover, the odds of acute malnutrition increased with increasing child's age, being highest among children aged 2 years and above compared to those aged 6–11 months (aOR= 11.67, 95% CI 3.24 – 41.86). When assessed using MUAC, only mother's nutritional status was significantly associated with acute malnutrition. The odds of acute malnutrition were 4 times higher in children whose mothers were underweight compared to those whose mothers had a normal weight (aOR=4.10, 95% CI 1.13 – 14.87).

Conclusions

Between survey Waves 1 and 2 conducted over a 5–6-month interval in Samburu County, experience of household shocks was almost universal and statistically significantly increased. There was a statistically significant decrease in regular saving and an increase in the use of an improved toilet facility. The prevalence of acute malnutrition in children did not statistically significantly change. Complementary feeding remained poor, with statistically significant reductions in minimum meal frequency, minimum dietary diversity, and minimum acceptable diet. Child morbidity increased while mother's/caregiver's food consumption remained poor, with significant reductions in the minimum dietary diversity and the mean number of food groups consumed.

1. BACKGROUND

The causal pathways leading to GAM in Samburu are complex and interlinked. An in-depth assessment and analysis are needed to fully understand the contextual, seasonal, and shock-specific factors associated with acute malnutrition. Although cross-sectional research has been conducted in Samburu on GAM and the immediate and underlying factors associated with undernutrition, virtually no evidence exists on how these factors vary over time, within households, and by the synergistic effects of increasingly frequent and severe climate-related and other shocks.

The longitudinal study aims to discern evidence-based insights for developing overarching solutions as well as micro-solutions for sustainably reducing GAM. Its two main objectives are to:

- Understand and map how a variety of immediate, underlying, basic, and systemic drivers interact to influence GAM over time among infants and young children living in different livelihood zones; and
- Identify and prioritize opportunities and barriers to achieve sustained reductions in GAM.

2. METHODS

2.1 STUDY DESIGN AND METHODOLOGY

This study uses a 24-month longitudinal mixed-methods observational design. Households with target populations were recruited and are being followed every 4 months for a total of six waves of data collection. Details of the sampling methodology, calculation of sample sizes, and sampling strategy are included in the Baseline Report and only briefly summarized here.

The surveys included mothers or caregivers and their children from households with children less than 3 years of age at baseline (Wave 1) and who were 4 months older at Wave 2. Anthropometric measurements (weight, height and MUAC) were taken from the sampled children.

At baseline, a representative sample of children less than 3 years and their mothers or caregivers was obtained using a multistage sampling approach, with survey zones as units of stratification. USAID Nawiri designated three survey zones in Samburu (Central, North, and East) that included all the livelihood zones (pastoral, agro-pastoral, and urban/peri-urban). The livelihood survey zones were delineated to generate evidence on the unique vulnerabilities of communities pursuing different livelihood strategies.

2.2 DATA COLLECTION AND MANAGEMENT PROCEDURES

Wave 2 data collection was conducted by 21 experienced women (11) and men (10) who were fieldworkers from the local communities recruited to collect data during Wave 1. A 2-day refresher training on data collection processes was conducted from November 11 to 12, 2021, in Maralal. Fieldworkers used SurveyCTO to collect the data. Data were uploaded from the tablets onto a secure African Population and Health Research Center (APHRC) server after each day of data collection. Besides refresher training, other data quality control

measures included regular spot checks and interview sit-ins by supervisors, data review by field coordinators, and post-survey data cleaning.

2.3 DEPENDENT AND INDEPENDENT VARIABLES

Anthropometric measurements and infant and young child feeding practices

The primary dependent variable was GAM (WHZ < -2 standard deviations [SD] or MUAC < 125 mm). The secondary dependent variables were stunting (height-for-age z-score [HAZ] < -2 SD) and underweight (weight-for-age z-score [WAZ] < -2 SD). The World Health Organization (WHO) Child Growth Standards [1] were used to calculate both the primary and secondary dependent variables from the anthropometric measurements and child age and sex. To classify a child as acutely malnourished using MUAC, a cutoff of less than 125 mm was used.

The height and weight of mothers and caregivers were measured and used to compute body mass index (BMI). The BMI was computed by dividing weight (in kg) by height in meters squared and categorized into underweight (BMI < 18.5 kg/m²), normal weight (BMI = 18.5–24.99 kg/m²), overweight (BMI = 25–29.99 kg/m²), and obese (BMI > 30 kg/m²).

Underweight for pregnant women was assessed using MUAC with a cutoff value of 21 cm, and short stature was assessed using the cutoff value of 145 cm recommended by the WHO [2].

Infant and young child feeding practices were assessed using indicators from WHO and UNICEF [3]. Women's minimum dietary diversity (MDD-W) was determined using a cutoff value of 5 out of the 10 food groups recommended by the Women's Dietary Diversity Project Study Group [4].

Coping strategy index, wealth index, poverty likelihood, and household water insecurity

The reduced coping strategy index (rCSI) was calculated using a set of behaviors with a universal set of severity weightings for each behavior [5]. The five standard coping strategies and their severity weightings used in rCSI calculation included eating less-preferred foods (1.0), borrowing food/money from friends and relatives (2.0), limiting portions at mealtime (1.0), limiting adult food intake (3.0), and reducing the number of meals per day (1.0).

Household wealth index was created using principal component analysis based on ownership of assets; house wall, floor and roof materials; and light source. The index was then used to rank households into wealth tertiles.

Household poverty likelihood (the probability that the household is poor) was calculated based on household responses to 10 poverty probability index (PPI) questions [6]. A PPI score was obtained by adding up the points allotted to the responses given by the household. This was then converted to a poverty likelihood by referring to published tables for the 2015 Kenya PPI [7].

Household water insecurity was measured using the Household Water Insecurity Experiences (HWISE) Scale, which consists of 12 items each with four response categories [8]. The total score, which is obtained by summing up scores to the 12 questions, can range from 0–36 and a household with a score of ≥ 12 is classified as water insecure.

2.4 DATA ANALYSIS

Data were summarized using descriptive statistics (percentages) according to livelihood zone. The overall proportions at Wave 1 and Wave 2 were compared using chi-squared tests. We used logistic regression models to assess factors associated with acute malnutrition at Wave 2. This involved conducting bivariate analysis to assess factors associated with acute malnutrition. A full list of independent (predictor) variables included in bivariate analysis is shown in **Annex 2**. Variables with a p -value < 0.2 in bivariate analysis were then included in multivariable analysis and mutually adjusted for each other. All analyses were performed in Stata 17 and accounted for the complex survey design and sampling weights.

2.5 ETHICAL CONSIDERATIONS

Ethical and research approvals and research permits were obtained from the AMREF Ethical and Scientific Review Committee (AMREF-ESRC P905/2020) and the National Commission for Science, Technology, and Innovation of Kenya, respectively. A reliance agreement was signed between the institutional review boards at APHRC and RTI. Informed consent was obtained from all participants during Wave 1 and reconfirmed at Wave 2.

3. RESULTS

3.1 RESPONSE RATE

Household response rate by survey zone is summarized in **Annex 3**. Of the 594 households sampled at baseline, 556 were surveyed at Wave 2. Thus, the response rate was 94%. The main reason for non-response was absence/out migration of the household. Those surveyed and those lost to follow-up were similar based on most baseline characteristics (**Annex 4**). However, households headed by men were over-represented among those lost to follow-up than among those surveyed at Wave 2. In addition, households lost to follow-up tended to have younger caregivers (<25 years), non-pregnant caregivers, male children, and children <12 months.

3.2 HOUSEHOLD AND MOTHER/CAREGIVER CHARACTERISTICS

There was no statistically significant change in the household head's occupation, main source of income, household reduced coping strategy index, household food insecurity, and household water insecurity between survey Waves 1 and 2 (**Table 1**). However, there was a statistically significant increase in the mean household poverty likelihood from 53.7% to 67.7%. The mean poverty likelihood was lowest in the agro-pastoral livelihood zone (52.1%) and highest in the pastoral zone (70.4%).

