# SMART+ Survey Report

**Hambela Wamena woreda, West Guji zone of Oromiya region,Ethiopia**

**January 2025**

**Rapid Smart**

**Validated**

**Funded by the Foreign, Commonwealth and Development Office (FCDO).**
**Assessment Coordinated by: REACH, Alinoor Mohamed Farah, Associate Research Manager**

**Technically Supported by: IMPACT Initiatives**

# 1. Acknowledgements

We express our profound gratitude to all individuals including the enumerators, drivers and organizations involved in the successful completion of the Rapid SMART+ survey in Hambela Wamena district, West Guji zone, Oromia region, on behalf of the REACH Initiative.

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## 2. Acronyms

| | |
|---|---|
| AFI | Acute Febrile Illness |
| ARI | Acute Respiratory Infection |
| DEFF | Design Effect |
| DRMB | Disaster Risk Management Bureau |
| DRMC | Disaster Risk Management Commission |
| ENA | Emergency Nutrition Assessment |
| FCDO | Foreign, Commonwealth & Development Office |
| FEWSNET | Famine Early Warning Systems Network |
| GAM | Global Acute Malnutrition |
| HAZ | Height-for-Age Z-score |
| IPC | Integrated Food Security Phase Classification |
| MUAC | Mid/Upper Arm Circumference |
| ORS | Oral Rehydration Solution |
| OTP | Outpatient Therapeutic Program |
| PPS | Probability Proportion to Size |
| PSU | Primary Sampling Unit |
| RENCU | Regional Emergency Nutrition Coordination Unit |
| SAM | Severe Acute Malnutrition |
| SBCC | Social Behavior Change Communication |
| SMART | Standardized Monitoring and Assessment for Relief and Transitions |
| SOP | Standard Operating Procedures |
| UNICEF | United Nations Children's Fund |
| WASH | Water, Sanitation and Hygiene |
| WHO | World Health Organization |
| WHZ | Weight-for-Height Z-score |

# 3. Executive Summary

### Introduction

The Rapid SMART+ Survey was conducted by the REACH Initiative in Hambela Wamena woreda of the West Guji zone, located in the Oromia region. The survey was carried out from January 25 to 29, 2025, which coincided with the lean season. The **primary objectives** of the survey were to assess the acute malnutrition situation and childhood morbidity and health seeking behaviors among children aged 6-59 months in Hambela Wamena district of West Guji zone.

### Methodology

A cross-sectional household survey was conducted to gather data on anthropometry, child morbidity and health seeking behavior. Using a two-stage cluster sampling method based on the SMART methodology, clusters were first selected randomly with probability proportional to size (PPS) to ensure equal chances for every household. Clusters, defined as Gare, were then sampled in the second stage using simple random sampling. The sample size was calculated as 25 clusters, based on the Rapid SMART guidance, as the percentage of children under the age of 5 years was above 15%. Ultimately, 25 clusters were selected, with each cluster comprising 11 households. All clusters (100%) were successfully reached.

### Discussion and conclusions

The nutritional assessment in Hambela Wamena revealed varying acute malnutrition rates depending on measurement criteria. Using weight-for-height z-scores (WHZ) and edema, the global acute malnutrition (GAM) prevalence was 6.2% (5.1% moderate, 1.1% severe), rising to 7.2% with mid-upper arm circumference (MUAC) and edema, and 9.0% when combining both methods. Although the survey coincided with the lean season, a period of heightened food insecurity, it overlapped with the coffee harvest, which likely temporarily bolstered household income and food access. Despite this, WHZ-based GAM (6.2%) falls within the “medium” public health severity classification, underscoring the need for sustained monitoring and targeted interventions to address persistently high malnutrition rates.

**Table 1:** Summary of Findings

| Child Nutritional Status Outcomes | | | |
|---|---|---|---|
| **Indicator** | **Denominator (N)** | **Numerator (n)** | **Result (95% CI)** |
| GAM prevalence among children 6-59 months per WHZ < -2SD* | 276 | 17 | 6.2% (3.7%, 10.0%) |
| SAM prevalence among children 6-59 months per WHZ < -3SD | 276 | 3 | 1.1% (0.3%, 3.3%) |
| GAM prevalence among children 6-59 months per MUAC <125 mm | 277 | 20 | 7.2% (4.4%, 11.6%) |

| Child Nutritional Status Outcomes | | | |
|---|---|---|---|
| **Indicator** | **Denominator (N)** | **Numerator (n)** | **Result (95% CI)** |
| SAM prevalence among children 6-59 months per MUAC <115 mm | 277 | 6 | 2.2% (1.0%, 4.5%) |
| Combined GAM prevalence among children 6-59 months per WHZ < -2SD or MUAC <125 mm | 277 | 25 | 9.0% (5.9%, 13.5%) |
| Combined SAM prevalence among children 6-59 months per WHZ < -3SD or MUAC <115 mm | 277 | 7 | 2.5% (1.3%, 4.9%) |
| Stunting among children 6-59 months per HAZ < -2SD (*estimated at 1 SD) | 265 | 155 | 63.6% |
| Underweight among children 6-59 months per WAZ < -2SD | 275 | 85 | 30.9% (24.7%, 37.9%) |
| Severe underweight among children 6-59 months per WAZ < -3SD | 275 | 34 | 12.4% (8.5%, 17.7%) |
| Prevalence of ARI symptoms | 277 | 3 | 1.1% (0.2%, 4.8%) |
| Prevalence of Fever | 277 | 65 | 23.4% (16.4%, 32.3%) |
| Prevalence of Diarrhea | 277 | 57 | 20.5% (14.1%, 28.8%) |
| ORS use during diarrhoea episode | 57 | 28 | 49.1% (29.4%, 69.2%) |
| Zinc tablet or syrup use during diarrhoea episode | 57 | 30 | 52.6% (34.2%, 70.3%) |
| ORS and zinc tablet or syrup use during diarrhoea episode | 57 | 26 | 45.6% (26.4%, 66.3%) |

**Table 2:** Recommendations

| Summary findings | Recommendations[1] |
|---|---|
| Nutrition status of children 6-59 months | Immediate |

[1] *Developed in consultation with program/humanitarian actors.*

| Summary findings | Recommendations[1] |
|---|---|
| • The prevalence of GAM among children aged 6-59 months, as defined by WHZ < -2SD, was 6.2%. **According to the classification by WHO/UNICEF, this falls into the medium category**. | • Strengthen Community-Based Nutrition Programs: Scale up Community-Based Management of Acute Malnutrition (CMAM) to effectively target both moderate and severe acute malnutrition, ensuring early detection and treatment.<br>• Implement social behavior change communication strategies (SBCC) to address underlying causes of malnutrition. |
| Health<br>• Prevalence of fever, diarrhea and ARI symptoms in the two weeks preceding the survey for children aged 6-59 months was 23.4, 1.1% and 20.5% respectively.<br>• 66.7, 63.1 and 68.4% of children with ARI, fever and diarrhea sought treatment respectively.<br>• 49.1, 52.6 and 45.6% of children with diarrhea, used ORS, Zinc tablet/syrup and ORS and Zinc tablet/syrup respectively. | Immediate<br>• Strengthen integrated management of childhood illness programs (IMCI).<br>Intermediate<br>• Improve adherence to treatment protocols by increasing the coverage of combined ORS and zinc for diarrhoea to at least 80–90% and ensure prompt treatment of fever and ARI to prevent complications.<br>• Scaling-up of integrated health and nutrition outreach activities in to improve coverage of the interventions to populations that are far from the health center catchment areas. |

# 4. Introduction

## 4.1. Organization

REACH Initiative was formed in 2010 as a joint initiative of IMPACT Initiatives (IMPACT) (a Geneva-based think-and-do-tank), its sister organization, the INGO Agency for Technical Cooperation and Development (ACTED), and United Nations Operational Satellite Applications Programme (UNOSAT), to promote and facilitate the development of information products that enhance the humanitarian community's decision-making and planning capacity. REACH is responsible for supporting humanitarian coordination mechanisms through non-proprietary information shared across organizations.

