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

WAVE 2 SURVEY REPORT

APRIL 2022

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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
CHS	Community Health System
CSI	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
MIYCN	Maternal, Infant, and Young Child Nutrition
MMF	Minimum Meal Frequency
MMFF	Minimum Milk Feeding Frequency
MUAC	Mid-Upper Arm Circumference
NDMA	National Drought Management Authority
PAM	Persistent Acute Malnutrition
PPI	Probability Poverty Index
RTI	International (registered trademark and trade name of Research Triangle Institute)
SD	Standard Deviation
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SwB	Sweet Beverage
UFC	Unhealth Food
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene
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 Turkana County, Kenya. The longitudinal study, part of the United States Agency for International Development (USAID) Nawiri program, aims to discern evidence-based insights for the development of overarching solutions as well as micro-solutions for sustainably reducing persistent acute malnutrition (PAM). USAID Nawiri's two main objectives are to:

- Understand and map how a variety of immediate, underlying, and basic/systemic drivers interact to influence global acute malnutrition (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 grouped into four survey zones (Central, North, West, and South) that reflect administrative sub-counties used in the Turkana Standardized Monitoring and Assessment of Relief and Transitions (SMART) Surveys. Stratification of findings by livelihood zones was done through post-stratification analysis. The Wave 2 survey included 1,068 households out of 1,211 households enrolled in Wave 1 representing a response rate of 88%. The longitudinal study is collecting data every 4 months over a 2-year period for a total of 6 waves (including baseline and endline). Wave 1 data collection was carried out from May 10 to June 25, 2021, and Wave 2 data collection was carried out from October 25 to November 23, 2021. Anthropometric data were collected from all index children and primary caregivers to the index child in the sampled households. Data were summarized using descriptive statistics according to livelihood zone. We used chi-squared tests to compare key findings at Waves 1 and 2 and logistic regression 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 a significant increase in the percentage of households experiencing severe food insecurity, but a significant decrease in the percentage of households experiencing water insecurity between the survey waves.

Experience of household shocks in the past 4 months was almost universal, with significant reductions between survey waves noted for climatic and biological shocks. Reducing food consumption by adults remained the predominant method of coping with shocks, with no significant change between survey waves.

The percentage of households with a member who regularly saves money ranged from 8% in the pastoral livelihood zone to 32.5% among the fisher folk, with an overall significant increase between survey waves (12.4% to 16.6%). The percentage of households that received financial support significantly increased from 8.1% to 12.2% between survey waves.

The main reason for borrowing was to purchase food, with no significant change between waves (72.7% to 66.3%).

Water, sanitation, and hygiene

The percentage of households using piped water and unprotected dug well/spring increased from 19.0% to 25.7% and 21.4% to 36.0%, respectively, and the percentage using surface water decreased from 38.0% to 17.9%. There was a statistically significant increase in time taken to obtain water between survey waves. The percentage of households using an appropriate water treatment method remained low and with no statistically significant change between waves (5.4% to 6.4%). There was no statistically significant change in the percentage of households with improved toilet facilities or using soap for hand washing between survey waves.

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

The prevalence of acute malnutrition was similar between Wave 1 and Wave 2 when measured by weight-for-height z-score (WHZ) (21.4% to 19.5%) but significantly declined when measured by mid-upper arm circumference (MUAC) (17.5% to 9.8%). The reduction based on MUAC was observed across all livelihood zones and selected characteristics at household, caregiver, and child levels.

Most children (70.6% based on WHZ and 79.9% based on MUAC) remained free from acute malnutrition across the two surveys. Acute malnutrition persisted in 12.2% of children based on WHZ and 6.2% based on MUAC. In addition, 7.3% transitioned from no acute malnutrition to acute malnutrition based on WHZ, and 2.6% based on MUAC.

Complementary feeding of children was generally poor between survey waves. The minimum meal frequency significantly declined from 13.7% to 7.7% while the minimum dietary diversity did not significantly change (2.5% to 2.0%). There was a statistically significant increase in consumption of sweet beverages (sodas, juices, other liquids with added sweeteners) (51.4% to 62.2%).

The percentage of caregivers whose diets met the minimum dietary diversity remained extremely low and significantly declined between survey waves (1.8% to 0.6%). The mean number of food groups consumed in the past 24 hours remained low and unchanged between survey waves (1.7 to 1.6). There was a significant reduction in the consumption of dairy products from 18% in Wave 1 to 7.6% at Wave 2.

The prevalence of child morbidity (cough, fever or diarrhea) in the previous 2 weeks significantly increased from 54.3% at survey Wave 1 to 63.6% at survey Wave 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 significantly increased from 40.7% at Wave 1 to 49.6% at Wave 2, with limited variation by livelihood zone.

Slightly less than a third of caregivers were gainfully employed in the past 4 months, with the percentage employed being highest among urban/peri-urban dwellers (44.0%) and lowest

among fisher folk (21.8%). Petty trading was the most common form of self-employment across all livelihood zones and overall (80.8%).

Slightly over one-third (32.5%) of married caregivers reported having experienced some form of domestic violence in the previous 4 months, with the highest percentage recorded among the agro-pastoralists (38.7%). Physical violence (21.5%) was the most common type of abuse.

Factors associated with acute malnutrition

Mothers'/caregivers' nutritional status was the only factor that was significantly associated with acute malnutrition based on WHZ in children. Compared with children of normal weight mothers/caregivers, children of underweight mothers/caregivers had increased odds of acute malnutrition (odds ratio [OR]=1.83, 95% confidence interval [CI] 1.16 – 2.89). When acute malnutrition was assessed using MUAC, gender of household head and caregiver alcohol consumption were the only factors significantly associated with acute malnutrition. The odds of acute malnutrition were higher among children in female-headed households than in male-headed households (OR=2.10, 95% CI 1.01– 4. 37) and among children whose caregivers consumed alcohol than among those whose caregivers were not alcohol consumers (OR=3.49, 95% CI 1.39 – 8.79).

Conclusions

Between survey Waves 1 and 2 conducted over an interval of 5–6 months, households in Turkana experienced a significant increase in severe food insecurity but a decrease in water insecurity. Almost all households experienced some shock. There was a significant increase in regular saving and receipt of financial support among households. Time taken to obtain water increased, but hygiene and sanitation practices did not change. Involvement in household decision-making among women increased. The prevalence of acute malnutrition did not change when measured by WHZ but significantly declined when measured by MUAC. Complementary feeding of children remained poor, with a reduction in the minimum meal frequency. Child morbidity increased while mother's/caregiver's food consumption remained poor.

1.   BACKGROUND

The causal pathways leading to GAM in Turkana 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 Turkana on GAM and the immediate and underlying factors associated with undernutrition, virtually no evidence exists on how these factors vary by season, within the same 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 and used to compute WHZ and MUAC. 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[1] as units of stratification. USAID Nawiri designated four survey zones in Turkana (Central, North, West, and South) that included all the livelihood zones (pastoral, agro-pastoral, fisher folk, and urban/peri-urban). The livelihood survey zones were delineated based on the unique nature of vulnerability of communities in various geographies occasioned by repeated shocks and associated stresses.

2.2   DATA COLLECTION AND MANAGEMENT PROCEDURES

Wave 2 data collection was conducted by 28 experienced women (10) and men (18) who were fieldworkers from the local communities recruited to collect data during Wave 1. The caregiver tool was expanded to include selected questions from the household tool administered at Wave 1. A 2-day refresher training on data collection processes was

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[1] The seven sub-counties were grouped into four survey zones: (1) South (South and East sub-counties), (2) Central (Central and Loima sub-counties), (3) North (North and Kibish sub-counties), and (4) West (West sub-county).

conducted from October 21–22, 2021, in Lodwar. Fieldworkers used Survey CTO 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. Data quality monitoring processes and checks were implemented throughout the data collection process. This included conducting spot checks and interview sit-ins by field team leaders and coordinators and supervision by county government officials.