Table 1: Percentage distribution of households by demographic and socioeconomic characteristics and by livelihood zone at Wave 2 and comparison by survey wave, Samburu

Characteristic	Livelihood zone			Wave 1	Wave 2	P-value
	Pastoral	Agro-pastoral	Urban / peri-urban			
Household head occupation						
Livestock herding	79.1	60.9	0.1	61.6	67.5	0.051
Employed/wage labor	11.6	29.8	92.0	17.0	23.4	
Petty trade/merchant	7.2	3.2	3.5	12.3	6.5	
Self-employment	0.7	0.9	4.2	3.5	1.2	
Crop farming/own farm labor	0.4	2.2	0.0	0.7	0.5	
Unemployed	1.0	3.0	0.3	4.9	1.0	
Main source of income for the household in the last 4 months						
Sale of livestock/crops	76.9	34.8	0.0	63.9	64.2	0.059
Casual/permanent employment	11.1	30.2	90.4	15.9	22.8	
Petty/merchant trade	8.3	8.5	1.3	17.0	7.4	
No Income/remittance/gift	3.7	26.5	8.3	3.2	5.6	
Household coping strategy index						
Low/medium coping	9.7	16.0	16.0	10.1	10.9	0.635
High coping	90.3	84.0	84.0	89.9	89.1	
Household's poverty likelihood ²	70.4	52.1	54.3	53.7	67.7	<0.001
Household food insecurity						
Mild/moderate	6.6	12.6	8.3	9.3	7.2	0.219
Severe	93.4	87.4	91.7	90.7	92.8	
Household water insecurity experience						
No	33.5	53.3	79.7	28.6	40.8	0.106
Yes	66.5	46.7	20.3	71.4	59.2	
Number of all households	359	136	61	594	556	

¹ e.g. Boda boda, welding, carpentry etc.

² Average of households' poverty likelihoods based on national poverty line referenced from the Kenya Poverty Probability Index 2015. The P-value is a test for means.

There was no statistically significant change in marriage arrangement, pregnancy status, alcohol consumption, smoking/use of tobacco, and land ownership between the survey waves (Table 2). As expected, mother's age increased between Wave 1 and Wave 2. The percentage

of caregivers who alone owned a house/dwelling unit statistically significantly increased (34.3% to 57.6%) while that of those who jointly owned a house/dwelling declined (56.0% to 31.1%) between the survey waves.

Table 2: Percentage distribution of mothers/caregivers by socio-demographic characteristics and livelihood zone at Wave 2 and comparison by survey wave, Samburu

Characteristic	Livelihood zone			Wave 1	Overall Wave 2	P-value
	Pastoral	Agro-pastoral	Urban/peri-urban			
Age (years)						
<25	35.4	44.5	44.1	39.5	37.1	0.001
25-34	44.7	46.6	42.4	46.0	44.5	
35+	19.9	9	13.5	14.5	18.4	
Polygamy marriage						
No	64.3	71.5	84.4	67.0	67.4	0.839
Yes	35.7	28.5	15.6	33.0	32.6	
Currently pregnant						
No	91	96.7	94.1	93.0	91.8	0.449
Yes	9	3.3	5.9	7.0	8.2	
Current alcohol consumer						
No	98.1	100	100	97.4	98.4	0.444
Yes	1.9	0	0	2.6	1.6	
Currently smoking/using tobacco						
No	70.5	71.8	92.5	70.0	73.5	0.394
Yes	29.5	28.2	7.5	30.0	26.5	
Number of all caregivers	359	136	61	594	556	
House/dwelling ownership						
Alone only	59.8	54.3	42.9	34.3	57.6	<0.001
Jointly only	33.4	44.5	7.3	56.0	31.1	
Does not own	6.8	1.2	49.7	9.7	11.3	
Land ownership						
Alone only	2.8	17	4	5.9	3.6	0.095
Jointly only	8	31.9	2.1	14.3	8.6	
Does not own	89.1	51.1	93.9	79.8	87.8	
Number of caregivers currently/formally	314	121	42	510	477	

Characteristic	Livelihood zone			Wave 1	Wave 2	P-value
	Pastoral	Agro-pastoral	Urban/peri-urban			

married or living with a man¹

¹Denominator for house/dwelling ownership and land ownership

3.3 HOUSEHOLD EXPERIENCES WITH SHOCKS, COPING STRATEGIES, AND ECONOMIC SAFEGUARDS

Virtually all households experienced some type of shock across all livelihood zones (Table 3). Overall, the percentage of households that experienced some shock statistically significantly increased from 93.8% at Wave 1 to 99.9% at Wave 2. Economic and climatic shocks were the most common types of shock experienced, with households that experienced these shocks statistically significantly increasing between survey waves (78.3% to 98.9% and 81.8% to 96.0%, respectively).

Table 3: Percentage distribution of households according to experience of shocks by livelihood zone at Wave 2 and comparison by survey wave, Samburu

Variable	Livelihood zone			Wave 1	Wave 2	P-value
	Pastoral	Agro-pastoral	Urban/peri-urban			
Household experienced some shock	100	99.7	99.7	93.8	99.9	<0.001
Type of shock						
Economic shock	98.7	99.7	99.5	78.3	98.9	<0.001
Climatic shock	98.2	66.0	96.1	81.8	96.0	<0.001
Biological shock	72.4	54.1	9.7	57.3	63.0	0.453
Conflict shock	35.2	35.5	6.4	36.1	31.4	0.467
Number of households	359	136	61	594	556	

Climatic shocks include excessive rains/flooding and variable rain/drought.

Biological shocks include livestock/crop/human disease outbreak, crop pest invasion, weed outbreak, and severe illness.

Conflict shocks include theft/destruction of assets, theft of livestock, domestic violence and community conflicts.

Economic shocks include loss of livelihood, increased/decreased prices in food/agricultural/livestock inputs, loss of land/rental property (evictions/demolitions), unemployment for youths, loss/death of household member, delay in food assistance, delay in other safety net programs and fire.

The most common shock coping strategy at Wave 2 was obtaining food on credit from a local merchant (Table 4). This was highest among agro-pastoralists (91.9%) and lowest among urban/peri-urban dwellers (67.2%). Overall, the percentage of households that practiced this strategy statistically significantly increased from 62.1% at Wave 1 to 80.9% at Wave 2. There was also a significant increase in the percentage of households that coped with shocks by reducing non-essential household expenses (67.1% to 79.3%) and receiving emergency food/cash (4.8% to 18.1%) but a significant decrease in households that coped by

slaughtering livestock (60.0% to 30.7%), sending children/adult to stay with relatives (12.0% to 3.2%), and using own savings (14.4% to 2.8%).

Table 4: Percentage distribution of households according to coping strategy by livelihood zone at Wave 2 and comparison by survey wave, Samburu

Coping strategy	Livelihood zone			Overall		P-value
	Pastoral	Agro-pastoral	Urban/peri-urban	Wave 1	Wave 2	
Got food on credit from a local merchant	82.4	91.9	67.2	62.1	80.9	<0.001
Reduced food consumption	80.2	90.3	69.6	77.0	79.4	0.586
Reduced non-essential household expenses	80.8	89.1	65.7	67.1	79.3	0.013
Sold livestock	83.9	53.3	6.6	78.7	71.8	0.191
Sent livestock in search of pasture	81.6	25.5	3.0	69.8	67.7	0.709
Took loan	58.9	32.0	10.0	37.0	50.7	0.065
Engaged in spiritual efforts (e.g., prayed, sacrifices, etc.)	45.8	41.9	10.1	31.7	40.8	0.204
Slaughtered livestock	36.6	13.5	2.6	60.0	30.7	<0.001
Received emergency food/cash	21.4	3.9	4.5	4.8	18.1	<0.001
Sent children/adult to stay with relatives	3.6	2.3	0.9	12.0	3.2	0.005
Used own savings	2.3	13.5	1.1	14.4	2.8	<0.001
Number of households	359	136	61	594	556	

The percentage of households with a member who regularly saves was lowest in the urban/peri-urban zone (7.0%) and highest in the agro-pastoral zone (38.8%) (Table 5). Overall, this indicator decreased statistically significantly from 34.9% at Wave 1 to 23.5% at Wave 2. There was no statistically significant change in the percentage of households that took a loan or received financial support between survey Waves 1 and 2. There was also no statistically significant change in place of holding savings and the primary decision-maker on use of savings. The most common source of loan was friends/family, although this significantly declined from 90.1% at Wave 1 to 76.8% at Wave 2. The main reason for borrowing was to purchase food, with no significant increase between Waves 1 and 2 (84.3% to 86.4%). Very few households received some financial support (3.0% at Wave 1 and 3.6% at Wave 2).