## 4.2. Background Information

West Guji zone lies in southern Oromia, Ethiopia. This zone shares borders with Borena to the south, the South Ethiopia Regional State to the west, the Gedeo Zone of South Ethiopia and Sidama Region to the north, and the Guji Zone to the east. Bule Hora serves as the administrative hub for West Guji.[2] Hambela Wemana woreda is one of the woredas in the Guji zone with total population of 150,487, with 74,580 males and 75,907 females. Only 1.61% of the population, lived in urban areas. The religious composition of the district was predominantly Protestant, with 73.62% of inhabitants adhering to this faith. Traditional beliefs were practiced by 11.84% of the population, while 3.97% identified as Muslim, 3.24% as Catholic, and 2.68% as Ethiopian Orthodox Christian.[3]

In West Guji, 43% of households reported poor food consumption. Key drivers of food security include land size, livestock ownership, and access to credit/extension services. Coping strategies such as market purchases, agricultural production, labor-for-food exchanges, social support, and foraging remain critical.[4]

The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) reported in 2018 that approximately one million individuals were estimated to be displaced in the regions of Gedeo and West Guji Zones.[5]

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[2] "West Guji". oromia.gov.et.

[3] Population Size by Sex, Area and Density by Region, Zone and Wereda: July 2023. Ethiopian Statistics Service. 2023. https://www.statsethiopia.gov.et/wp-content/uploads/2022/07/Population-Size-by-Sex-Zone-and-Wereda-July-2023.pdf

[4] NEEDS ASSESSMENT REPORT (2024-2025) GUJI AND WEST GUJI, OROMIA, ETHIOPIA

[5] "Ethiopia: Escalating inter-communal violence displaces close to 1M people". United Nations Office for the Coordination of Humanitarian Affairs. 27 June 2018.

#### 4.2.1. Survey Area

*Survey Population*

The target population for this survey is General population.

#### 4.2.2. Humanitarian Assistance

Ethiopia Wetlands and Natural Resources Association (EWNRA), in partnership with Menschen für Menschen Switzerland (MfM CH), are implementing resilient project that supports the smallholder farmers. The project aims to support over 33,000 beneficiaries, 50% of whom are women by targeting smallholder farmers and vulnerable communities in eight kebeles. The initiative will deliver improved agricultural inputs on a revolving basis, youth economic empowerment, access to revolving funds, safe drinking water, cooperative strengthening, and community capacity building.

#### 4.2.3. Health and Safety Situation Update

In the woreda where the survey was conducted, there were no health-related issues and security was stable, although a few incidents were reported in a neighboring woreda.

### 4.3. Survey Type

The survey type used was a Rapid Smart+ survey.

### 4.4. Survey Timing

The survey was carried out from January 25 to 29, 2025, which coincided with lean season.

The survey lasted for 5 day(s).

### 4.5. Type of Setting

This survey took place in the Rural area of the survey location.

### 4.6. Survey Location

The survey took place in Hambela Wamena, West Guji Zone, Ethiopia. A total of 30 Kebeles were selected, then Zones were selected under each Kebele, followed by Gari under each Zone where households were selected.

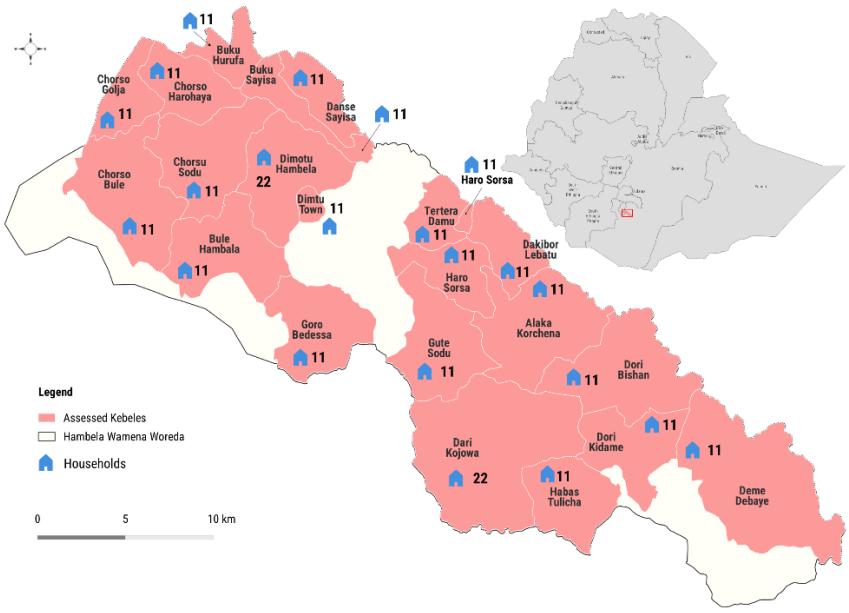



Figure 1: Map of the woreda where the Rapid SMART+ was conducted

### 4.7. Excluded Areas

No Kebele was excluded.

## 5. Survey Goal and Objectives

### 5.1. Survey Goal and Primary Objective

The overall objective of the Rapid SMART Survey was to assess the acute malnutrition situation and childhood morbidity and health seeking behaviors among children aged 6-59 months in Hambela Wamena district of West Guji zone.

### 5.2. Specific Survey Objectives

- To estimate the prevalence of acute malnutrition (Weight for Height and by MUAC), stunting (Height for Age) and underweight (Weight for Age) among children aged 6 – 59.
- To assess retrospective childhood morbidity and health seeking behaviors among children aged 6-59 months two weeks prior to the survey.

### 5.3. Survey Justification

Between January and September 2024, health facilities in West Guji reported a total of 22,231 cases of severe acute malnutrition (SAM), averaging 2,480 cases per month which is an

unusually high figure given historical trends in the zone.[6] In Hambela Wamena district specifically, SAM cases averaged 286 per month during this period, with the highest incidence recorded in September at 542 cases. Additionally, a multi-sectoral needs assessment (MSNA) conducted by the REACH Initiative in September 2024 identified gaps in food security, healthcare access, and child health in these areas. Approximately 59% of households scored borderline on the food consumption scale and 21% facing emergency-level livelihood coping strategies. Child health indicators further highlighted gaps in preventive care, with only 44% of children receiving Vitamin A supplementation and 23% receiving deworming treatment in the past six months. Considering the increase in SAM cases, alongside food security and health challenges, the federal and Oromia ENCU recommended a rapid SMART survey to verify the rise in SAM cases in the target district.