2.3   DEPENDENT AND INDEPENDENT VARIABLES

2.3.1   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 anthropometric measurements and child age. To classify a child as acutely malnourished using MUAC, a cutoff of less than 12.5 cm was used.

The height and weight of mothers and caregivers were measured and used to compute maternal 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/m^2), normal weight (BMI = 18.5–24.99 kg/m^2), overweight (BMI = 25–29.99 kg/m^2), and obesity (BMI > 30 kg/m^2).

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 Pan American Health Organization/WHO [2].

Infant and young child feeding practices were assessed using indicators from WHO and the United Nations Children's Fund (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].

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

The coping strategy index (CSI) 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 CSI 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 intake (3.0), and reducing the number of meals per day (1.0).

The 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 quintiles.

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 Scale, which consists of 12 items each with four response categories [8]. The total score, which is obtained by summing up 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. Logistic regression models were used 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 considered 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 APHRC and RTI. We secured informed consent from all participants during Wave 1 and reconfirmed this consent at Wave 2.

3.   RESULTS

3.2   RESPONSE RATE

Household response rate by survey zone is summarized in *Annex 3*. Of the 1,211 households sampled at baseline, 1,068 were surveyed at Wave 2. Thus, the response was 88%, ranging from 83% in the Central zone to 92% in the South and East zones. The main reason for non-response was the absence of the respondent. Those surveyed and those not surveyed (lost to follow-up) were similar based on most baseline characteristics (*Annex 4*). However, there was a significantly higher percentage of residents of pastoral and agro-pastoral zones and a lower percentage of fisher folk among those lost to follow-up than among those surveyed. The group lost to follow-up also had a significantly higher percentage of household heads employed in livestock herding and a lower percentage of the self-employed and traders than the surveyed group.

3.3   HOUSEHOLD AND MOTHER/CAREGIVER CHARACTERISTICS

There was a significant change in the household head's occupation between survey Waves 1 and 2, with the percentage involved in livestock herding decreasing from 48.8% to 31.6% and the unemployed increasing from 6.3% to 15.6% **(*Table 1*).** The reduction in the percentage of household heads involved in livestock herding at Wave 2 was probably because of a higher loss to follow-up in this group **(*Annex 4*).** Petty trade was the main source of household income across all livelihood zones, except among the fisher folk, with no significant change between survey waves. However, the proportion of households whose main source of income was paid labor/wages increased from 4.5% at Wave 1 to 13.4% at Wave 2, while those whose main source of income was sale of livestock decreased from 21.5% to 10.8% over the same period. Paid labor was highest among fisher folk (48.8%) and lowest among pastoralists (3.3%). Household CSI and household poverty likelihood did not vary between the survey waves. The proportion of households with severe food insecurity significantly increased from 90.4% at Wave 1 to 95.9% at Wave 2 in all livelihood zones. The proportion of households that were water insecure declined from 73.3% to 58.9% between the two waves.

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

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/ peri-urban		Wave 1	Wave 2	*P*-value
Household head occupation								
Livestock herding	54.2	22.3	13.1	7.1		48.8	31.6	<0.001
Farming	0.0	34.1	0.0	1.6		6.7	5.6	
Employed/salaried	3.1	3.9	1.2	5.3		2.2	3.4	
Merchant/trader	21.7	21.5	15.9	71.5		23.8	31.3	
Self-employed[1]	2.5	1.1	55.8	4.8		12.1	12.5	
Unemployed	18.5	17.1	14.1	9.8		6.3	15.6	
Main source of income for the household in the last 4 months								

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/peri-urban		Wave 1	Wave 2	*P*-value
No income	16.0	15.0	5.7	6.7		11.2	11.9	<0.001
Sale of livestock	20.2	10.3	0.6	0.3		21.5	10.8	
Income/wages	3.3	5.7	48.8	9.8		4.5	13.4	
Petty/merchant trade	59.1	68.3	43.7	82.9		60.4	62.9	
Others	1.4	0.7	1.3	0.3		2.4	1.0	
Household CSI								
Low/medium coping	13.8	11.1	4.3	8.1		10.1	10.4	0.910
High coping	86.2	88.9	95.7	91.9		89.9	89.6	
Household poverty likelihood[2]	80.7	73.3	69.9	71.2		77.8	77.2	0.491
Household food insecurity								
Mild/moderate	2.7	1.4	12.7	2.0		9.6	4.1	0.001
Severe	97.3	98.6	87.3	98.0		90.4	95.9	
Household water insecurity experience								
No	32.7	41.6	66.2	36.4		26.7	41.1	<0.001
Yes	67.3	58.4	33.8	63.6		73.3	58.9	
Number of all households	398	190	106	374		1211	1068	

[1] e.g., Boda boda, welding, carpentry, fishing, etc.
[2] Average of households' poverty likelihoods based on national poverty line referenced from the Kenya PPI 2015. The P-value is a test for means.

There was no significant change in mother's age, marriage arrangement, pregnancy status, alcohol consumption, and house/dwelling ownership between the survey waves **(Table 2).** The percentage of current smoking mothers significantly decreased from 48.6% at survey Wave 1 to 38.4% at survey Wave 2.

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

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban / peri-urban		Wave 1	Wave 2	*P*-value
Age (years)								
<25	12.8	16.9	21.1	29.0		19.8	18.4	0.276

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban / peri-urban		Wave 1	Wave 2	*P*-value
25–34	50.6	48.0	52.8	42.6		47.6	48.9	
35+	36.6	35.1	26.1	28.4		32.6	32.7	
Polygamy marriage								
No	44.4	48.9	53.3	50.4		50.1	48.0	0.145
Yes	44.2	38.1	30.5	30.3		35.1	37.8	
No response/missing	11.4	13.0	16.2	19.3		14.8	14.2	
Currently pregnant								
No	90.3	85.1	81.9	80.3		88.9	85.8	0.222
Yes	9.7	14.9	18.1	19.7		11.1	14.2	
Current alcohol consumer								
No	93.5	86.5	91.7	95.6		91.7	92.5	0.607
Yes	6.5	13.5	8.3	4.4		8.3	7.5	
Current smoker/tobacco user								
No	52.6	57.6	76.6	70.4		51.4	61.6	<0.001
Yes	47.4	42.4	23.4	29.6		48.6	38.4	
Number of all caregivers	398	190	106	374		1211	1068	
House/dwelling ownership								
Alone only	41.1	26.0	42.7	50.0		38.8	40.7	0.129
Jointly only	45.2	68.5	51.9	40.3		54.9	49.2	
Does not own	13.7	5.6	5.5	9.7		6.4	10.1	
Land ownership								
Alone only	28.7	17.6	40.3	31.2		9.3	29.6	<0.001
Jointly only	23.2	35.7	26.9	28.0		20.4	26.8	
Does not own	48.1	46.7	32.8	40.8		70.2	43.7	
Number of caregivers currently married or living with a man[1]	334	156	83	279		988	852	

[1]Denominator 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 survey waves (**Table 3**), with economic and climatic shocks being the most common types of shock, experienced by more than 91% of households. There was a significant reduction in the percentage of households that experienced climatic shocks (95.9% to 91.8%) and biological shocks (77.3% to 67.8%) between survey Waves 1 and 2. There was no change in the proportion of households that experienced conflict or economic shocks between the survey waves.

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

Variable	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/ peri-urban		Wave 1	Wave 2	*P*-value
Household experienced any shock	99.4	100.0	97.0	99.8		99.2	99.1	0.812
Type of shock								
Economic	94.4	96.3	90.5	99.0		92.8	95.0	0.190
Climatic	93.1	98.3	81.5	93.1		95.9	91.8	0.014
Biological	79.8	82.4	60.0	39.0		77.3	67.8	0.002
Conflict	39.4	53.2	18.2	36.6		34.7	37.1	0.367
Number of all households	**398**	**190**	**106**	**374**		**1211**	**1068**	

Notes: **Climatic shocks** include excessive rain/ 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, practiced by more than 81% of households across all livelihood zones was reducing food consumption (**Table 4**). There was no significant difference between the two waves. There was a significant reduction between Waves 1 and 2 in the percentage of households that obtained food on credit or engaged in spiritual efforts. Further, there was a significant increase in households that coped by receiving emergency food/cash, reducing non-essential expenses, selling livestock, sending livestock in search of pasture, slaughtering livestock, and using their own savings.