Table 5: Percentage distribution of households according to savings, loans, and financial support/cash transfer by livelihood zone at Wave 2 and comparison by survey wave, Samburu

Characteristic	Livelihood zone			Wave 1	Overall Wave 2	P-value
	Pastoral	Agro-pastoral	Urban/peri-urban			
Household members regularly saves cash	25.1	38.8	7.0	34.9	23.5	0.013
Took/borrowed a loan in the last 4 months	60.4	42.5	25.6	48.5	54.7	0.356
Received any financial support, i.e., cash transfer, in the last 4 months	4.3	1.8	0.3	3.0	3.6	0.746
Number of households	359	136	61	594	556	
Where savings are primarily held						
At home	72.3	61.3	35.6	64.3	69.7	0.400
Mobile phone banking	16.7	17.6	44.9	26.1	17.9	
Sacco/cooperative/village savings group	8.8	17.7	17.6	5.3	10.0	
Bank	2.2	3.4	1.8	4.3	2.3	
Who primarily decides how savings are used						
Self	46.0	74.0	73.7	49.6	49.9	0.233
Partner/spouse	16.7	12.1	4.9	29.0	15.8	
Jointly & other household members	37.3	13.9	21.4	21.4	34.3	
Number of households	75	49	15	191	139	
Sources of loan						
Friends/family	74.9	84.8	97.9	90.1	76.8	0.019
Cooperative/ <i>Chama</i>	8.1	10.5	1.2	4.8	7.8	
Bank/mobile loans	2.6	0.9	0.0	1.5	2.3	
Other(s) ¹	14.4	3.8	0.8	3.6	13.1	
Reason for borrowing						
Purchase food	86.2	84.4	89.7	84.3	86.4	0.677
Health care expenses	18.3	24.9	0.5	17.5	17.5	0.996
Purchase household items	11.8	3.8	0.0	1.3	10.7	<0.001
Personal needs	4.8	2.0	0.5	13.8	4.4	0.006
School fees	4.0	8.8	0.7	2.2	4.0	0.298
Purchase of livestock	3.6	2.7	0.0	7.3	3.4	0.287

Characteristic	Livelihood zone			Wave 1	Overall Wave 2	P-value
	Pastoral	Agro-pastoral	Urban/peri-urban			
Invest in business	2.1	2.3	8.8	2.0	2.5	0.774
Purchase farm inputs	0.7	4.4	0.5	0.2	0.9	0.013
Number of households	175	55	12	293	242	
Source of cash transfer						
Non-governmental organizations	79.9	69.7	0.0	10.6	78.8	<0.001
Government programs (elderly, orphans and vulnerable children)	15.8	30.3	40.8	52.0	16.5	0.131
County government	2.9	0.0	0.0	1.6	2.8	0.696
Remittance/gift	1.3	0.0	59.2	38.8	1.8	<0.001
Mode of transfer used for the financial support						
Mobile network	79.1	52.9	59.2	17.1	78.1	0.006
Cash	15.4	47.1	0.0	30.3	16.2	
Bank	3.6	0.0	40.8	49.9	3.8	
Vouchers	1.9	0.0	0.0	0.0	1.9	
Number of households	20	4	2	29	26	

¹Other sources of loan include relatives, traders, friends etc.

3.4 WATER, HYGIENE, AND SANITATION

There was no statistically significant change in source of drinking water, time to obtain drinking water, the person who fetches drinking water, and appropriate treatment of drinking water between survey Waves 1 and 2 (**Table 6**). The percentage of households that used some chemical to treat drinking water was low despite statistically significantly increasing between survey Waves 1 and 2 (0.9% to 4.2%). There was a significant decrease in the percentage of households that stored drinking water safely (8.0% to 1.8%).

Table 6: Percentage distribution of households according to source of drinking water, time to obtain drinking water, person who usually collects drinking water, and treatment of drinking water by livelihood zone at Wave 2 and comparison by survey waves, Samburu

Characteristic	Livelihood zone			Wave 1	Overall Wave 2	P-value
	Pastoral	Agro-pastoral	Urban / peri-urban			
Source of drinking water						
Piped/tapped	28.0	1.6	7.1	24.4	23.7	0.954
Tube well/borehole	7.7	30.1	15.8	8.6	10.1	

Characteristic	Livelihood zone			Wave 1	Overall Wave 2	P-value
	Pastoral	Agro-pastoral	Urban / peri-urban			
Protected dug well/spring	6.3	0.6	0.0	5.1	5.2	
Unprotected dug well/spring	26.0	4.0	5.3	24.8	21.9	
Tanker/shop	1.1	26.4	20.2	5.7	5.2	
Surface water	30.8	37.3	51.6	31.4	34.0	
Time to obtain drinking water (round trip)						
< 15 min (500 m)	17.9	41.5	78.0	33.4	27.3	0.072
15 min to 1 hr (500 m to 2 km)	49.0	50.6	5.8	36.7	43.5	
1 to 2 hrs (>2 km)	33.1	7.9	16.2	26.4	29.3	
Person who usually collects drinking water						
Women/girls	99.4	100.0	100.0	97.5	99.5	0.076
Men/boys	0.6	0.0	0.0	2.5	0.5	
Number¹	328	135	49	552	512	
Water treatment prior to drinking						
Boil	1.7	3.5	0.8	1.1	1.7	0.518
Water Guard/Aqua tabs/other chemical (chlorine)	1.9	5.0	18.0	0.9	4.2	0.004
Use water filter (ceramic, sand, composite)	0.0	0.3	0.1	1.6	0.0	n/a
Households that did not treat water	96.9	91.5	80.7	96.6	94.4	0.300
Using an appropriate treatment method²	1.9	5.0	18.0	3.2	4.2	0.638
Water storage						
Safe	1.0	16.0	0.6	8.0	1.8	<0.001
Unsafe	99.0	84.0	99.4	92.0	98.2	
Number	359	136	61	594	556	

¹ Denominator for 'Time to obtain drinking water' and 'Person who usually collects drinking water'

² Appropriate water treatment methods include boiling, bleaching/adding chlorine, filtering/straining, and solar disinfecting.

The percentage of households with an improved toilet facility was highest in the urban/peri-urban zone (70.8%) and lowest in the pastoral zone (13.0%), and statistically significantly increased from 12.5% at Wave 1 to 22.7% at Wave 2 (**Table 7**). A majority of households did not practice handwashing with soap, with no statistically significant change between survey waves (81.6% to 83.7%). There was a statistically significant increase in the percentage of households that reported washing hands (with or without soap) before preparing food (76.6% to 84.0%) and a statistically significant decrease in washing hands before eating (88.3% to 77.6%).

Table 7: Percentage distribution of households according to sanitation facilities and handwashing practice by livelihood zone at Wave 2 and comparison by survey waves, Samburu

Characteristic	Pastoral	Agro-pastoral	Urban/peri-urban	Wave 1	Wave 2	P-value
Type of toilet facility						
Improved facility ¹	13.0	46.7	70.8	12.5	22.7	0.001
Non-improved facility ²	87.0	53.3	29.2	87.5	77.3	
Household practicing handwashing	92.1	98.8	93.7	94.4	92.7	0.544
Household using soap for handwashing	85.0	92.8	71.5	81.6	83.7	0.680
Handwashing event						
Before preparing food	85.5	78.7	77.6	76.6	84.0	0.041
Before eating	76.7	86.5	78.4	88.3	77.6	0.015
After handling child's waste	58.7	50.0	46.3	56.9	56.6	0.947
After visiting toilet	44.6	57.9	73.0	55.6	49.2	0.314
Before feeding a child	40.7	66.0	16.8	41.9	39.0	0.563
Number	359	136	61	594	556	

¹ Improve toilet facility includes flush, traditional pit, VIP toilet

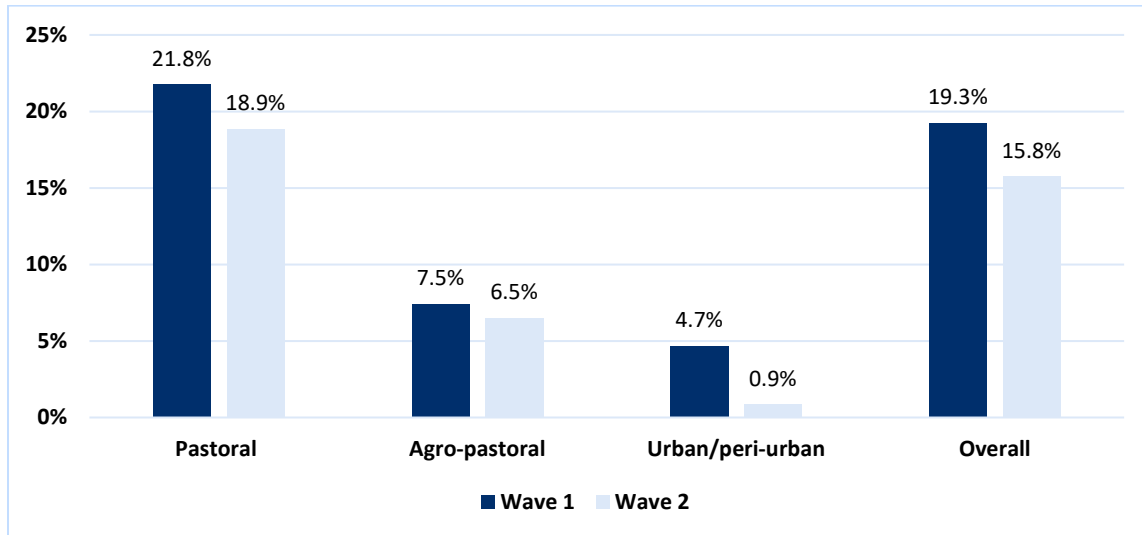
² Non-improved facility includes no facility, bush, field, and flying toilet