# 6. Methodology

## 6.1. Survey Design

### *6.1.1. Sample Size*

A cluster sampling methodology was employed for this survey, chosen for its efficiency and reliability in large-scale, population-based assessments like the SMART survey. This approach enables the systematic selection of clusters that represent the diverse characteristics of the population, which is crucial in resource-limited settings. Anthropometric data were prioritized to determine the sample size, ensuring accurate estimates of the malnutrition indicators.

For cluster sampling, the number of clusters and households per cluster were determined to achieve statistical power while balancing logistical constraints. An optimal number of clusters was calculated to maintain representativeness, and a manageable number of households per cluster was selected to ensure data quality while minimizing the survey duration and resource use.

All calculations were performed using SMART+ platform. The parameters for calculating the sample size are detailed in the tables below.

**Table 3:** Sample Size Calculation of Anthropometry

| Parameters for Anthropometry | Value | Assumptions/Justifications based on context (footnote any references used) |
|---|---|---|
| % Children under-5 | 15% | Based on the based on the woreda health office 2024 conversion factor for under five |
| **Households to be included** | 250 | Based on Rapid SMART guidance when the percentage of children under the age of 5 years is above 15%, the final sampling procedure should be: 25 clusters each comprised of 10 households. |

[6] Oromia Regional ENCU. (October 2024). Program Data.

### 6.1.2. Sampling Method

This survey applied a two-stage cluster sampling using the SMART methodology with the clusters (primary sampling unit) being selected using the probability proportional to population size (PPS). Stage one sampling involved the sampling of the clusters to be included in the survey while the second stage sampling involved the selection of the households from the sampled cluster. For this assessment, a cluster is defined as the smallest unit in the woreda, which in this case it is a Gare.

### 6.1.3. Second Stage Sampling Method

At second stage, households were selected using the simple random sampling within the cluster. In each area, the households list was updated on the start of data collection day in collaboration with village leaders. The team selected households to be interviewed using random generator number mobile app (RGN) according to the target number of households per cluster, which was 11 HHs, regardless of the number of children interviewed. First, zones were selected using probability proportional to size (PPS). Garis (clusters) were then selected via simple random sampling if the number of households in each Gari was nearly equal, or via PPS if household numbers varied significantly. Within each Gari, survey teams generated a random number between 1 and the total number of households using a random number generator (RNG). This number determined the starting point (specific household) within the segment to initiate data collection, ensuring an unbiased sampling process.

### 6.1.4. Sampling Procedure – Cluster Sampling

Population data was initially collected at the district level by REACH field officers 2 weeks before actual data collection. This data collection occurred at both the kebele and zonal levels. Using the SMART+ platform, a total of 25 clusters were randomly selected based on the Probability to Population Size (PPS) technique. This approach ensured that every household in district had an equal chance of being chosen, irrespective of zone size. All selected cluster were reached.

In instances of empty households or were abandoned, replacements were not made, as non-response was factored into the sample size calculations. However, households with absent children were revisited at the end of the day, and if still absent during the second visit, their absence was recorded in the cluster control form.

Initially, zones were selected using the PPS method, and then Garis were chosen using simple random sampling if the number of households in each Gari was nearly equal or using PPS if there was variability in the number of households per Gari. Subsequently, teams randomly selected a number within the range of one to the total number of households in each Gari using a random number generator (RGN).

### 6.1.5. Training, Team Composition, and Supervision

The SMART+ survey was conducted by five survey teams, each comprised a measurer and an assistant measurer. Most of the enumerators had a background in health with a minimum qualification of a bachelor's degree. Daily monitoring was conducted to verify the accuracy and consistency of data through regular field visits, cross-checking, and plausibility testing via the SMART+ platform by the SMART manager. Additionally, the survey manager and two local supervisors provided supervision and oversight of the field team, ensuring the overall management of the survey.

Before commencing field data collection, the survey team underwent two days of SMART methodology training. They were trained by one SMART+ certified manager. The SMART training tools and presentations were customized to align with the survey's objectives and were utilized throughout the training sessions. Topics covered during the training included survey objectives, household selection strategies, demonstration and standardization of anthropometric measurements, data collection techniques, interview skills through group work.

### 6.1.6. Referral

Survey teams were provided with referral forms for children diagnosed as severely or moderately malnourished. For MUAC, children with measurements <115 mm were considered severe while those between ≥115mm and <125mm were considered moderate cases. Additionally, children identified as severely malnourished—with WHZ < -3, OR MUAC < 115 mm, OR with bilateral pitting edema they were referred to the nearest health center or health post.

### 6.1.7. Data Analysis

Data collection was conducted using smartphones equipped with the SMART Collect application. Daily feedback on the quality of the data was provided to the survey teams by the Survey Manager, who also offered support on enhancing the quality of the measures based on plausibility checks. The SMART+ platform was utilized to automatically analyze anthropometric data and additional indicators. During the analysis process, any data flagged using SMART flag criteria was removed to ensure accuracy and reliability. Furthermore, quality checks were performed for the food security indicators, and daily feedback was provided accordingly.

# 7. Indicators: Definition, Calculations, and Interpretation

## 7.1. Overview of Indicators

The survey conducted utilized standardized integrated SMART indicators to assess health and nutrition within the surveyed population of Hambela Wamena district. For children aged 6-59 months, anthropometric measurements were taken to assess nutritional status. Additionally, episodes of Acute Respiratory Infection (ARI), diarrhoea, and fever were assessed, along with care-seeking behaviors and utilization of appropriate treatments during these episodes.

**Table 2:** Standardized Integrated SMART Indicators

| Indicator | Target Population |
|---|---|
| **Child Indicators** | |
| Anthropometry | 6-59 months |
| Episode of ARI, and care-seeking for children with ARI | 6-59 months |
| Episode of diarrhoea, care-seeking for children with diarrhoea, and use of ORS and Zinc during an episode of diarrhoea | 6-59 months |
| Episode of fever and care-seeking for children with fever | 6-59 months |

## 7.2. Anthropometric Indicators

The survey conducted comprehensive assessments of the nutritional status of children aged 6-59 months using various anthropometric indicators. These included Mid-Upper Arm Circumference (MUAC), Weight-for-Height Z-score (WHZ), Height-for-Age Z-score (HAZ), and Weight-for-Age Z-score (WAZ). MUAC measurements were employed to determine acute malnutrition status, with specific thresholds established for different categories. Children with a MUAC measurement greater than 125 mm were classified as having no malnutrition, while those with a measurement of 125 mm or less fell under the category of Global Acute Malnutrition (GAM). Within the GAM, further differentiation was made between Moderate Acute Malnutrition (MAM), defined as MUAC between 115 mm and 125 mm, and Severe Acute Malnutrition (SAM), indicated by MUAC below 115 mm.