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

Coping strategy	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/ peri-urban		Wave 1	Wave 2	P-value
Reduced food consumption	81.5	89.2	80.8	95.1		81.8	85.5	0.218
Got food on credit from a local merchant	56.8	71.6	65.0	69.5		52.2	63.3	**<0.001**
Received emergency food/cash	49.9	66.4	52.3	58.4		19.6	54.7	**<0.001**
Reduced non-essential household expenses	43.7	36.6	43.1	51.5		54.6	44.2	**0.001**
Sold livestock	49.9	42.9	24.8	24.9		50.2	38.9	**0.014**
Sent livestock in search of pasture	49.2	29.8	13.3	15.6		56.9	32.5	**<0.001**
Slaughtered livestock	41.3	31.3	26.1	15.8		44.2	31.5	**0.002**
Engaged in spiritual efforts (e.g., prayer, sacrifice, etc.)	29.8	32.9	28.5	23.6		14.4	28.7	**<0.001**
Sent children/adult to stay with relatives	16.0	22.6	23.7	29.1		19.1	21.3	0.548
Used own savings	14.9	7.7	30.1	13.9		8.2	16.3	**0.002**
Took loan	10.8	22.1	16.6	17.4		18.7	15.0	0.230
Number of households experienced any shock	397	190	102	369		1201	1058	

The percentage of households with a member who regularly saves ranged from 8% in the pastoral livelihood zone to 32.5% among the fisher folk, with an overall significant increase between survey waves (12.4% to 16.6%) **(Table 5).** The percentage of households that received financial support significantly increased from 8.1% to 12.2% between survey waves. There was no statistically significant change in place of holding savings, the primary decision maker on how savings are used, taking a loan/borrowing, and source of loan. The main

reason for borrowing was to purchase food, which decreased between waves (72.7% to 66.3%). However, this decrease was not statistically significant.

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, Turkana

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/peri-urban		Wave 1	Wave 2	P-value
Household member regularly saves cash	8.0	14.4	32.5	22.9		12.4	16.6	**<0.001**
Took/borrowed a loan in the last 4 months	19.1	34.1	33.4	23.6		24.6	25.0	0.91
Received any financial support (cash transfer) in the last 4 months	8.0	12.3	17.7	16.2		8.1	12.2	**<0.001**
Number of households	**398**	**190**	**106**	**374**		**1211**	**1068**	
Where savings are primarily held								
At home	58.4	57.8	57.1	69.5		65.8	61.2	0.155
Mobile phone banking	19.0	25.2	42.4	14.3		16.7	26.7	
Sacco/cooperative/village savings group	9.8	16.9	0.5	15.8		6.2	9.2	
Bank	12.4	0.0	0.0	0.4		11.3	2.8	
Who primarily decides how savings are used								
Self	31.6	27.5	17.8	56.5		50.7	33.4	0.216
Partner/spouse	11.0	10.0	52.8	21.1		26.6	28.8	
Jointly & other household members	57.4	62.6	29.4	22.4		22.7	37.8	
Number of households	**41**	**22**	**37**	**75**		**142**	**175**	
Sources of loan								
Friends/family	78.3	75.8	77.8	48.2		69.2	71.6	0.257
Cooperative/*Chama*	16.2	18.1	15.4	32.6		15.4	19.7	
Bank/mobile loans	4.0	0.8	3.6	2.9		2.8	3.0	
Other(s)[1]	1.5	5.2	3.2	16.3		12.6	5.7	
Reason for borrowing								
Purchase food	65.2	79.3	74.1	45.3		72.7	66.3	0.404
Invest in business	16.5	17.6	17.5	23.9		12.4	18.5	0.109
School fees	10.8	25.3	12.2	23.6		12.4	16.8	0.140

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/peri-urban		Wave 1	Wave 2	*P*-value
Health care expenses	20.6	16.7	6.2	22.4		20.1	16.6	0.894
Personal needs	11.0	1.9	5.2	3.3		16.1	6.1	**0.033**
Purchase household items	0.1	2.9	0.0	14.3		13.2	3.6	**0.010**
Number of households	**96**	**62**	**35**	**115**		**348**	**308**	
Source of cash transfer								
Government programs	86.8	64	66.5	93.3		61.7	79.7	**0.014**
Non-governmental organizations	6	27.6	0	6		13.7	7.8	0.193
Remittance/gift	6.9	9.2	13.1	0.8		32.9	7.1	**<0.001**
County government	0.3	5.8	20.3	0		0.00	6.4	n/a
Number of households	**42**	**26**	**16**	**37**		**98**	**121**	

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

3.4 WATER, HYGIENE, AND SANITATION

The source of drinking water varied by livelihood zone and changed significantly between survey waves overall (***Table 6***). The percentage of those using piped water and unprotected dug well/spring increased from 19.0% to 25.7% and 21.4% to 36.0%, respectively, and the percentage using surface water reduced from 38.0% to 17.9%. There was a statistically significant increase in time taken to obtain water between survey waves. The percentage of households that spent less than 15 minutes decreased (37.1% to 27.6%), while the percentage that spent 15 to 60 minutes increased (31.7% to 45.1%). There was a statistically significant decrease in the percentage of households that did not treat water in some way, from 91.9% to 85.6%. The percentage of households using an appropriate water treatment method remained low and with no statistically significant change between waves (5.4% to 6.4%).

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, Turkana

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban / peri-urban		Wave 1	Wave 2	P-value
Source of drinking water -								
Piped/tapped	26.2	32.8	6.9	35.5		19.0	25.7	**<0.001**
Tube well/borehole	17.6	8.9	0.6	15.9		15.5	12.8	
Unprotected dug well/spring	38.6	21.5	42.6	35.5		21.4	36.0	
Surface water	10.6	28.8	44.5	2.7		38.0	17.9	

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban / peri-urban		Wave 1	Wave 2	P-value
Tanker truck and water kiosk	7.0	8.0	5.4	10.4		6.1	7.6	
Time to obtain drinking water (round trip)								
< 15 min (500 m)	23.7	48.2	23.6	24.7		37.1	27.6	**0.001**
15 min to 1 hr (500 m to 2 km)	45.3	33.2	43.4	54.6		31.7	45.1	
1 to 2 hrs (>2 km)	30.9	18.7	33	20.7		27.7	27.3	
Person who usually collects drinking water								
Women/girls	99.7	98.2	96.6	94.9		97.5	97.9	0.633
Men/boys	0.3	1.8	3.4	5.1		2.5	2.1	
Number of households[1]	**389**	**182**	**97**	**308**		**1119**	**976**	
Water treatment prior to drinking								
Boil	3.1	4.5	16.3	7.7		3.1	6.7	**0.024**
Water Guard/Aqua tabs/other chemical (Chlorine)	2.9	4.9	15.5	4.3		5.4	5.8	0.795
Sitting to settle/sedimentation	1.9	1.8	3.2	0.6		0.1	1.8	**0.001**
Use water filter (ceramic, sand, composite)	0.9	1.0	0.0	0.1		0.1	0.6	**0.019**
Households that did not treat water	92.2	80.6	71.3	87.7		91.9	85.6	**0.014**
Households using an appropriate treatment method[2]	3.9	6	15.5	4.4		5.4	6.4	0.526
Water Storage								
Safe	2.6	6.9	9.2	12.6		7.7	6.6	0.612
Unsafe	97.4	93.1	90.8	87.4		92.3	93.4	
Number of households	**398**	**190**	**106**	**374**		**1211**	**1068**	

[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.

There was no statistically significant change in the percentage of households with improved toilet facilities or using soap for hand washing between survey waves **(Table 7).** There were significant increases in the percentage of households washing hands before preparing food (52.1% to 62.3%) and before feeding a child (35.0% to 46.4%).