3.5 CHILD NUTRITIONAL STATUS, FEEDING PRACTICES, AND MORBIDITY, AND MOTHER/CAREGIVER FOOD CONSUMPTION

Overall no statistically significant difference in acute malnutrition (measured by WHZ) was observed between Waves 1 and 2. However, when disaggregated by livelihood zone and other child and household characteristic, significant changes were observed (**Figure 1** and **Annex 5**). A statistically significant reduction was observed by livelihood zone, with the greatest reduction occurring in the peri-urban zone (4.7% to 0.9%). Statistically significant changes between survey Waves 1 and 2 were also observed when data were stratified by child's sex, caregiver's education, caregiver's nutritional status, household wealth index, household use of toilet facility, and household water insecurity (**Annex 5**). Overall, GAM

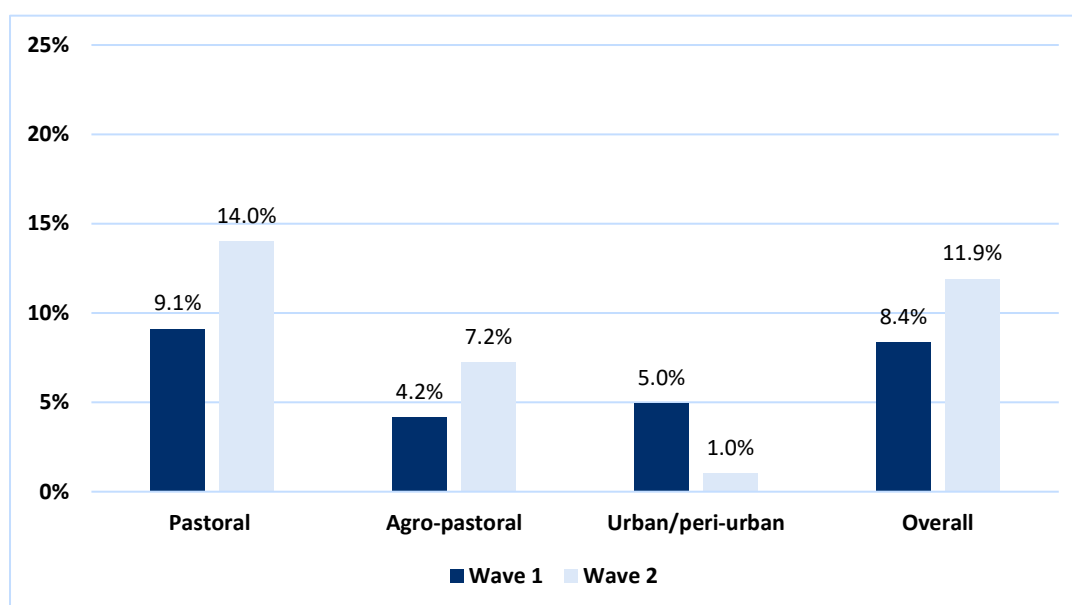
declined among children of non-pregnant caregivers, in households belonging to the lowest and middle wealth tertiles or using an appropriate toilet facility. GAM also declined among both boys and girls. GAM prevalence remained highest among pastoralists and continued to be above the emergency threshold in this livelihood zone at Wave 2.

Figure 1: Prevalence of acute malnutrition (WHZ < -2SD) among children by livelihood zone and survey wave, Samburu



When measured by MUAC, there was a non-significant increase in the prevalence of GAM from 8.4% at Wave 1 to 11.9% at Wave 2 (**Figure 2**). When data were stratified by livelihood zone, an increase was observed in pastoral and agro-pastoral livelihood zones but a decline was observed in the urban/peri-urban zone. Overall, there were significant changes in GAM prevalence between survey waves when data were stratified by all background characteristics examined (**Annex 5**).

Figure 2: Prevalence of acute malnutrition (MUAC \leq 125mm) among children by livelihood zone and survey wave, Samburu



The percentage of children with acute malnutrition at Waves 1 and 2 was 9.4% based on WHZ and 5.9% based on MUAC (Table 8). Based on WHZ score, 6.6% of those without acute malnutrition (WHZ > -2SD and MUAC > 125mm) at Wave 1 transitioned to acute malnutrition (WHZ < -2SD and MUAC \leq 125mm) at Wave 2, as did 4.7% based on MUAC, while 11.9% transitioned from acute malnutrition to without acute malnutrition based on WHZ and 2.7% based on MUAC. Overall, the percentage of children who were free from acute malnutrition across the two surveys was 72.1% based on WHZ and 86.7% based on MUAC. Statistically significant variations were noted across livelihood zones when GAM was based on WHZ but not MUAC.

Table 8: Percentage distribution of children according to acute malnutrition (WHZ \leq 2 SD and MUAC \leq 125mm) transition between survey waves by livelihood zone, Samburu

GAM status	Livelihood zone			Overall	P-value
	Pastoral	Agro-pastoral	Urban/peri-urban		
WHZ					
No GAM in either wave	68.2	89.5	94.2	72.1	0.006
No GAM in Wave 1, GAM in Wave 2	7.5	4.5	0.9	6.6	
GAM in Wave 1, no GAM in Wave 2	13.4	1.8	4.7	11.9	
GAM in both waves	10.8	4.2	0.1	9.4	
Number of children	326	101	76	503	

MUAC

GAM status	Livelihood zone			Overall	P-value
	Pastoral	Agro-pastoral	Urban/peri-urban		
No GAM in either wave	85.2	93.7	93.7	86.7	0.146
No GAM in Wave 1, GAM in Wave 2	5.5	2.0	0.9	4.7	
GAM in wave 1, no GAM in Wave 2	2.4	0.4	5.2	2.7	
GAM in both waves	6.9	3.9	0.2	5.9	
Number of children	263	96	78	437	

The prevalence of stunting and underweight among children by survey wave and background characteristics is shown in **Annex 6**. Overall, stunting prevalence increased from 23.9% to 35.6% while underweight prevalence increased from 30.0% to 35.9% between survey Waves 1 and 2. The percentage of children aged 12–23 months who continued to breastfeed was lowest in the agro-pastoral zone (37.4%) and highest in the urban/peri-urban zone (86.9%) (**Table 9**). Overall, this indicator did not change between survey waves. An assessment of complementary feeding among children aged 6 months and above showed a statistically significant decrease in the percentage of children with minimum dietary diversity (6.1% to 1.3%), minimum meal frequency (MMF) (30.0% to 16.6%), and minimum acceptable diet (2.2% to 0.1%) between survey Waves 1 and 2. MMF varied by livelihood zone, ranging from 13.1% in the urban/peri-urban zone to 55.6% in the agro-pastoral zone. Consumption of zero vegetables or fruits was very common and statistically significantly increased between survey waves (95.9% to 98.5%). Consumption of sweet beverages was also common but did not change by survey wave (73.7% to 75.1%). There was a significant reduction in the consumption of unhealthy food from 11.8% at Wave 1 to 5.0% at Wave 2. **Annex 7** shows a comparison of food groups consumed by children 6 months and above by survey wave. There was a decrease in consumption of breast milk and dairy products and an increase in consumption of grains, roots, and tubers. There was also an increase in the consumption of flesh food and legumes or nuts between survey waves, although the percentage of children who consumed these food groups was small.