In addition to MUAC, WHZ was utilized to assess acute malnutrition and overweight status. The criteria for WHZ categories were delineated, with thresholds for normal, undernutrition, and overweight conditions. Similarly, HAZ measurements were employed to evaluate stunting, with specific cut-off points set to distinguish between normal, moderate stunting, and severe stunting. Finally, WAZ was utilised to assess underweight status, with criteria established to differentiate between varying degrees of undernutrition.

These anthropometric indicators provided a comprehensive framework for assessing the nutritional status of children in the surveyed population. By utilising multiple indicators, the survey aimed to capture a holistic picture of nutritional status, encompassing acute malnutrition, chronic malnutrition, and underweight. The use of standardised cut-off points for each indicator enabled consistent interpretation of the data and facilitated comparisons across different populations and contexts.

**Table 3:** MUAC cut off points for children 6-59 months.

| Nutritional Status | Definition |
|---|---|
| No malnutrition | 125 mm > MUAC |
| Global Acute Malnutrition (GAM) | 125 mm ≤ MUAC |
| Moderate Acute Malnutrition (MAM) | 115 mm ≤ MUAC < 125 mm |
| Severe Acute Malnutrition (SAM) | MUAC < 115 mm |

**Table 4:** Cut off points for the WHZ index expressed in Z-score, WHO Standards

| Nutritional Status | Definition |
|---|---|
| No undernutrition | WHZ ≥ -2 and no oedema |
| Global Acute Malnutrition (GAM) | WHZ < -2 or bilateral oedema (or both) |
| Moderate Acute Malnutrition (MAM) | (-3 ≤ WHZ < -2) and absence of bilateral oedema |
| Severe Acute Malnutrition (SAM) | WHZ < -3 or bilateral oedema (or both) |
| Overweight | WHZ > 2 and no oedema |
| Moderate overweight | (2 < WHZ ≤ 3) and no oedema |
| Severe overweight | WHZ ≥ 3 and no oedema |

**Table 5:** Cut off points for the HAZ index expressed in Z-score, WHO Standards

| Nutritional Status | Definition |
|---|---|
| Not stunted | HAZ ≥ -2 |
| Stunted | HAZ < -2 |
| Moderate stunting | -3 ≤ HAZ < -2 |
| Severe stunting | HAZ < -3 |

**Table 6:** Cut off points for WAZ Index expressed in Z-scores, WHO Standards

| Nutritional Status | Definition |
|---|---|
| Not underweight | WHZ ≥ -2 |
| Global underweight | WAZ < -2 |

| Nutritional Status | Definition |
|---|---|
| Moderate underweight | -3 ≤ WAZ < -2 |
| Severe underweight | WAZ < -3 |

## 7.3. Other Indicators (Morbidity and health-seeking behaviour)

Morbidity

Morbidity refers to the prevalence of illnesses within a given population, particularly among children aged 0-59 months. The key indicators assessed in this survey include:

a. Acute Respiratory Infection (ARI) Symptoms: This refers to cases where a child experienced a cough accompanied by fast or difficult breathing due to a chest-related issue (not a blocked nose).
b. Fever: Defined as an elevated body temperature reported by caregivers, often indicating infections such as malaria or other febrile illnesses.
c. Diarrhoea: The passage of three or more loose or watery stools in a 24-hour period, as reported by caregivers.

ORS and zinc use during diarrhoea episode for children aged 0-59 months

This indicator measures the proportion of children aged 0-59 months who received oral rehydration salts (ORS) and/or zinc supplementation during an episode of diarrhoea in the two weeks preceding the survey. These treatments are recommended by WHO and UNICEF as the standard management for childhood diarrhoea to prevent dehydration and reduce illness duration and severity. The key indicators assessed in this survey include:

a. ORS Use: The proportion of children with diarrhoea who were given oral rehydration salts to prevent dehydration.
b. Zinc Supplementation: The proportion of children with diarrhoea who received zinc tablets or syrup, which helps reduce diarrhoea severity and recurrence.
c. Combined ORS and Zinc Use: The proportion of children who received both ORS and zinc as the recommended treatment.

Treatment for ARI symptoms, fever and diarrhoea for children aged 0-59 months

This indicator measures the proportion of children aged 0-59 months with ARI, fever, or diarrhoea in the two weeks preceding the survey for whom advice or treatment was sought from a recognized health facility or provider. It excludes visits to pharmacies, shops, and traditional practitioners. Seeking care from a qualified provider is essential for timely and appropriate management of common childhood illnesses, reducing morbidity and mortality risks. The key indicators assessed in this survey include:

a. Treatment for ARI Symptoms: The proportion of children with symptoms of ARI (cough with fast or difficult breathing) who were taken to a health facility or provider.
b. Treatment for Fever: The proportion of children with fever for whom medical advice or treatment was sought from a health facility or provider.
c. Treatment for Diarrhoea: The proportion of children with diarrhoea for whom care was sought from a qualified health provider.

## 8. Questionnaire

The SMART+ standard questionnaire encompassed a comprehensive set of indicators covering various domains as mentioned in the previous section.

To ensure the effectiveness and reliability of data collection, the survey team conducted a pre-test of the questionnaire in Afaan Oromo, as it is the main local language spoken in the surveyed communities. This pre-testing phase was crucial in evaluating the clarity and understandability of the questions from the perspective of the respondents. By administering the questionnaire in the local language, the team aimed to facilitate clear communication and accurate interpretation of the questions, thereby enhancing the quality and reliability of the data collected.

The pre-testing process allowed the survey team to identify any potential ambiguities or challenges in question comprehension, enabling them to refine and adjust the questionnaire accordingly. This iterative approach to questionnaire development ensured that the final instrument was culturally appropriate, linguistically accessible, and effectively captured the information needed to achieve the survey objectives.

## 9. Limitations

The results of stunting prevalence should be interpreted with caution, as the standard deviation (SD) for HAZ exceeded 1.2, indicating data quality issues, primarily due to inaccurate age estimation and observed age heaping. Therefore, HAZ prevalence was estimated at 1 SD, which is 63.6%.

# 10. Survey Findings

## 10.1. Survey Sample

For anthropometry data, the survey sample included 25 out of the planned 25 clusters, achieving a coverage of 100%.

**Table 7:** Proportion of Household and Child Sample Achieved (Anthropometry Data)

| Indicator | Value |
|---|---|
| Number of clusters planned | 25 |
| Number of clusters surveyed | 25 |
| % clusters of planned | 100% |

Table 10 provides the non-response rates (NRR) for households and children under five in the survey. Among 275 households, there were no refusals or absentees, resulting in a 0.0% non-response rate for households. For children under five, out of 278, 1 child was absent, leading to a 0.36% non-response rate.