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

Characteristic	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban / peri-urban		Wave 1	Wave 2	P-value
Type of toilet facility								
Improved facility[1]	5.5	13.3	2.0	19.6		7.6	9.1	0.433
Non-improved facility[2]	94.5	86.7	98.0	80.4		92.4	90.9	
Households practicing handwashing	83.4	76.8	87.7	84.7		80.4	83.5	0.358
Households using soap for handwashing	52.2	54.4	72.2	60.3		52.3	57.9	0.211
Handwashing event								
After visiting the toilet	64.6	65.4	80.4	74.0		63.6	69.6	0.122
Before eating	81.5	74.8	84.3	82.7		76.3	81.2	0.153
Before preparing food	60.7	55.7	72.3	61.6		52.1	62.3	**0.010**
After handling child's waste	41.5	53.0	50.6	55.3		43.4	47.9	0.268
Before feeding a child	46.2	46.2	44.2	48.8		35.0	46.4	**0.002**
Number of households	**368**	**190**	**106**	**374**		**1211**	**1068**	

[1] Improved toilet facilities include flush, traditional pit, and ventilated improved pit toilet.
[2] Non-improved facilities include no facility, bush, field, or flying toilet.

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

The prevalence of acute malnutrition measured by WHZ remained unchanged between survey Wave 1 (21.4%) and Wave 2 (19.5%) (*Figure 1*). There was no significant change in the prevalence of GAM between survey Waves 1 and 2 when data were stratified by household, maternal, and child background characteristics, except household water insecurity and caregiver nutritional status (**Annex 5**). Among underweight caregivers, GAM prevalence was higher at Wave 1 (20%) than at Wave 2 (16.4%). Similarly, among water insecure households, GAM prevalence was higher at Wave 1 (20.6%) than at Wave 2 (15.7%).

In contrast, when measured by MUAC, the prevalence of GAM significantly declined from 17.5% at Wave 1 to 9.8% at Wave 2 (*Figure 2*). The reduction was observed in all livelihood zones and socio-demographic factors at household, caregiver, and child levels. (*Annex 5*).

The prevalence of stunting and underweight among children by survey wave and background characteristics is shown in **Annex 6.**

Figure 1**.** Prevalence of acute malnutrition (WHZ < -2SD) among children by livelihood zone and survey wave, Turkana
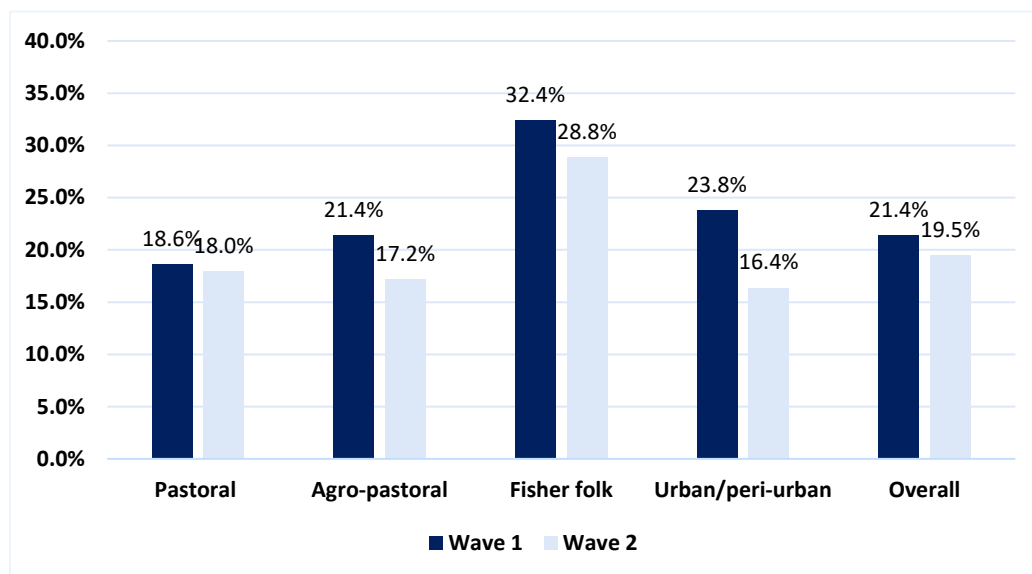
Figure 2. Prevalence of acute malnutrition (MUAC <= 125mm) among children by livelihood zone and survey wave, Turkana
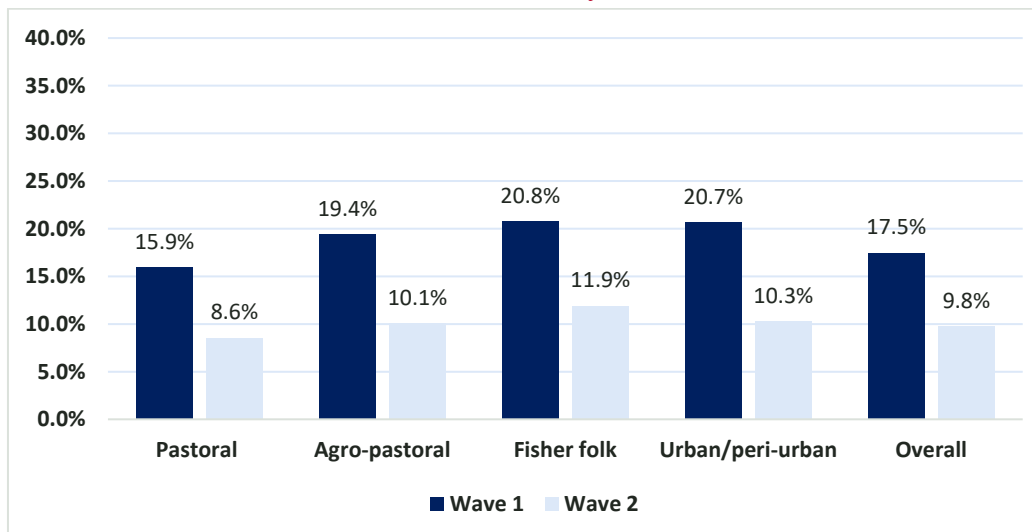
The percentage of children with acute malnutrition at Waves 1 and 2 was 12.2% based on WHZ and 6.2% based on MUAC (*Table 8*). In total, 7.3% of those who were not acutely malnourished (WHZ>-2SD and MUAC>125mm) at survey Wave 1 transitioned to acute malnutrition (WHZ<-2SD and MUAC ≤ 125mm) at Wave 2 based on WHZ score and 2.6% based on MUAC, while 9.8% transitioned from acutely malnourished to normal based on WHZ, and 11.4% based on MUAC. Overall, the percentage of children who were free from

acute malnutrition across the two surveys was 70.6% based on WHZ and 79.9% based on MUAC. No significant variations were noted across livelihood zones.

Table 8. Percentage distribution of children according to acute malnutrition (WHZ ≤ 2 SD and MUAC ≤ 125mm) transition between survey waves by livelihood zone, Turkana

| GAM status | Livelihood zone | | | | Overall | *P-*value |
	Pastoral	Agro-pastoral	Fisher folk	Urban/peri-urban		
WHZ						
No GAM in either wave	75.5	65.0	59.0	65.7	70.6	0.122
No GAM in Wave 1, GAM in Wave 2	5.7	10.4	9.9	9.5	7.3	
GAM in Wave 1, no GAM in Wave 2	8.5	11.7	12.3	12.1	9.8	
GAM in both waves	10.3	12.9	18.8	12.7	12.2	
Number of children	**372**	**127**	**74**	**438**	**1011**	
MUAC						
No GAM in either wave	82.1	78.8	73.0	78.1	79.9	0.212
No GAM in Wave 1, GAM in Wave 2	1.8	1.4	6.7	2.4	2.6	
GAM in Wave 1, no GAM in Wave 2	10.6	10.3	13.9	14.7	11.4	
GAM in both waves	**5.4**	**9.6**	**6.5**	**4.8**	**6.2**	
Number of children	**314**	**110**	**64**	**345**	**833**	

The percentage of children aged 12–23 months who continued to breastfeed ranged from 53.6% among the fisher folk to 87.5% among the pastoralists **(Table 9).** Overall, this indicator increased from 64.8% at Wave 1 to 73.5% at Wave 2, although the change was not statistically significant. An assessment of complementary feeding among children aged 6 months and above showed that a very small proportion had minimum dietary diversity (2%) or minimum acceptable diet (0.5%) **(Table 9).** The percentage who had minimum meal frequency was also low, significantly decreasing from 13.7% at Wave 1 to 7.7% at Wave 2. A majority of the study children (98.1% at Wave 1 and 98.4% at Wave 2) did not consume any fruits or vegetables. Consumption of sweet beverages was common and significantly increased from 51.2% at Wave 1 to 62.2% 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/tubers and legumes/nuts between survey waves.