Table 9: Percentage distribution of children according to infant and young child feeding practices by livelihood zone at Wave 2 and comparison by survey wave, Samburu

Indicator	Livelihood zone			Overall		p-value
	Pastoral	Agro-pastoral	Urban/peri-urban	Wave 1	Wave 2	
Breastfeeding indicator						
Continued breastfeeding (12–23 months)	70.1	37.4	86.9	69.6	69.9	0.970
Number of children	134	54	29	205	217	

Indicator	Livelihood zone			Wave 1	Wave 2	Overall <i>p</i> -value
	Pastoral	Agro-pastoral	Urban/peri-urban			
Complementary feeding indicators						
Minimum dietary diversity (MDD) ¹	0.9	3.1	2.9	6.1	1.3	<0.001
Minimum meal frequency (MMF) ²	14.2	55.6	13.1	30.0	16.6	0.005
Minimum acceptable diet (MAD) ³	0.0	0.5	0.3	2.2	0.1	<0.001
Eggs and/or flesh foods (EFF) ⁴	9.3	2.9	2.0	8.9	7.9	0.673
Minimum milk feeding frequency (MMFF) ⁵	22.7	14.9	11.6	23.5	20.7	0.535
Zero vegetables or fruits (ZVF) ⁶	99.3	96.7	95.2	95.9	98.5	0.032
Unhealthy foods (UFC) ⁷	5.2	6.4	3.2	11.8	5.0	0.003
Sweet beverages (SwBs) ⁸	73.8	66.4	86.1	73.7	75.1	0.761
Number of children	347	131	60	469	538	

¹ Children 6 months and above who received foods from ≥ 5 food groups out of 8 food groups, breast milk inclusive

² Children 6 months and above who received foods the minimum times or more

³ Children 6 months and above who receive a MAD

⁴ Children 6 months and above who consumed EFF during the previous day

⁵ Non-breastfed children 6 months and above who consumed at least two milk feeds during the previous day

⁶ Children 6 months and above who did not consume any vegetables or fruits during the previous day

⁷ Children 6 months and above who consumed selected sentinel unhealthy foods during the previous day

⁸ Children 6 months and above who consumed SwBs, which include sodas, juices, other liquids with added sweeteners during the previous day

There was a statistically significant decrease in the percentage of caregivers who had MDD (5.7% to 2.4%) and the mean number of food groups consumed in the past 24 hours (2.5 to 1.9) between survey Waves 1 and 2 (**Table 10**). The most commonly consumed food item at Wave 2 was starchy staples (grains, white roots and tubers, and plantains) followed by pulses and dairy products. Overall, there was a significant reduction in the consumption of starchy staples, dairy, dark green leafy vegetables, and eggs. Consumption of pulses and meat, poultry, and fish did not change between Waves 1 and 2.

Table 10: Percent distribution of caregivers by food consumption and dietary diversity according to livelihood zones at Wave 1 and comparison by wave, Samburu

Variable	Livelihood zone			Overall		P-value
	Pastoral	Agro-Pastoral	Urban/peri-urban	Wave 1	Wave 2	
Grains, white roots and tubers, and plantains	94.5	80.9	100.0	97.7	94.4	0.031
Pulses	33.8	24.3	44.6	41.0	34.6	0.226
Dairy	19.2	40.7	14.4	59.2	19.9	<0.001
Meat, poultry, and fish	15.3	7.5	4.8	14.1	13.5	0.876
Dark green leafy vegetables	3.7	45.4	12.9	12.3	7.5	0.007
Eggs	1.1	2.4	4.6	4.5	1.6	0.002
Nuts and seeds	0.5	0.6	4.0	1.0	1.0	0.981
Other vegetables	6.6	17.1	29.3	14.7	10.3	0.176
Other fruits	1.5	1.5	6.0	4.0	2.1	0.272
Other vitamin A-rich and vegetables	1.8	1.8	2.5	3.8	1.9	0.175
Mean number of food groups consumed in the past 24 hours	1.8	2.2	2.2	2.5	1.9	0.008
MDD ¹	2.2	3.2	3.2	5.7	2.4	0.003
Number of all caregivers	359	136	61	594	556	

¹ MDD is a dichotomous indicator of whether or not women have consumed at least 5 out of 10 in the past 24 hours

The percentage of children who had experienced any illness (cough, fever, or diarrhea) in the previous 2 weeks significantly increased from 62.6% at Wave 1 to 71.5% at Wave 2 (Table 11). The percentage varied by livelihood zone; ranging from 30.5% in the urban/peri-urban zone to 79.2% in the pastoral zone. There was a significant increase in the percentage of children who experienced fever (29.2% to 38.6%) and diarrhea (30.8% to 44.1%) but not cough between survey Waves 1 and 2. Health seeking for any illness did not vary by survey wave.

Table 11: Percentage distribution of children according to morbidity and health seeking behavior by livelihood zone at Wave 2 and comparison by survey wave, Samburu

Variable	Livelihood zone			Overall		P-value
	Pastoral	Agro-Pastoral	Urban/peri-Urban	Wave 1	Wave 2	
Any illness in the past 2 weeks before survey	79.2	58.2	30.5	62.6	71.5	0.199

Variable	Livelihood zone			Overall		P-value
	Pastoral	Agro-Pastoral	Urban/peri-Urban	Wave 1	Wave 2	
Type of illness						
Cough	52.8	44.1	23.1	39.0	48.3	0.126
Fever	43.4	36.8	10.2	29.2	38.6	0.030
Diarrhea	47.9	36.5	24.5	30.8	44.1	0.041
Number of children	359	136	61	594	556	
Sought treatment of any illness	65.3	91.2	51.5	71.3	65.8	0.291
Number of children	230	85	22	308	337	

3.6 MOTHER/CAREGIVER DECISION-MAKING, EMPLOYMENT, AND EXPERIENCE WITH DOMESTIC VIOLENCE

Table 12 shows that between survey Waves 1 and 2, there was a statistically significant increase in the percentage of women who participated in making decisions on food purchase (73.2% to 81.9%) and a decrease in the percentages of women who participated in decisions on woman's own health care (90.2% to 82.5%), and visits to friends and relatives (78.0% to 70.5%). The percentage of women involved in making all six decisions assessed varied widely by live livelihood zone, ranging from 27.3% in the pastoral zone to 86.1% in the urban/peri-urban zone, but did not statistically significantly change between survey Waves 1 and 2.

Table 12: Percentage distribution of caregivers according to participation in decision-making by livelihood zone at Wave 2 and comparison by survey wave, Samburu

Variable	Livelihood zone			Overall		P-value
	Pastoral	Agro-pastoral	Urban/peri-urban	Wave 1	Wave 2	
All six decisions	27.3	44.4	86.1	38.0	34.7	0.514
Food purchase	78.7	96.8	99.5	73.2	81.9	0.038
Woman's own health care	79.6	94.6	99.8	90.2	82.5	0.016
Child health	77.7	98.1	99.8	87.5	81.2	0.116
Visit to her friends/relatives	66.9	87.7	90.8	78.0	70.5	0.031
Major household purchase	53.2	86.8	96.8	59.7	59.7	1.000
Usage of household income	48.9	54.4	89.0	48.2	53.7	0.230

Variable	Livelihood zone			Overall		P-value
	Pastoral	Agro-pastoral	Urban/peri-urban	Wave 1	Wave 2	
Number of caregivers married or living with a man	314	121	42	510	477	

Slightly more than a third (34.7%) of caregivers were formally or casually employed in the previous 4 months, with the percentage employed highest among agro-pastoralists (75.6%) and lowest among pastoralists (21.8%) (Table 13). Among those employed, petty trading was the most common form of employment in pastoral and agro-pastoral zones while formal employment/causal labor was dominant in the urban/peri-urban zone. Most of those employed earned cash (23.8%) and slightly less than a quarter (23.8%) were paid both in cash and in kind, but this varied by zone.

Table 13: Percentage distribution of caregivers who were currently married or living with a man according to employment by livelihood zones at Wave 2, Samburu

Variable	Livelihood zone			Overall
	Pastoral	Agro-pastoral	Urban/peri-urban	
Employed in the past 4 months	29.6	75.6	54.9	34.7
Number of all caregivers	314	121	42	477
Kind of work				
Employed/casual labor	31.4	28.1	93.2	41.9
Petty/merchant trade	68.6	71.9	6.8	58.1
Type of earning				
Cash	63.0	36.2	99.3	66.5
Cash and in-kind	28.8	28.5	0.3	23.8
In-kind	8.1	34.7	0.0	9.6
Not paid	0.1	0.7	0.3	0.2
Caregivers employed in the past 4 months	98	80	20	198

Overall, 45.1% of married caregivers had experienced some form of domestic violence in the previous 4 months (Table 14). However, there was variation by livelihood zone, with this percentage being 50.0% in pastoral and agro-pastoral zones 8.6% in the urban/peri-urban zone. Emotional violence and physical violence were the most common types of domestic violence experienced. Among those who experienced domestic violence, only 17.9% sought help.