**Table 10:** Non-Response Rates (NRR)

| Level | Consented or Measured | Refused | Absent | Sample Non-Response Rate |
|---|---|---|---|---|
| Household | 275 | 0 | 0 | 0.0%[a] |
| Children under 5 | 278 | | 1 | 0.36%[b] |

[a]*The household non-response rate (NRR) is defined as the number of households not interviewed out of all households selected for interview. The formula for HH NRR is (total HH refused + total HH absent) / (total HH consented + total HH refused + total HH absent).*

[b]*The child non-response rate (NRR) is defined as the number of unmeasured children out of all eligible children. The formula for the child NRR is (total eligible children absent) / (total eligible children measured + total eligible children absent).*

Table 11 presents the distribution of age and sex among children aged 6–59 months, excluding SMART criteria. The total sample size was 278 children, with a nearly equal gender distribution: 48.9% boys and 51.1% girls. The age groups were balanced, with the largest proportion in the 30–41 months age group (29.1%) and the smallest in the 54–59 months group (4.7%).

Gender ratios varied across age groups. In the 6–17 months group, girls slightly outnumbered boys (53.1% vs. 46.9%, ratio 0.9), while in the 18–29 months group, the distribution was equal (50% boys and girls, ratio 1.0). A notable imbalance was observed in the 54–59 months group, where boys significantly outnumbered girls (76.9% vs. 23.1%, ratio 3.3).

**Table 11:** Distribution of age and sex among children 6-59 months (SMART exclusions)

| Age (Months) | Boys | | Girls | | Total | | Ratio |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | Boy:Girl |
| 6 to 17 | 23 | 46.9 | 26 | 53.1 | 49 | 17.6 | 0.9 |
| 18 to 29 | 36 | 50.0 | 36 | 50.0 | 72 | 25.9 | 1.0 |
| 30 to 41 | 32 | 39.5 | 49 | 60.5 | 81 | 29.1 | 0.7 |
| 42 to 53 | 35 | 55.6 | 28 | 44.4 | 63 | 22.7 | 1.3 |
| 54 to 59 | 10 | 76.9 | 3 | 23.1 | 13 | 4.7 | 3.3 |
| Total | 136 | 48.9 | 142 | 51.1 | 278 | 100.0 | 1.0 |

## 10.2. Data Quality

The data quality resulting from the survey indicates generally acceptable standards. In terms of anthropometric indicators among children aged 6-59 months, the standard deviation (SD) was within reasonable ranges for all the three indices except HAZ.

- For weight-for-height, the design effect for this indicator was 1.18, indicating no clustering effect. There was one instances where Z-scores were not available, and one case where Z-scores were out of range.
- Similarly, for weight-for-age, the design effect for this indicator was 1.29, again suggesting no clustering effect. one case had missing Z-scores, and two cases were out of range.
- Height-for-age showed a design effect for this indicator was 1.68, suggesting some clustering effect. However, there were one instances of missing Z-scores, and 12 cases where Z-scores were out of range, indicating potential data accuracy issues.

**Table 12:** Mean Z-scores, Design Effects, Missing and Out-of-Range Data of Anthropometric Indicators among Children 6-59 months (SMART exclusions)

| Indicator | N | Mean z-scores ± SD | Design effect (z-score < -2) | Z-scores not available* | Z-scores out of range |
|---|---|---|---|---|---|
| Weight-for-Height | 276 | -0.43 ±0.96 | 1.02 | 1 | 1 |
| Weight-for-Age | 275 | -1.61 ±1.09 | 1.29 | 1 | 2 |
| Height-for-Age | 265 | -1.235 ±1.26 | 1.68 | 1 | 12 |

## 10.3. Prevalence of Acute Malnutrition

Table 13 presents the prevalence of acute malnutrition among children aged 6–59 months by Weight-for-Height Z-score (WHZ) and/or oedema, disaggregated by severity and sex, using the WHO 2006 reference. The prevalence of global acute malnutrition (GAM) was 6.2% (95% CI: 3.7%–10.0%), affecting boys (9.0%) more than girls (3.5%). Moderate acute malnutrition (MAM) was observed in 5.1% of children, with boys (7.5%) again showing a higher prevalence than girls (2.8%). Severe acute malnutrition (SAM) was 1.1%, with 1.5% among boys and 0.7% among girls.

**Table 13:** Prevalence of Acute Malnutrition by WHZ (and/or oedema) by Severity and Sex among Children 6-59 months (SMART exclusions), WHO 2006 Reference

| Indicator | All (N=276) | Boys (N=134) | Girls (N=142) |
|---|---|---|---|
| Prevalence of global acute malnutrition (<-2 z-score and/or oedema) | (17) 6.2 % (3.7%, 10.0%) | (12) 9.0 % (5.3%, 14.7%) | (5) 3.5 % (1.5%, 7.9%) |
| Prevalence of moderate acute malnutrition (<-2 to ≥-3 z-score) | (14) 5.1 % (2.8%, 9.0%) | (10) 7.5 % (4.0%, 13.5%) | (4) 2.8 % (1.1% -7.0%) |
| Prevalence of severe acute malnutrition (<-3 z-score and/or oedema) | (3) 1.1 % (0.3%, 3.3%) | (2) 1.5 % (0.4%, 6.1%) | (1) 0.7 % (0.1%, 5.4%) |

Table 14 presents the prevalence of acute malnutrition by WHZ and/or oedema across different age groups. The highest prevalence of wasting was among children aged 6–17 months (10.4%), followed by those aged 18–29 months (8.4%). Wasting was lower in older age groups, with 3.7% among children aged 30–41 months, 3.2% among those aged 42–53 months, and 7.7% in the 54–59-month age bracket.

**Table 14:** Prevalence of Acute Malnutrition per WHZ and/or Oedema by Severity and Age Group (SMART exclusions)

| Age (Months) | N | No wasting (WHZ ≥ -2) | | Wasting (WHZ < -2) | | Moderate wasting (-3 ≤ WHZ < -2) | | Severe wasting (WHZ < -3) | | Oedema | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % | n | % |
| 6 to 17 | 48 | 43 | 89.6% | 5 | 10.40% | 4 | 8.3% | 1 | 2.1% | 0 | 0.0 |
| 18 to 29 | 71 | 65 | 91.5% | 6 | 8.40% | 4 | 5.6% | 2 | 2.8% | 0 | 0.0 |
| 30 to 41 | 81 | 78 | 96.3% | 3 | 3.70% | 3 | 3.7% | 0 | 0.0% | 0 | 0.0 |
| 42 to 53 | 63 | 61 | 96.8% | 2 | 3.20% | 2 | 3.2% | 0 | 0.0% | 0 | 0.0 |

| Age (Months) | N | No wasting (WHZ ≥ -2) | | Wasting (WHZ < -2) | | Moderate wasting (-3 ≤ WHZ < -2) | | Severe wasting (WHZ < -3) | | Oedema | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % | n | % |
| 54 to 59 | 13 | 12 | 92.3% | 1 | 7.70% | 1 | 7.7% | 0 | 0.0% | 0 | 0.0 |
| All | 276 | 259 | 93.8% | 17 | 6.20% | 14 | 5.1% | 3 | 1.1% | 0 | 0.0 |

Figure 2 illustrates the distribution of WHZ in the study population compared to the WHO growth standards. The mean WHZ among the 276 assessed children was -0.43 ± 0.96. The density plot shows a slight leftward shift in the study population's WHZ distribution relative to the WHO reference, indicating mild undernutrition among the surveyed population.