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, Turkana

Indicator	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/ peri-urban		Wave 1	Wave 2	P-value
Breastfeeding indicators								
Continued breastfeeding (12–23 months)	87.5	83.1	53.6	57.2		64.8	73.5	0.054
Number of children	**141**	**62**	**43**	**140**		**429**	**386**	
Complementary feeding indicators								
Minimum dietary diversity (MDD)[1]	2.1	0.6	2.0	2.8		2.5	2.0	0.540
Minimum meal frequency (MMF)[2]	5.9	15.8	4.4	8.3		13.7	7.7	0.005
Minimum acceptable diet (MAD)[3]	0.4	0.0	0.0	1.7		1.0	0.5	0.273
Egg and/or flesh food (EFF)[4]	7.5	1.3	39.0	7.5		16.0	12.3	0.188
Minimum milk feeding frequency (MMFF)[5]	9.9	17.1	13.5	12.9		15.2	12.3	0.332
Zero vegetable or fruit (ZVF)[6]	99.5	95.7	100.0	96.9		98.1	98.4	0.695
Unhealthy foods (UFC)[7]	0.3	0.5	3.3	1.5		2.3	1.1	0.169
Sweet beverage (SwB)[8]	55.8	64.4	66.9	70.2		51.4	62.2	0.003
Number of children	**396**	**187**	**104**	**369**		**957**	**1056**	

[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 both breastfed and non-breastfed who received foods the minimum times or more.
[3] Children 6 months and above who receive 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.

The percentage of caregivers who had MDD remained low, ranging from 0% among fisher folk to 1.1% among agro-pastoralists **(Table 10).** Overall, this indicator declined from 1.8%

at survey Wave 1 to 0.6% at survey Wave 2. The reduction was statistically significant. The mean number of food groups consumed in the past 24 hours remained low and unchanged between the survey waves. The most consumed food item was starchy staples (grains, white roots and tubers, and plantains) followed by pulses. Overall, apart from dairy, there was no statistically significant change in the food items consumed between the survey waves. The percentage of caregivers who consumed dairy declined by more than a half over the follow-up period, from 18% at survey Wave 1 to 7.6% at survey Wave 2.

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

Variable	Livelihood zone					Overall		
	Pastoral	Agro-pastoral	Fisher folk	Urban/peri-urban		Wave 1	Wave 2	*P*-value
Grains, white roots and tubers, and plantains	86.7	92.8	82.4	91.0		85.9	87.8	0.388
Pulses	31.4	23.3	33.7	34.8		25.4	31.3	0.121
Meat, poultry and fish	9.8	5.8	46.2	9.2		17.1	15.7	0.598
Dark green leafy vegetables	4.0	21.1	1.7	16.7		10.3	9.0	0.575
Dairy	5.9	15.3	9.1	4.5		18.0	7.6	**<0.001**
Nut and seeds	2.2	4.9	1.2	1.7		1.3	2.3	0.135
Eggs	0.5	0.6	0.0	0.4		0.5	0.4	0.708
Other vitamin A-rich and vegetables	0.5	2.6	0.5	1.2		2.3	1.0	0.056
Other vegetables	1.4	4.4	7.2	14.7		4.5	5.8	0.503
Other fruits	0.4	0.1	0.6	0.3		0.9	0.4	0.184
Mean number of food groups taken in the past 24 hours	1.48	1.77	1.89	1.81		1.66	1.61	0.100
MDD [1]	0.5	1.1	0.0	0.8		1.8	0.6	**0.024**
Number of all caregivers	**398**	**190**	**16**	**374**		**1211**	**1068**	

[1] MDD is a dichotomous indicator of whether or not women have consumed at least 5 out of 10 food groups 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 54.3% at survey Wave 1 to 63.6% at survey Wave 2 (**Table 11**). Children who experienced fever increased significantly from 25.9% to 35.3% between the two survey waves. The percentage of children who sought treatment for illness at Wave 2 was high (89.3%) and similar to that at Wave 1.

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

| Variable | Livelihood zone | | | | | Overall | | |
	Pastoral	Agro-Pastoral	Fisher folk	Urban/peri-urban		Wave 1	Wave 2	P-value
Any illness in the past 2 weeks before the survey	56.0	76.1	71.8	63.6		54.3	63.6	**0.020**
Type of illness								
Cough	39.4	55.3	47.3	43.3		38.4	44.1	0.117
Fever	30.3	50.0	36.7	33.8		25.9	35.3	**0.005**
Diarrhea	27.8	39.5	27.8	29.8		32.1	30.0	0.517
Number of children	**398**	**190**	**106**	**374**		**1211**	**1068**	
Sought treatment for any illness	89.9	92.6	80.7	93.8		88.9	89.3	0.867
Number of children	**252**	**147**	**75**	**241**		**671**	**715**	

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 significant increase in the percentage of women who participated in making decisions on usage of household income (48.2% to 68.4%), food purchases (79.6% to 86.4%), and major household purchases (57.5% to 64.5%). Overall, the percentage of women involved in making all six decisions assessed significantly increased from 40.7% at Wave 1 to 49.6% at Wave 2, with limited variation by livelihood zone at Wave 2.

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

| Variable | Livelihood zone | | | | | Overall | | |
	Pastoral	Agro-Pastoral	Fisher folk	Urban/peri-urban		Wave 1	Wave 2	P-value
All six decisions	49.8	54.6	46.3	48.0		40.7	49.6	**0.036**
Usage of household income	69.5	73.2	63.1	67.0		48.2	68.4	**<0.001**

Variable	Livelihood zone					Overall		
	Pastoral	Agro-Pastoral	Fisher folk	Urban/peri-urban		Wave 1	Wave 2	P-value
Child health	85.1	86.0	87.5	86.0		83.8	85.9	0.064
Woman's own health care	79.7	83.9	89.7	77.2		82.0	81.7	0.128
Food purchase	84.4	84.8	94.5	84.8		79.6	86.4	**0.003**
Major household purchase	62.3	71.2	67.4	61.7		57.5	64.5	**0.016**
Visit her friends/ relatives	77.0	85.4	81.5	64.8		72.2	76.8	0.070
Number of caregivers married or living with a man	**334**	**156**	**83**	**279**		**988**	**852**	

Slightly less than a third (29.4%) of caregivers were employed in the previous 4 months, with the percentage employed highest among urban/peri-urban dwellers (44%) and lowest among fisher folk (21.8%) (*Table 13*). Among those employed, petty trading was the most common form of employment across all livelihood zones and overall (80.8%). Most of those employed earned cash (70.3%) and less than a third (26.3%) were paid cash and in-kind.