Table 14: Percentage distribution of currently married caregivers by experience of domestic violence in the past 4 months by livelihood zone at Wave 2, Samburu

Variable	Livelihood zone			Overall
	Pastoral	Agro-pastoral	Urban/peri-urban	
Experienced any kind of domestic violence	50.0	50.8	8.6	45.1
Experienced emotional violence	34.7	40.0	7.9	31.8
Experienced physical violence	32.7	43.5	5.6	30.0
Experienced sexual violence	20.5	37.8	2.6	19.2
Number of caregivers	341	132	53	526
Sought for help to stop domestic violence	18.5	13.1	6.4	17.9
Number of caregivers who experience domestic violence	151	46	9	206

3.7 FACTORS ASSOCIATED WITH ACUTE MALNUTRITION

Livelihood zone and child's age were the only factors that were statistically significantly associated with acute malnutrition based on WHZ in children (**Table 15**). The odds of acute malnutrition were 76% lower among children in the non-pastoral (urban/peri-urban and agro-pastoral) zone than among those in the pastoral zone (aOR=0.24, 95% CI 0.06 – 0.86). The odds of acute malnutrition increased with increasing child's age, reaching about 12-fold among children aged 2 years and above compared to those aged 6–11 months (aOR 11.67, 95% CI 3.24 – 41.86). When acute malnutrition was assessed using MUAC, mother's nutritional status was the only factor that showed a statistically significant association with acute malnutrition (**Annex 8**). The odds of acute malnutrition were slightly more than 4 times higher in children whose mothers were underweight compared to those with normal weight mothers (aOR=4.10, 95% CI 1.13 – 14.87).

Table 15: Multivariable logistic regression analysis of factors associated with acute malnutrition among children at Wave 2 based on WHZ, Samburu

Variable	aOR ¹	95% CI	P-value
Community level factors			
Livelihood zones (Ref: Pastoral)			
Urban/peri-urban/Agro-pastoral	0.24	0.06 – 0.86	0.029
Household factors			
Gender of household head (Ref: Male)			
Female	0.32	0.04 – 2.45	0.271
Age of the household head (Ref: <25 years)			
25–34 years	0.39	0.04 – 4.21	0.437

Variable	aOR ¹	95% CI	P-value
35+ years	0.17	0.01 – 2.76	0.212
Wealth tertile (Ref: Lowest)			
Middle	3.52	0.97 – 12.81	0.056
Highest	2.23	0.56 – 8.82	0.253
Water insecurity experience (Ref: No)			
Yes	2.03	0.68 – 6.03	0.204
Caregiver factors			
Age (Ref: Above 25 years)			
Below 25 years	0.66	0.15 – 2.89	0.585
Decision over child health (Ref: No)			
Yes	0.67	0.16 – 2.81	0.581
Decision on food purchase (Ref: No)			
Yes	0.76	0.18 – 3.28	0.718
Child factors			
Sex (Ref: Male)			
Female	0.61	0.22 – 1.73	0.352
Age (Ref: 6–11 months)			
12-23 months	8.27	2.53 – 27.04	<0.001
24+ months	11.65	3.24 – 41.86	<0.001
Diarrhea in the last 2 weeks (Ref: No)			
Yes	1.34	0.45 – 4.00	0.605
Achieved MDD (Ref No)			
Yes	0.17	0.02 – 1.67	0.128

¹Adjusted odds ratio. All the variables are mutually adjusted for each other

4. DISCUSSION

This study provides the first insights into temporal changes in acute malnutrition prevalence and its determinants over a 5–6-month interval in Samburu County.

Although Wave 1 was meant to capture data during the continental rains season and Wave 2 during the short rains season, there was rainfall failure during Wave 2 resulting in a drought. The drought prompted a humanitarian response from the county government and implementing partners, which may have helped to avert further deterioration in water and food insecurity and thus explain the lack of statistically significant changes in these indicators despite the drought. The study shows a significant increase in the percentage of households that received emergency food/cash (4.8% to 18.1%), confirming the emergency response. A significantly higher percentage of respondents at Wave 2 than at Wave 1 reported using chemicals to treat drinking water (0.9% to 4.2%), probably because the water supplied during

the humanitarian response was already treated using this method. The humanitarian response could have also helped to increase the availability of improved toilet facilities and maintain the status quo regarding water, hygiene, and sanitation indicators.

There was a statistically significant decrease in regular saving, which could be an indicator of reduced availability of disposable income occasioned by increased household shocks, including drought, between Waves 1 and 2. However, there was no change in taking loans or receipt of financial support. The percentage of households that received financial support was too small, an indication that the humanitarian support was mainly in-kind (food).

Despite the drought at Wave 2, the prevalence of acute malnutrition did not statistically significantly change between survey waves. This could also be attributed to the humanitarian response and the shock coping mechanisms employed (particularly obtaining food on credit and not reducing the amount of food consumed). Although the prevalence of acute malnutrition in agro-pastoral and urban/peri-urban zones remained less than 10%, which is the threshold for declaring acute malnutrition to be a problem of high public health concern [9], in the pastoral zone the prevalence of acute malnutrition at Wave 2 was 18.9% based on WHZ and 14.0% based on MUAC. This calls for prioritizing interventions to reduce malnutrition among pastoralists.


Overall, complementary feeding of children remained poor, with reductions in MMF, MDD, and MAD. Lack of vegetable and fruit consumption and consumption of sweet beverages were alarmingly high. Poor complementary feeding points to a general lack of access to a diversified diet among children in the county.

Child morbidity increased at Wave 2 probably because of increased exposure to the external environment including food and reduced breastfeeding as children age. Mother's/caregiver's food consumption remained poor, with significant reductions in the MDD and the mean number of food groups consumed. The reduction in food consumption could be due to the drought and lack of diversity in the food aid provided as a part of the humanitarian response. Women's decision-making did not change between Waves 1 and 2 overall, which is expected given the short survey interval and the absence of a specific intervention to empower women.

The odds of acute malnutrition were higher in the pastoral livelihood zone probably because this zone was the most affected by drought and has the least access to health services because of the migratory nature of the population. The odds of acute malnutrition also increased with increasing children's age, probably because of increased exposure to the external environment and reduced breastfeeding as children age, leading to increased morbidity, as previously mentioned.

4.1 IMPLICATIONS FOR PROGRAMMING/RECOMMENDATIONS

The findings of this study highlight the urgent need to implement interventions to promote the appropriate complementary feeding practices among children older than 6 months. There is a need to increase children's dietary diversity, acceptable diet, and meal frequency. There is also a need to increase the consumption of eggs, flesh food, fruits, and vegetables and reduce the consumption of sweet beverages among these children. Given the poor and deteriorating maternal food consumption, the study also highlights the need to focus interventions to promote maternal nutrition. Distribution of food aid should consider diversity



in the food items distributed to ensure the dietary needs of women and children are met. High child morbidity points to the need to strengthening the community health system to implement community-based approaches to prevent and manage common illnesses. Strengthening the community health system should include building a cadre of supporting community health volunteers and building their capacity to undertake nutrition; water, sanitation, and hygiene; and health promotion roles appropriately.

Given that children in the pastoral zone were at a higher risk of acute malnutrition than those in the agro-pastoral and urban/peri-urban zones, in the context of limited resources, there is a need to prioritize interventions to reduce acute malnutrition among pastoralists. Moreover, it was only in the pastoral zone where the prevalence of acute malnutrition exceeded the 10% threshold for declaring acute malnutrition to be a problem of high public health concern.

4. REFERENCES

1. WHO (World Health Organization) Multicentre Growth Reference Study Group, *WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development*. 2006, WHO, Geneva.
2. Pan American Health Organization (PAHO), *Maternal Nutrition and Pregnancy Outcomes: Anthropometric Assessment, Scientific Publication No. 529*. 1991, PAHO, Washington, DC.
3. WHO (World Health Organization) and UNICEF (United Nations Children’s Fund), *Indicators for assessing infant and young child feeding practices: definitions and measurement methods*. 2021, WHO, Geneva.
4. Women's Dietary Diversity Project (WDDP) Study Group, Development of a dichotomous indicator for population-level assessment of dietary diversity in women of reproductive age. *Curr Dev Nutr*, 2017. 1(12).
5. Kenya National Bureau of Statistics, *Kenya Demographic and Health Survey 2014*. <https://www.dhsprogram.com/publications/publication-fr308-dhs-final-reports.cfm>. 2015.
6. Innovations for Poverty Action (IPA), *Kenya 2015 PPI®: User Guide*, 2018, IPA.
7. Innovations for Poverty Action (IPA), *Kenya 2015 PPI®: Scorecards and Look-up Tables*, 2018, IPA.
8. Young, S.L., et al., The Household Water InSecurity Experiences (HWISE) Scale: development and validation of a household water insecurity measure for low-income and middle-income countries. *BMJ Global Health*, 2019. 4(5): p. e001750.
10. de Onis, M., R. Yip, and Z. Mei, The development of MUAC-for-age reference data recommended by a WHO Expert Committee. *Bull World Health Organ*, 1997. 75(1): p. 11-8.