Figure 2: Distribution of WHZ Sample Compared to the WHO 2006 WHZ Reference Curve

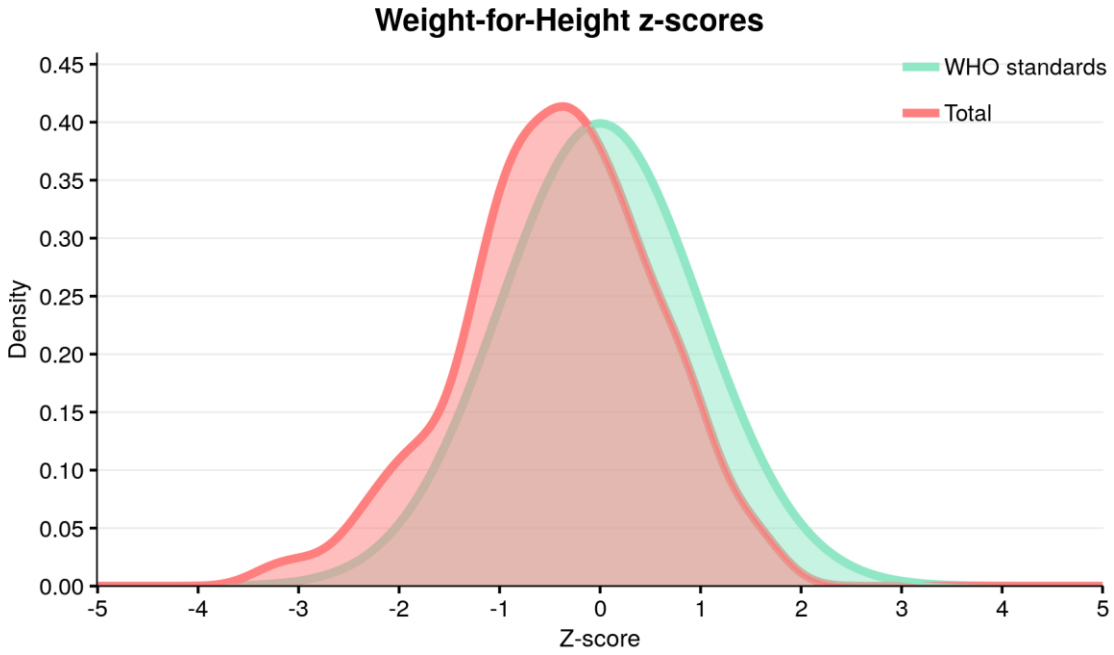



Figure 3 presents the mean WHZ across different age groups. The WHZ is lowest among children aged 6–17 months and 54–59 months, indicating greater nutritional vulnerability in these age groups. In contrast, children aged 30–41 months have WHZ values closer to zero, suggesting relatively better nutritional status. The variation in WHZ across age groups highlights differences in nutritional status and possible age-related risk factors for acute malnutrition.

Figure 3: Mean WHZ by Age Group

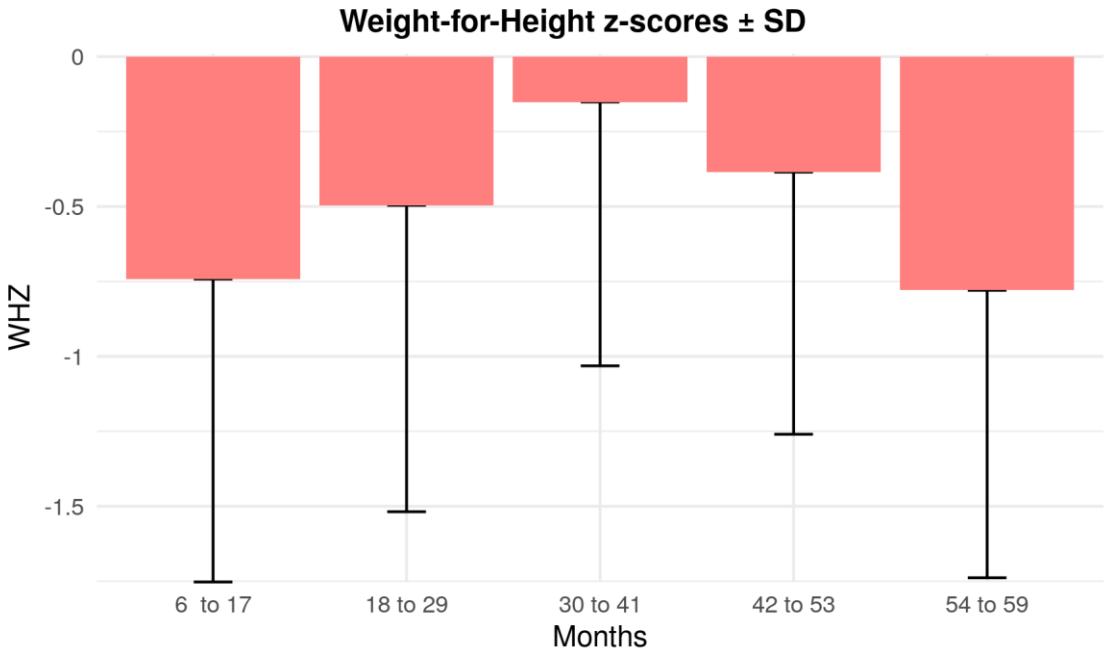



Table 15 shows the distribution of SAM based on oedema status among children aged 6–59 months. No cases of kwashiorkor or marasmic kwashiorkor were reported. All cases of SAM (1.4%) were marasmic and occurred in children without oedema.

**Table 15:** Distribution of Severe Acute Malnutrition per Oedema among Children 6-59 months (SMART exclusions)

| | WHZ < -3 | WHZ ≥ -3 |
|---|---|---|
| Presence of Oedema* | Marasmic kwashiorkor<br>0<br>(0.0%) | Kwashiorkor<br>0<br>(0.0%) |
| Absence of Oedema | Marasmic<br>4<br>(1.4%) | Not severely malnourished<br>273<br>(98.6%) |

Table 16 presents the prevalence of acute malnutrition among children aged 6–59 months based on Mid-Upper Arm Circumference (MUAC) cutoffs and oedema, disaggregated by sex. Overall, 92.8% of the 277 assessed children had no malnutrition, with a slightly lower

proportion among boys (91.9%) compared to girls (93.7%). The prevalence of GAM was 7.2% (95% CI: 4.4%–11.6%), affecting boys (8.1%) more than girls (6.3%). MAM was observed in 5.1% of children, with boys (5.9%) having a higher prevalence than girls (4.2%). SAM was recorded at 2.2%, with similar rates among boys (2.2%) and girls (2.1%). The prevalence of wasting based on MUAC was higher than that based on WHZ, which aligns with findings from a study conducted in one of the agrarian regions of Ethiopia in particular, Southern Ethiopia. In that study, MUAC categorized more children as wasted (10.5%, 95% CI: 9.6%–11.4%) compared to WHZ (5.4%, 95% CI: 4.8%–6.1%), highlighting the tendency of MUAC to identify a greater proportion of children as malnourished.[7]