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

Variable	Livelihood zone				Overall
	Pastoral	Agro-pastoral	Fisher folk	Urban/ peri-urban	
Employed in the past 4 months	25.0	33.2	21.8	44	29.4
Number of caregivers	**334**	**156**	**83**	**279**	**852**
Kind of work					
Petty/merchant trading	87.3	69.5	73.1	82.8	80.8
Farm or herd	5.7	19.6	16.8	9.4	10.8
Employed	7.0	10.9	10.1	7.8	8.3
Type of earnings					
Cash	66.5	48.1	96.6	76.6	70.3

Variable	Livelihood zone				Overall
	Pastoral	Agro-pastoral	Fisher folk	Urban/peri-urban	
Cash and in-kind	30.2	40.8	3.4	23	26.3
In-kind	3.3	0	0	0.1	1.3
Not paid	0	11.1	0	0.3	2.1
Number of caregivers employed in the past 4 months	**80**	**50**	**18**	**96**	**244**

About one-third (32.5%) of married caregivers had experienced some form of domestic violence in the previous 4 months **(Table 14).** The highest percentage was among the agro-pastoralists (38.7%) and the lowest among pastoralists (28.7%). The most common type of domestic violence experienced was physical violence (21.5%), while the least was emotional violence (16.5%). Among those who experienced domestic violence, only 9.1% 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, Turkana

Experience of domestic violence	Livelihood zone				Overall
	Pastoral	Agro-pastoral	Fisher folk	Urban/peri-urban	
Experienced any kind of domestic violence	28.7	38.7	38.5	30.9	32.5
Experienced physical violence	18.6	26.3	23	22.8	21.5
Experienced emotional violence	14.7	19.2	17.3	17.4	16.5
Experienced sexual violence	17.0	28.8	21.3	15.1	19.2
Number of caregivers	**397**	**187**	**106**	**368**	**1058**
Sought help to stop domestic violence	7.3	15.9	8.7	6.7	9.1
Number of caregivers who experienced any form of domestic violence	**120**	**69**	**38**	**120**	**347**

3.7 FACTORS ASSOCIATED WITH ACUTE MALNUTRITION

Mother's nutritional status was the only factor that was significantly associated with acute malnutrition based on WHZ in children (*Table 15*). There was an increased odds of acute malnutrition among children of underweight mothers compared to children of normal weight mothers/caregivers (OR=1.83, 95% CI 1.16 – 2.89). When acute malnutrition was assessed using MUAC, gender of household head and caregiver alcohol consumption were the only factors that showed significant association with acute malnutrition (*Annex 8*). The odds of

acute malnutrition were two times higher among children in female-headed households than in male-headed households (OR=2.10, 95% CI 1.01– 4.37) and about three and a half times higher among children whose caregivers' consumed alcohol than among those whose caregivers were not alcohol consumers (OR=3.49, 95% CI 1.39 – 8.79).

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

Variable	aOR[1]	95% CI	P-value
Community level factor			
Livelihood zones (Ref: Urban/peri-urban)			
Pastoral	1.09	0.59 – 2.01	0.792
Agro-pastoral	0.83	0.42 – 1.67	0.605
Fisher folk	1.73	0.85 – 3.55	0.132
Household factors			
Gender of household head (Ref: Male)			
Female	1.38	0.86 – 2.21	0.185
Age of the household head (Ref: <25 years)			
25–34 years	1.11	0.38 – 3.23	0.844
35+ years	1.44	0.47 – 4.39	0.520
Source of income from sale of livestock (Ref: No)			
Yes	0.46	0.17 – 1.20	0.110
Caregiver factors			
Age (Ref: >25 years)			
25–34 years	1.38	0.72 – 2.65	0.337
35+ years	1.44	0.66 – 3.15	0.363
Current consuming alcohol (Ref: No)			
Yes	1.99	0.97 – 4.10	0.061
Nutrition status (Ref: Not underweight)			
Underweight	1.83	1.16 – 2.89	0.010
Child factors			
Sex (Ref: Female)			
Male	1.17	0.74 – 1.85	0.517
Age (Ref: < 12 months)			
12–23 months	0.94	0.50 – 1.75	0.836
24+ months	1.72	0.92 – 3.21	0.087
Diarrhea in the last 2 weeks (Ref: No)			

Variable	aOR[1]	95% CI	P-value
Yes	1.22	0.75 – 1.99	0.419
Fever in the last 2 weeks (Ref: No)			
Yes	1.12	0.69 – 1.83	0.643
Consumption of sweet beverages (Ref: No)			
Yes	1.11	0.69 – 1.79	0.676

[1]The variables are mutually adjusted for each other.

4.   DISCUSSION

This study provides the first insights into temporal changes in acute malnutrition and its determinants in Turkana County.

The lower percentage of household heads involved in livestock herding at Wave 2 than at Wave 1 was probably because of a higher loss to follow-up in this group (Annex 4).

The significant increase in the percentage of severely food insecure households and significant decrease in the proportion of households experiencing water insecurity, climatic shocks, and biological shocks is probably linked to seasonality: Wave 1 was conducted during the lean season (the reference period overlapped with the long rains season), and Wave 2 was conducted during the short rains period.

The prevalence of acute malnutrition remained unchanged between Wave 1 and Wave 2 when measured by WHZ but significantly declined when measured by absolute MUAC (MUAC not adjusted for age). The reduction in the prevalence of acute malnutrition based on MUAC could be because MUAC may increase with child's age [9, 10] and thus fail to reflect improvement in acute malnutrition during follow-up. This could also explain the lower percentage of children who transitioned to acute malnutrition based on MUAC (2.6%) than on WHZ (7.3%).

Complementary feeding remained generally poor based on all indicators, with a significant reduction in the minimum meal frequency and an increase in the use of sweet beverages between the survey waves. This is not surprising given that there was no specific intervention to improve complementary feeding during the study interval. The increase in consumption of sweet beverages may be related to changes in sampled children's diets as they age.

The prevalence of child morbidity (cough, fever, or diarrhea) in the 2 weeks preceding the survey increased between the waves. This could be season- and age-related, i.e., children becoming more exposed to the external environment including food and becoming less likely to be breastfed as they age.

The percentage of caregivers who met the MDD remained extremely low and significantly declined between the survey waves. The mean number of food items consumed in the past 24 hours remained low and unchanged between the survey waves. There was a notable significant reduction in the consumption of dairy products, probably due to higher attrition among households whose heads were involved in livestock herding.

The percentage of women empowered in key decision-making significantly increased between the waves, with limited variation by livelihood zone. This was unexpected given the

short time period and lack of any specific intervention to promote empowerment. Questions on caregiver employment and experience of domestic violence referred to different time frames at Wave 1 (past 12 months) and Wave 2 (past 4 months), making it impossible to assess any changes. This was done to ensure the reference period at Wave 2 did not overlap with that at Wave 1.

4.1   IMPLICATIONS FOR PROGRAMMING/RECOMMENDATIONS

Interventions should be geared toward strengthening the county government community health system (CHS) capacities as well as promoting community-based approaches to prevent and manage common illnesses.

Strengthen the existing CHS to enable community health volunteers to undertake nutrition; water, sanitation, and hygiene (WASH); and health promotion roles appropriately. This will include capacity-building of health care workers, strengthening advocacy and education on optimal maternal, infant, and young child nutrition (MIYCN) practices with a focus on complementary feeding and women's dietary diversity and promoting and scaling up community-based interventions such as the baby-friendly community initiative and integrated community-based case management.

Strengthen the implementation of the social and behavior change communication strategy appropriate for various target groups in the community on MIYCN and health through sustainable model programs and/or platforms to enhance information sharing and create a conducive environment for adoption of behavior change.

Enhance the scale-up of high-impact nutrition interventions for the prevention and management of all forms of malnutrition. This can be done through strengthening of routine growth monitoring for children, building the capacity of mothers to utilize mother-led-MUAC for early detection and screening of malnutrition at community level, and increasing community and individual capacity to practice nutrition and demand for nutrition services, for example through mother-to-mother support groups.

Initiate father support groups and enhance community management of acute malnutrition and community integrated outreach, including mobile clinics, and strengthen nutrition supplementation programs.

Create conducive and sustainable environments that attract investment in food value chains, especially enhancing access to markets, food price regulation, and promoting resilience and diversified livelihoods to facilitate improved financial incomes to households, thereby increased food purchasing power.