ANNEXES

ANNEX A. SAMBURU LONGITUDINAL STUDY CORE TEAM

Table A-1: Samburu County Longitudinal Study Core Team

Dr. Estelle M. Sidze	Principal Investigator and Longitudinal Study Technical Lead, APHRC
Dr. Faith Thuita	Principal Investigator, RTI
Dr. Dickson Amugsi	Co-Investigator and Quantitative Component Lead, APHRC
Dr. Calistus Wilunda	Project Manager, APHRC
Dr. Martin K. Mutua	Lead Statistician, APHRC
Mr. Bonventure Mwangi	Data Management and Analysis, APHRC
Dr. Chessa Lutter	Co-Investigator, RTI
Dr. Valerie Flax	Co-Investigator, RTI
Mr. Albert Webale	Co-Investigator, RTI
Mr. Brad Sagara	Co-Investigator, Mercy Corps
Mr. Evans Onyiego	USAID Nawiri Field Director
Mr. Simon Eris	Field Research Coordinator, RTI
Mr. Dancan Lesiamito	Study Field Coordinator, APHRC
Mr. Joel Olewe	Monitoring and Evaluation Coordinator, Mercy Corps
Mr. Timothy Lesingiran	Government Engagement Manager, Mercy Corps
Mr. Koolic Loosengei	County Information Officer, NDMA Turkana County
Mr. Augustine Lemowanapi	County Community Strategy Focal Person, Ministry of Health
Mr. Jeff Mukuria	County Monitoring and Evaluation Coordinator
Mr. Christopher Lengusuranga	County Nursing Officer, Ministry of Health
Ms. Delphina Kaaman	County Nutrition Coordinator, Ministry of Health
Mr. Francis Lesiantam	Sub-County Nutrition Coordinator, Ministry of Health
Mr. John Bosco Losusui	Sub-County Nutrition Coordinator, Ministry of Health

ANNEX B. INDEPENDENT VARIABLES INCLUDED IN BIVARIATE ANALYSIS

Household factors

Sex and age of household head, household wealth tertile, water insecurity experience, toilet facility, sale of livestock, shocks (climatic, conflict, biological and economic), poverty probability likelihood, and coping strategy index.

Caregiver factors

Age, marital status, polygamy, domestic violence (sexual, emotional, physical), decision-making (food and household purchase, own health, and child health), smoking/tobacco use, alcohol consumption, pregnancy status, and nutrition status.

Child factors

Age, sex, immunization status, illness (cough, fever and diarrhea), complementary feeding indicators (minimum acceptable diet, minimum dietary diversity, sweet beverage consumption, unhealthy food consumption, minimum milk feeding frequency for non-breastfed children, egg and/or flesh food consumption , and zero vegetable or fruit consumption), and breast feeding status.

ANNEX C. HOUSEHOLD RESPONSE RATE AT WAVE 2, SAMBURU

Table C-1: Household response rate (Wave 2)

Result of interview	Survey zone			Total
	Central	East	North	
Sampled households	297	144	153	594
Completed	277	137	142	556
Incomplete	0	0	0	0
No competent household member	3	0	1	4
Household absent/out migrated	13	6	2	21
Postponed	1	0	0	1
Outside the study site ¹	0	0	8	8
Refused	3	1	0	4
Total	297	144	153	594
Response rate (%) ²	93%	95%	93%	94%

¹The households are located in a village (Koros) of the neighboring county (Marsabit).

² Response rate = (Completed)/(Total number of households) * 100

ANNEX D. A COMPARISON OF THE BASELINE CHARACTERISTICS OF PARTICIPANTS SURVEYED AT WAVE 2 AND THOSE LOST TO FOLLOW-UP, SAMBURU

Table D-1: Baseline characteristics of survey participants

Variable	Wave 2	Lost to follow-up	P-value
Number of households	556	38	
Livelihood zone			
Pastoral	84.0	91.6	0.535
Agro-pastoral	5.1	2.0	
Urban/peri-urban	11.0	6.5	
Survey zone			
Central	6.8	3.9	0.461
East	15.3	7.7	
North	77.9	88.4	
Sex of household head			
Male	83.5	98.6	0.002
Female	16.5	1.4	
Head of household age (years)			
<25	11.7	10.3	0.481
25-34	39.7	33.1	
35+	48.6	56.7	
Head household occupation			
Livestock herding	60.7	68.8	0.003
Farming	0.8	0.2	
Employed/salaried	18.3	5.7	
Merchant/petty trade	13.7	0.3	
Self-employment	2.6	11.4	
Unemployed	3.9	13.6	
Household wealth tertiles			
Lowest	34.1	50.5	0.139
Middle	56.8	44.9	
Highest	9.1	4.5	
Caregiver characteristics			
Age (years)			
<25	37.9	53.0	0.017
25-34	47.3	34.7	

Variable	Wave 2	Lost to follow-up	P-value
35+	14.7	12.2	
Mother to index children			
Yes	96.4	100.0	0.647
No	3.6	0.0	
Highest level of education			
No education	80.9	82.3	0.944
Primary	14.8	14.3	
Post-primary	4.3	3.4	
Marital status			
Not in union	14.4	12.5	0.540
In union	85.6	87.5	
Polygamy marriage			
No	68.0	58.8	0.277
Yes	32.0	41.2	
Currently pregnant	7.8	0.4	<0.001
Child characteristics			
Gender			
Female	48.3	33.9	0.003
Male	51.7	66.1	
Age (months)			
0–11	45.1	69.7	0.016
12–23	33.4	25.7	
24–35	21.5	4.5	

¹ e.g., Boda boda, welding, carpentry, etc.

ANNEX E. PREVALENCE OF ACUTE MALNUTRITION AMONG CHILDREN UNDER 5 YEARS BY SURVEY WAVE AND BACKGROUND CHARACTERISTICS, SAMBURU

Table E-1: Prevalence of acute malnutrition among children under 5 years

Variable	GAM (WHZ < -2SD)			GAM (MUAC <= 125mm)		
	Wave 1	Wave 2	P-value	Wave 1	Wave 2	P-value
Livelihood zone						
Pastoral	21.8	18.9	0.002	9.1	14.0	0.024
Agro-pastoral	7.5	6.5		4.2	7.2	
Urban/peri-urban	4.7	0.9		5.0	1.0	
Survey zone						
Central	11.9	10.6	0.085	7.2	12.0	0.049
East	11.1	14.0		2.4	7.1	
North	21.4	16.5		9.7	12.9	
Child's sex						
Male	24.7	21.9	0.005	5.5	8.5	0.002
Female	14.4	10.0		11.2	15.2	
Age (months)						
0–11	18.0	7.1	0.308	10.8	16.8	<0.001
12–23	20.2	15.2		6.3	11.7	
24+	20.6	23.7		9.1	9.2	
Caregiver's/mother's age (years)						
<25	17.7	16.0	0.819	12.5	12.6	0.002
25–34	20.3	16.4		6.3	12.7	
35+	20.1	13.6		3.7	8.9	
Caregiver's/mother's marital status						
Not in union	18.4	19.9	0.569	8.5	6.7	0.021
In union	19.4	15.1		8.3	12.8	
Caregiver's education						
No formal education	22.4	18.1	0.011	9.7	13.5	0.028
Primary	7.8	4.6		3.7	2.3	
Secondary+	1.1	10.1		0.6	15.6	
Caregiver is underweight						
No	17.6	3.1	<0.001	7.3	3.8	<0.001

Variable	GAM (WHZ < -2SD)			GAM (MUAC <= 125mm)		
	Wave 1	Wave 2	P-value	Wave 1	Wave 2	P-value
Yes	21.1	21.4		9.5	18.0	
Household coping strategy index						
No/low/medium	13.3	11.0	0.583	1.2	5.2	0.020
High	19.9	16.3		9.2	12.8	
Household food insecurity						
Mild/moderate	20.7	12.3	0.574	5.0	9.3	0.050
Severe	19.1	16.0		8.8	12.1	
Household wealth tertiles						
Lowest	10.0	8.5	0.028	3.0	5.0	0.002
Middle	26.2	20.3		12.6	16.9	
Highest	14.1	14.4		4.4	7.8	
Household uses appropriate toilet facility						
No	19.4	18.2	0.028	8.5	14.6	0.003
Yes	18.0	7.5		7.7	1.7	
Household water insecurity experience						
No	14.6	9.6	0.781	1.7	6.6	0.003
Yes	21.2	20.1		11.0	15.4	
Overall	19.3	15.8	0.334	8.4	11.9	0.091
Number of children	583	511		467	524	