**Table 16:** Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex.

| Indicator | All (N=277) | Boys (N=135) | Girls (N=142) |
|---|---|---|---|
| Prevalence of global acute malnutrition (< 125 mm and/or oedema) | (20) 7.2 % (4.4%, 11.6%) | (11) 8.1 % (4.6%, 14.0%) | (9) 6.3 % (2.8%, 13.7%) |
| Prevalence of moderate acute malnutrition (< 125 and ≥ 115 mm, no oedema) | (14) 5.1 % (3.2%, 8.0 %) | (8) 5.9 % (3.0%, 11.3%) | (6) 4.2 % (1.7%, 10.0%) |
| Prevalence of severe acute malnutrition (< 115 mm and/or oedema) | (6) 2.2 % (1.0%, 4.5%) | (3) 2.2 % (0.7%, 6.7 %) | (3) 2.1 % (0.7% - 6.6%) |

Table 17 presents the prevalence of acute malnutrition based on MUAC and oedema across different age groups. The highest prevalence of GAM was observed in children aged 18–29 months (11.2%) and 6–17 months (10.2%), while the lowest was in children aged 42–53 months (3.2%). Moderate acute malnutrition (MAM) was highest in the 18–29 months (7.0%) and 6–17 months (6.1%) age groups. Severe acute malnutrition (SAM) was reported in 2.2% of children, mainly affecting those aged 6–29 months. No cases of oedema were observed.

**Table 17:** Prevalence of Acute Malnutrition per MUAC and/or Oedema by Severity and Age Group

| Age (Months) | N | GAM | | MAM | | SAM | | Oedema | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| 6 to 17 | 49 | 5 | 10.2% | 3 | 6.1% | 2 | 4.1% | 0 | 0.0 |
| 18 to 29 | 71 | 8 | 11.2% | 5 | 7.0% | 3 | 4.2% | 0 | 0.0 |

[7] Tadesse, A. W., Tadesse, E., Berhane, Y., & Ekström, E.-C. (2017). Comparison of Mid-Upper Arm Circumference and Weight-for-Height to Diagnose Severe Acute Malnutrition: A Study in Southern Ethiopia. Nutrients, 9(3), 267. https://doi.org/10.3390/nu9030267

| Age (Months) | N | GAM | | MAM | | SAM | | Oedema | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| 30 to 41 | 81 | 4 | 4.9% | 4 | 4.9% | 0 | 0.0% | 0 | 0.0 |
| 42 to 53 | 63 | 2 | 3.2% | 1 | 1.6% | 1 | 1.6% | 0 | 0.0 |
| 54 to 59 | 13 | 1 | 7.7% | 1 | 7.7% | 0 | 0.0% | 0 | 0.0 |
| All | 277 | 20 | 7.3% | 14 | 5.1% | 6 | 2.2% | 0 | 0.0 |

Table 18 presents the prevalence of combined GAM and SAM based on WHZ, MUAC, and oedema, disaggregated by sex. Overall, 9.0% (95% CI: 5.9%–13.5%) of children aged 6–59 months were classified as GAM, with a higher prevalence among boys (11.1%) compared to girls (7.0%). The prevalence of combined SAM was 2.5% (95% CI: 1.3%–4.9%), with boys (3.0%) slightly more affected than girls (2.1%).

**Table -18:** Prevalence of combined GAM and SAM based on WHZ and MUAC cut off's (and/or oedema) and by sex.

| Indicator | All (N=277) | Boys (N=135) | Girls (N=142) |
|---|---|---|---|
| Prevalence of combined GAM (WHZ <-2 and/or MUAC < 125 mm and/or oedema) | (25) 9.0 % (5.9%, 13.5%) | (15) 11.1 % (7.0%, 17.2%) | (10) 7.0 % (3.4%, 14.1%) |
| Prevalence of combined SAM (WHZ <-2 and/or MUAC < 125 mm and/or oedema) | (7) 2.5 % (1.3%, 4.9%) | (4) 3.0 % (1.1%, 7.6%) | (3) 2.1 % (0.7%, 6.6%) |
| **With SMART or WHO flags a missing MUAC/WHZ or not plausible WHZ value is considered as normal when the other value is available* | | | |

Table 19 provides a detailed breakdown of combined GAM and SAM based on different classification criteria. Overall, 9.0% of children aged 6–59 months were classified as GAM, with oedema contributing to 0.0% and both WHZ and oedema accounting for 4.3%. SAM was observed in 2.5% of children, SAM cases were primarily identified using MUAC (1.4% or 4 children). WHZ alone accounted for 1.8% of GAM and 0.4% of SAM cases.

**Table 19:** Detailed number for combined GAM and SAM

| | Global Acute Malnutrition (GAM) | | Severe Acute Malnutrition (SAM) | |
|---|---|---|---|---|
| | **n** | **%** | **n** | **%** |
| Oedema | 0 | 0.0% (0%, 0%) | 0 | 0.0% (0%, 0%) |
| Both | 12 | 4.3% (2.2%, 8.4%) | 2 | 0.7% (0.2%, 2.9%) |
| WHZ | 5 | 1.8% (0.6%, 5.1%) | 1 | 0.4% (0.0%, 2.8%) |
| MUAC | 8 | 2.9% (1.1%, 7.6%) | 4 | 1.4% (0.5%, 3.8%) |
| Total | 25 | 9.0% (5.9%, 13.5%) | 7 | 2.5% (1.3%, 4.9%) |

**Figure 4:** Pie Chart of Proportion of Children with SAM by Indicator

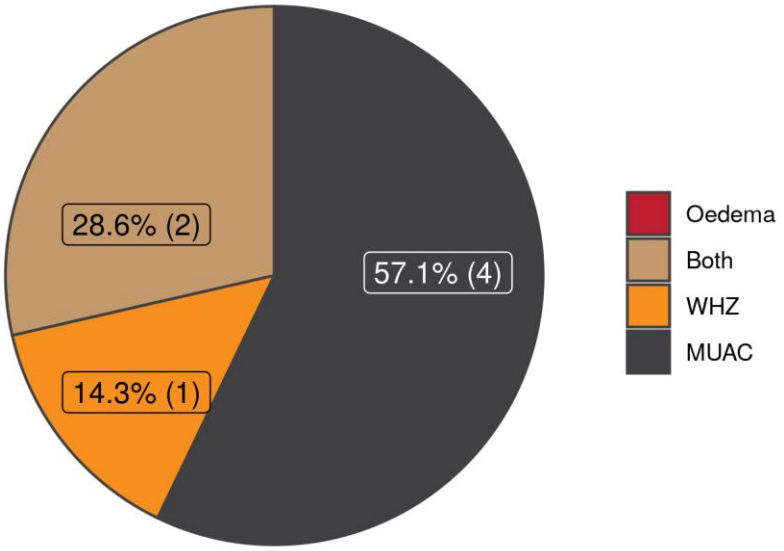
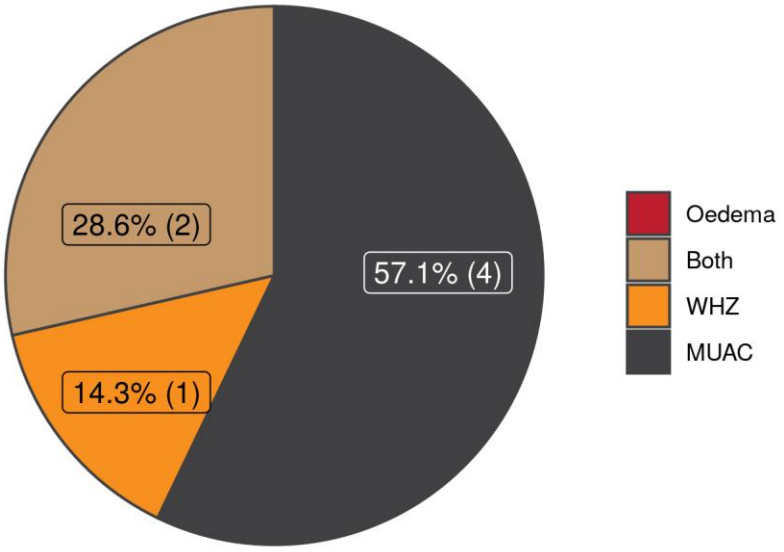