Strengthen women's empowerment programs to enhance women's capacity to own productive assets, enhance their income base through financial literacy and support formation of saving groups, and increase their access to financial service providers for savings and credit facility.

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ANNEXES

ANNEX 1. TURKANA 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	Quantitative Component Lead, APHRC
Dr. Calistus Wilunda	Longitudinal Study 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, MC
Ms. Esther Anono	Research Officer, APHRC
Ms. Hazel A. Odhiambo	Research Officer, APHRC
Mr. Godfrey Wafula	Field Research Coordinator, RTI
Mr. John Ebei	Study Field Coordinator, APHRC
Mr. Gabriel Ekuwam	USAID Nawiri Field Director
Mr. Peter Ingolan	Government Engagement Manager
Mr. Benson Mutiso	Monitoring and Evaluation Officer, CARITAS
Mr. Edwin Chemiron	Monitoring and Evaluation Coordinator, Mercy Corps
Mr. Emmanuel Essau Eruppe	Livestock and Agriculture Officer
Mr. Jacob Esinyen Emanikor	Sub-County Nutrition Coordinator, Ministry of Health
Mrs. Fridah Asimit Ekaudu	Nutrition Coordinator Turkana West, Ministry of Health
Mrs. Cynthia Ekato	County Nutrition Coordinator, Ministry of Health
Mr. Julius Gogong	County Monitoring and Evaluation Officer, Ministry of Health
Mr. Lucas Edete	County Community Strategy Focal Person, Ministry of Health
Mr. Dennis Mosioma	County Information Officer, NDMA

ANNEX 2. 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 3. HOUSEHOLD RESPONSE RATE AT WAVE 2, TURKANA

Table 3-1. Household response rate Wave 2, Turkana

Result of interview	Survey zone				Total
	Central	North & Kibish	South & East	West	
Sampled households	**355**	**144**	**396**	**316**	**1211**
Completed	294	131	364	279	1068
Incomplete	1	0	0	2	3
Absent	**42**	**10**	**26**	**33**	**111**
Dwelling vacant/address not a dwelling	16	0	0	0	16
Dwelling destroyed	0	3	0	0	3
Dwelling not found	0	0	0	0	0
Postponed	**0**	**0**	**0**	**1**	**1**
Repeated household (duplicates)	1	0	3	0	4
Refused	1	0	3	1	5
Total	**355**	**144**	**396**	**316**	**1211**
Response rate (%) [1]	**83%**	**91%**	**92%**	**88%**	**88%**

[1] (Completed/Total households) *100

ANNEX 4. A COMPARISON OF THE BASELINE CHARACTERISTICS OF PARTICIPANTS SURVEYED AT WAVE 2 AND THOSE LOST TO FOLLOW-UP, TURKANA

Table 4-1. Baseline characteristics comparison of participants surveyed

Characteristic	Surveyed at Wave 2	Lost to follow-up	*P*-value
Livelihood zone			**0.018**
Pastoral	62.9	70.4	
Agro-pastoral	14.0	19.8	
Fisher folks	16.4	4.3	
Urban/peri-urban	6.7	5.5	
Survey zone			**0.283**
Central	20.6	24.0	
North	26.6	19.5	
South	24.8	19.2	
West	28.0	37.4	
Sex of household head			**0.413**
Male	61.0	67.9	
Female	39.0	32.1	
Head of household age (years)			**0.329**
<25	9.9	17.5	
25–34	34.9	32.7	
35+	55.2	49.8	
Head household occupation			**0.007**
Livestock herding	46.8	61.9	
Merchant/trader	25.3	14.1	
Farming	6.5	8.2	
Unemployed	6.3	6.9	
Employed/salaried	1.8	4.9	
Self-employed[1]	13.3	4.0	
Household wealth tertile			**0.952**
Lowest	40.8	42.4	
Middle	39.7	39.5	
Highest	19.5	18.1	
Caregiver characteristics			

Characteristic	Surveyed at Wave 2	Lost to follow-up	P-value
Age (years)			**0.213**
<25	18.4	28.5	
25–34	48.9	39.5	
35+	32.7	32.0	
Mother to index children			**0.250**
No	8.5	5.1	
Yes	91.5	94.9	
Highest level of education			**0.402**
No formal education	86.5	86.0	
Primary	11.9	10.1	
Post-primary	1.7	3.9	
Marital status			**0.884**
Not in union	14.7	15.3	
In union	85.3	84.7	
Polygamy marriage			**0.325**
No	51.6	40.4	
Yes	33.7	44.4	
No response/don't know	14.7	15.3	
Current pregnancy status			**0.135**
No	88.3	93.4	
Yes	11.7	6.6	
Child characteristics			
Gender			**0.939**
Female	48.2	48.8	
Male	51.8	51.2	
Age (months)			**0.222**
0–11	41.7	51.7	
12–23	31.2	29.6	
24–35	27.1	18.7	
Number of households	**1068**	**143**	

[1] e.g., Boda boda, welding, and carpentry

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

Table 5-1. Prevalence of acute malnutrition among children 5 years or under

Variable	GAM (WHZ < -2SD)				GAM (MUAC <= 125mm)		
	Wave 1	Wave 2	*P*-value		Wave 1	Wave 2	*P*-value
Livelihood zone							
Pastoral	18.6	18.0	0.428		15.9	8.6	<0.001
Agro-pastoral	21.4	17.2			19.4	10.1	
Fisher folks	32.3	28.8			20.8	11.9	
Urban/peri-urban	23.8	16.4			20.7	10.2	
Survey zone							
Central	21.9	29.0	0.207		15.6	10.9	<0.001
North	24.9	20.6			14.4	9.6	
South	24.0	16.4			18.1	9.2	
West	15.9	14.1			21	9.6	
Child's sex							
Female	22.2	18.6	0.165		21.7	10.3	<0.001
Male	20.7	20.3			13.5	9.2	
Child's age (months)							
0–11	15.5	14.7	0.302		18.7	11.2	<0.001
12–23	25.9	14.9			22.8	10.2	
24+	25.9	25.0			10.2	9.0	
Caregiver's age (years)							
<25	15.3	13.2	0.366		17.6	6.9	<0.001
25–34	23.9	19.5			21.6	10.7	
35+	21.3	23.2			12.0	10.0	
Marital status							
Not in union	20.5	19.4	0.345		19.2	14.0	<0.001
In union	21.6	19.5			17.1	9.0	
Caregiver's highest level of education							
No formal education	20.9	20.0	0.699		16.5	9.3	<0.001
Primary	23.1	17.5			24.5	13.2	
Post-primary	33.5	8.8			19.7	7.0	

	GAM (WHZ < -2SD)				GAM (MUAC <= 125mm)		
Caregiver is underweight							
Yes	20.0	16.4	0.008		16.7	8.2	<0.001
No	25.1	25.5			20.3	12.3	
Household CSI index							
No/low/medium coping	27.6	20.2	0.056		9.6	7.0	<0.001
High coping	20.7	19.4			18.4	10.0	
Household food insecurity experience							
Mild/moderate	17.4	29.0	0.542		13.1	24.3	<0.001
Severe	21.8	19.1			17.9	9.2	
Household wealth tertile							
Lowest	19.4	21.0	0.216		12.1	9.5	<0.001
Middle	20.8	18.0			18.3	9.1	
Highest	26.9	19.1			28	11.8	
Appropriate toilet facility							
No	19.7	19.5	0.683		15.9	9.3	<0.001
Yes	42.1	19.4			37.7	14.6	
Household water insecurity experience							
No	23.8	24.6	0.019		17.3	12.8	<0.001
Yes	20.6	15.7			17.5	7.5	
Number of children	**1184**	**1031**			**948**	**1023**	

ANNEX 6. PREVALENCE OF STUNTING AND UNDERWEIGHT AMONG CHILDREN UNDER 5 YEARS BY SURVEY WAVE AND BACKGROUND CHARACTERISTICS, TURKANA