ANNEX F. PREVALENCE OF STUNTING AND UNDERWEIGHT AMONG CHILDREN UNDER 5 YEARS BY SURVEY WAVE AND BACKGROUND CHARACTERISTICS, SAMBURU

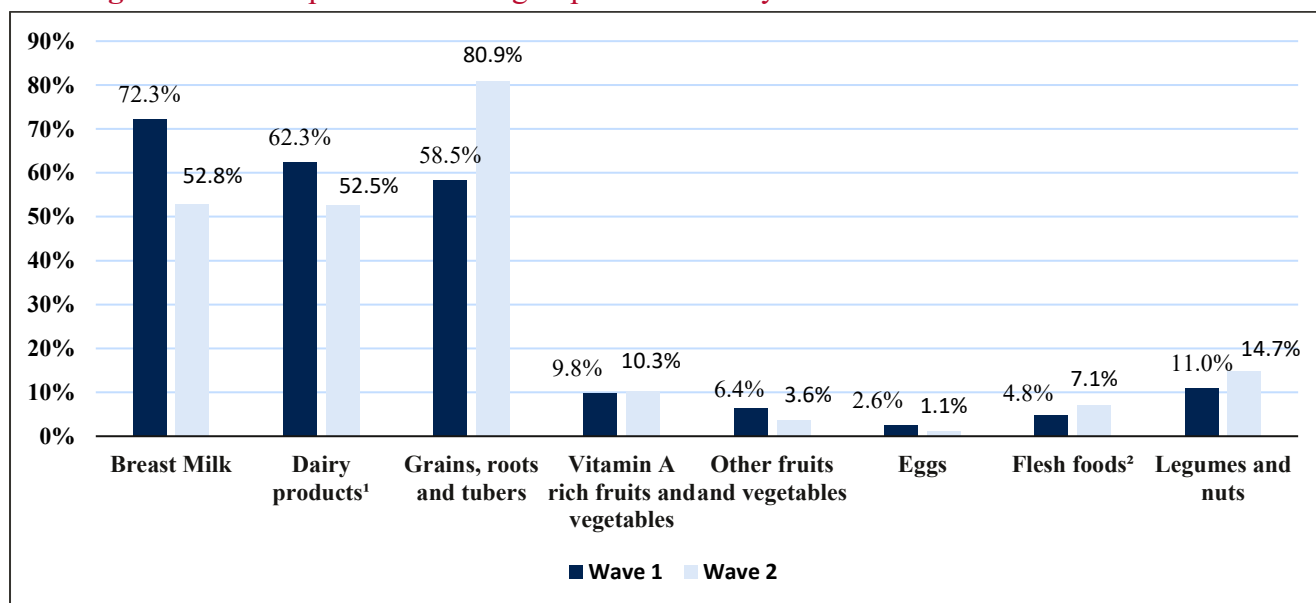
Table F-1: Prevalence of stunting and underweight children under 5

Characteristic	Stunted (HAZ < -2SD)				Underweight (WAZ < -2SD)			
	Wave 1		Wave 2		Wave 1		Wave 2	
	%	P-value	%	P-value	%	P-value	%	P-value
Livelihood zone								
Pastoral	25.8	0.113	38.7	0.115	32.20	0.006	39.5	0.009
Agro-pastoral	18.7		37.9		14.40		10.1	
Urban/peri-urban	10.2		13.4		19.60		25.5	
Survey zone								
Central	23.1	0.945	25.7	0.017	18.60	0.001	21.0	0.004
East	23.6		22.7		17.40		23.4	
North	24.1		39.0		33.20		39.5	
Child's sex								
Male	26.6	0.384	34.0	0.725	37.30	0.069	44.3	0.023
Female	21.7		37.0		23.60		28.1	
Age (months)								
0–11	5.8	< 0.001	8.3	< 0.001	17.10	< 0.001	13.2	< 0.001
12–23	36.6		41.1		33.70		36.4	
24+	48.0		53.6		55.20		54.7	
Caregiver's/mother's marital status								
Not in union	15.1	0.148	37.4	0.859	42.60	0.155	43.4	0.384
In union	25.3		35.3		27.90		34.7	
Caregiver's/mother's age (years)								
<25	25.5	0.732	41.0	0.472	30.40	0.24	33.4	0.352
25–34	24.2		33.6		34.10		41.8	
35+	19.0		29.4		16.10		26.7	
Caregiver education								
No education	24.6	0.369	37.1	0.24	31.20	0.093	39.6	0.009
Primary	25.4		33.5		31.40		24.8	
Secondary+	6.1		13.1		2.90		5.1	
Household coping strategy index								
No/low/medium	18.6	0.392	20.6	0.03	11.90	0.001	24.5	0.131

Characteristic	Stunted (HAZ < -2SD)				Underweight (WAZ < -2SD)			
	Wave 1		Wave 2		Wave 1		Wave 2	
	%	P-value	%	P-value	%	P-value	%	P-value
High	24.6		37.4		32.00		37.3	
Household food insecurity								
Mild/moderate	21.7	0.849	24.7	0.156	19.80	0.411	23.7	0.113
Severe	24.2		36.4		31.00		36.8	
Household wealth index tertile								
Lowest	19.0	0.22	35.2	0.587	17.50	0.003	22.5	0.003
Middle	26.9		37.3		39.50		45.4	
Highest	26.1		26.4		20.80		26.6	
Appropriate toilet facility								
No	25.3	0.143	38.4	0.264	31.20	0.365	38.0	0.573
Yes	14.8		25.4		21.80		29.0	
Household water insecurity experience								
No	27.3	0.422	28.2	0.179	28.50	0.688	29.8	0.372
Yes	22.6		40.6		30.60		40.2	
Overall	23.9		35.6		30.0		35.9	
Number of children	585		549		588		514	

ANNEX G. A COMPARISON OF FOOD GROUPS CONSUMED BY CHILDREN 6 MONTHS AND ABOVE BY SURVEY WAVE, SAMBURU

Figure G-1: Comparison of food groups consumed by children 6 months and older



¹The dairy products include cheese, yogurt, milk and other milk products.

²The flesh foods include meat, poultry, fish and organ meat.

ANNEX H. MULTIVARIABLE LOGISTIC REGRESSION ANALYSIS OF FACTORS ASSOCIATED WITH ACUTE MALNUTRITION AMONG CHILDREN AT WAVE 2 BASED ON MUAC, SAMBURU COUNTY

Table H-1: Multivariable regression analysis associated with acute malnutrition

Variable	aOR ¹	95% CI	P-value
Community level factors			
Livelihood zones (Ref: Pastoral)			
Non-pastoral	0.807	0.214 - 3.037	0.751
Household factors			
Gender of household head (Ref: Male)			
Female	0.240	0.012 - 4.776	0.350
Age of the household head (Ref: <25 years)			
25–34 years	0.955	0.095 - 9.546	0.968
35+ years	0.201	0.013 - 3.020	0.246
Wealth tertile (Ref: Lowest)			
Middle	2.772	0.772 - 9.955	0.118
Highest	1.212	0.280 - 5.251	0.797
Coping strategy index (Ref: No/Low coping)			
High	1.663	0.295 - 9.371	0.565
Experience of biological shock (Ref: No)			
Yes	0.953	0.228 - 3.973	0.947
Experience of conflict shock (Ref: No)			
Yes	2.257	0.611 - 8.335	0.222
Water insecurity experience (Ref: No)			
Yes	0.932	0.292 - 2.976	0.905
Caregiver factors			
Age (Ref: Above 25 years)			
Below 25 years	0.624	0.172 - 2.268	0.474
Education (Ref: Formal education)			
No formal education	0.922	0.117 - 7.297	0.939
Nutrition status (Ref: Not underweight)			
Underweight	4.101	1.132 - 14.856	0.032
Decision on all key areas (Ref: No)			
Yes	0.778	0.190 - 3.183	0.727

Variable	aOR ¹	95% CI	P-value
Experience of sexual violence (Ref: No)			
Yes	3.195	0.997 - 10.233	0.051
Child factors			
Sex (Ref: Male)			
Female	1.951	0.656 - 5.807	0.23
Age (Ref: 6-11 months)			
12–23 months	1.18	0.357 - 3.898	0.786
24+ months	0.949	0.217 - 4.143	0.945
Cough in the last 2 weeks (Ref: No)			
Yes	1.572	0.530 - 4.664	0.415

¹All the variables are mutually adjusted for each other

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