Table 6-1. Prevalence of stunting and underweight of children under 5 years

| | Stunting (HAZ < -2SD) | | | | | Underweight (WAZ < -2SD) | | | |
| | Wave 1 | | Wave 2 | | | Wave 1 | | Wave 2 | |
	%	*P*-value	%	P-value		%	P-value	%	P-value
Livelihood zone									
Pastoral	26.1	0.105	28.5	0.923		29.1	0.082	33.3	0.085
Agro-pastoral	33.8		30.1			40.1		32.1	
Fisher folks	20.4		26.3			30		28.7	
Urban/peri-urban	21		29.5			29.6		21.5	
Survey zone									
Central	24.5	0.555	25.6	0.043		31.7	0.837	32.8	0.626
North	22.9		25.9			30.1		25.8	
South	25.5		24.1			32.9		31.8	
West	30.6		37.3			29.4		29.4	
Child's sex									
Female	20.5	0.002	19.7	< 0.001		27.1	0.042	23	< 0.001
Male	31.4		36.7			34.5		36	
Child's age (months)									
0–11	11.9	< 0.001	8.7	< 0.001		16.5	< 0.001	17.2	< 0.001
12–23	31.7		24.7			36.5		22.5	
24+	43.2		38.6			48.1		40	
Caregiver's age (years)									
<25	20.9	0.069	32.4	0.417		20.5	0.072	24.2	0.345
25–34	23.4		24.8			32.1		29.5	
35+	33.2		32.1			35.4		33.3	
Marital status									
Not in union	33.2	0.147	27.1	0.75		33.4	0.648	26.2	0.417
In union	24.9		28.8			30.5		30.4	
Caregiver's highest level of education									

	Stunting (HAZ < -2SD)				Underweight (WAZ < -2SD)			
	Wave 1		Wave 2		Wave 1		Wave 2	
	%	*P*-value	%	*P*-value	%	*P*-value	%	*P*-value
No formal education	26.7	0.44	29.4	0.217	31.7	0.326	30.5	0.374
Primary	23.7		24.5		26.5		26.2	
Post-primary	15.1		13.6		20		17.6	
Caregiver is underweight								
No	24.6	0.276	27.4	0.452	29	0.225	26.3	0.029
Yes	28.5		30.8		34		36.3	
Household below national poverty line								
No	26.2	0.484	29	0.015	31.1	0.198	30	0.221
Yes	18.7		9.2		16.7		17.8	
Household CSI index								
No/low/ medium	24.7	0.792	20.5	0.221	31.5	0.913	27.2	0.667
High	26.3		29.6		30.8		30.1	
Household wealth tertile								
Lowest	27.4	0.597	34	0.135	30.9	0.82	33.4	0.309
Middle	26.7		26.2		32		27	
Highest	22.1		21.9		28.7		27.9	
Household with appropriate toilet facility								
No	26.1	0.93	28.4	0.808	30.2	0.124	29.7	0.912
Yes	25.6		29.9		39.8		30.3	
Overall %	26.1		28.6		30.9		29.7	
Number of children	**1184**		**1057**		**1194**		**1063**	

ANNEX 7. A COMPARISON OF FOOD GROUPS CONSUMED BY CHILDREN 6 MONTHS AND ABOVE BY SURVEY WAVE, TURKANA

Figure 7-1. Comparison of food groups consumed by children 6 months and older
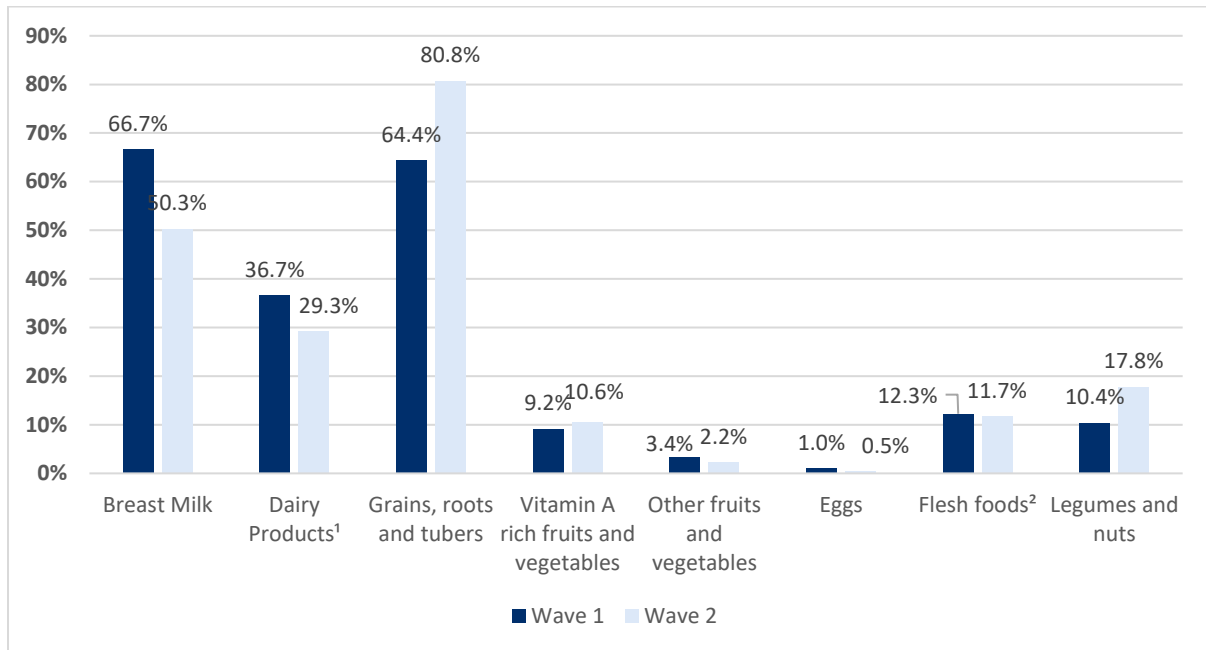
1 Dairy products include cheese, yogurt, milk, and other milk products
2 Flesh foods include meat, poultry, fish, and organ meat

ANNEX 8. MULTIVARIABLE LOGISTIC REGRESSION ANALYSIS OF FACTORS ASSOCIATED WITH ACUTE MALNUTRITION AMONG CHILDREN AT WAVE 2 BASED ON MUAC

Table 8-1. Multivariable logistic regression analysis associated with acute malnutrition

Variable	aOR[1]	95% CI	*P*-value
Community level factors			
Livelihood zones (Ref: Urban/peri-urban)			
Pastoral	0.59	0.22 – 1.59	0.298
Agro-pastoral	0.76	0.22 – 2.61	0.668
Fisher folk	1.12	0.34 – 3.67	0.858
Household factors			
Gender of household head (Ref: Male)			
Female	2.10	1.01 – 4.37	**0.049**
Age of the household head (Ref: <25 years)			
25–34 years	1.31	0.29 – 6.02	0.726
35+ years	0.98	0.18 – 5.32	0.981
Caregiver factors			
Age (Ref: Above 25 years)			
25–34 years	1.89	0.78 – 4.57	0.158
35+ years	1.35	0.40 – 4.48	0.630
Polygamy (Ref: No)			
Yes	0.67	0.32 – 1.39	0.281
Current consuming alcohol (Ref: No)			
Yes	3.49	1.39 – 8.79	**0.008**
Nutrition status (Ref: Not underweight)			
Underweight	1.84	0.89 – 3.79	0.098
Decides over the use of household income (Ref: No)			
Yes	0.54	0.26 – 1.12	0.096
Child factors			
Sex (Ref: Female)			
Male	0.81	0.41 – 1.74	0.656
Age (Ref: < 12 months)			
12–23 months	0.85	0.35 – 2.06	0.710
24+ months	0.83	0.34 – 2.04	0.688
Diarrhea in the last 2 weeks (Ref: No)			

Variable	aOR[1]	95% CI	*P*-value
Yes	1.79	0.85 – 3.77	0.125
Fever in the last 2 weeks (Ref: No)			
Yes	1.80	0.89 – 3.64	0.104

[1]The variables are mutually adjusted for each other.

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