**Figure 5:** Pie Chart of Proportion of Children with SAM by Indicator




### 10.4. Prevalence of Chronic Malnutrition

As the standard deviation (SD) for HAZ was greater than 1.2, suggesting data quality issues mainly due to poor age estimation. Thus, the HAZ prevalence was estimated at 1 SD, which 63.6%.

### 10.5. Prevalence of Underweight

Table 20 presents the prevalence of underweight among children aged 6-59 months based on weight-for-age z-scores (WAZ) using the WHO 2006 reference. Overall, 30.9% (95% CI: 24.7%, 37.9%) of children were underweight, with boys (35.1%) more affected than girls (27.0%). Moderate underweight was observed in 18.5% of children, while 12.4% were severely underweight, with boys (15.7%) experiencing a higher burden than girls (9.2%).

**Table 20:** Prevalence of Underweight by WAZ by Severity and Sex among Children 6-59 months (SMART exclusions), WHO 2006 Reference

| Indicator | All (N=275) | Boys (N=134) | Girls (N=141) |
|---|---|---|---|
| Prevalence of underweight (WAZ < -2 SD) | (85) 30.9 % (24.7%, 37.9%) | (47) 35.1 % (28.2%, 42.6%) | (38) 27.0 % (19.8%, 35.6%) |
| Prevalence of moderate underweight (WAZ ≥ -3 to -2 SD) | (51) 18.5 % (14.2%, 23.8%) | (26) 19.4 % (14.6%, 25.4%) | (25) 17.7 % (11.7%, 26.0%) |

| Indicator | All (N=275) | Boys (N=134) | Girls (N=141) |
|---|---|---|---|
| Prevalence of severe underweight (WAZ < -3 SD) | (34) 12.4 % (8.5%, 17.7%) | (21) 15.7 % (9.9%, 23.8% ) | (13) 9.2 % (5.6%, 14.9%) |

Table 21 presents the prevalence of underweight among children aged 6-59 months, categorized by age group and severity based on weight-for-age z-scores (WAZ). Overall, 30.9% of children were underweight, with 18.5% experiencing moderate underweight and 12.4% suffering from severe underweight. Across age groups, the prevalence of underweight varied, with the highest burden observed in children 54-59 months, where 53.8% were underweight, including 30.8% with severe underweight.

**Table 21:** Prevalence of Underweight per WAZ by Severity and Age Group (SMART exclusions)

| Age (Months) | N | Underweight (WAZ < -2) | | Moderate Underweight (-3 ≤ WAZ < -2) | | Severe Underweight (WAZ < -3) | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| 6 to 17 | 49 | 13 | 26.6% | 9 | 18.4 | 4 | 8.2 |
| 18 to 29 | 70 | 26 | 37.1% | 15 | 21.4 | 11 | 15.7 |
| 30 to 41 | 80 | 20 | 25.0% | 12 | 15.0 | 8 | 10.0 |
| 42 to 53 | 63 | 19 | 30.1% | 12 | 19.0 | 7 | 11.1 |
| 54 to 59 | 13 | 7 | 53.1% | 3 | 23.1 | 4 | 30.8 |
| All | 275 | 85 | 30.9% | 51 | 18.5 | 34 | 12.4 |

Figure 4 compares the distribution of WAZ from the sample data to the WHO 2006 WAZ reference curve. The graph shows that the sample data has a mean WAZ of -1.61 ± 1.09, indicating that, on average, the children's weight-for-age is significantly below the WHO reference median. The distribution curve for the sample data is shifted to the left compared to the WHO reference curve, reflecting a higher prevalence of underweight children in the sample.

**Figure 6:** Distribution of WAZ Sample Compared to the WHO 2006 WAZ Reference Curve

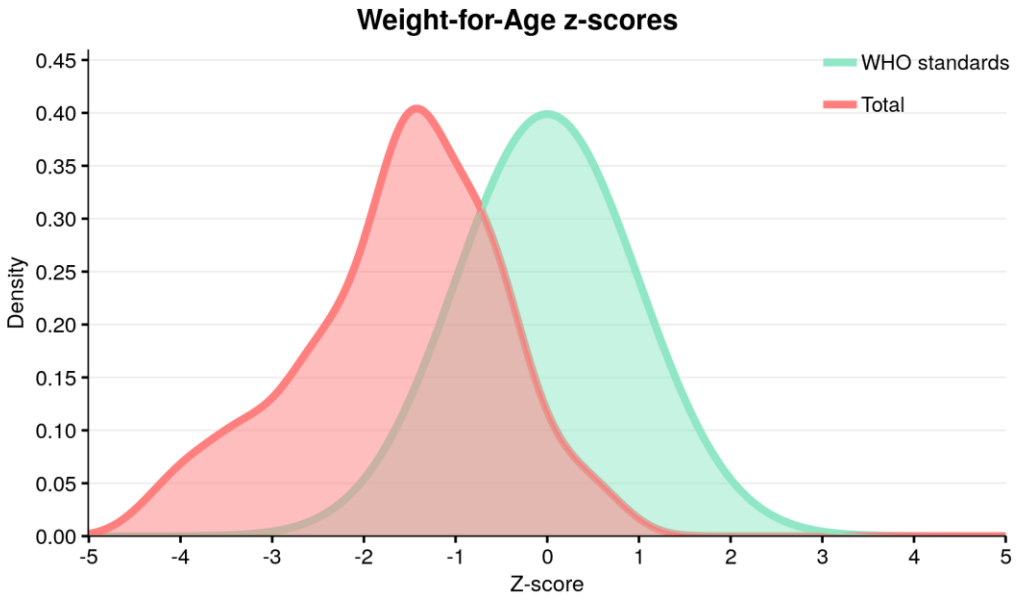
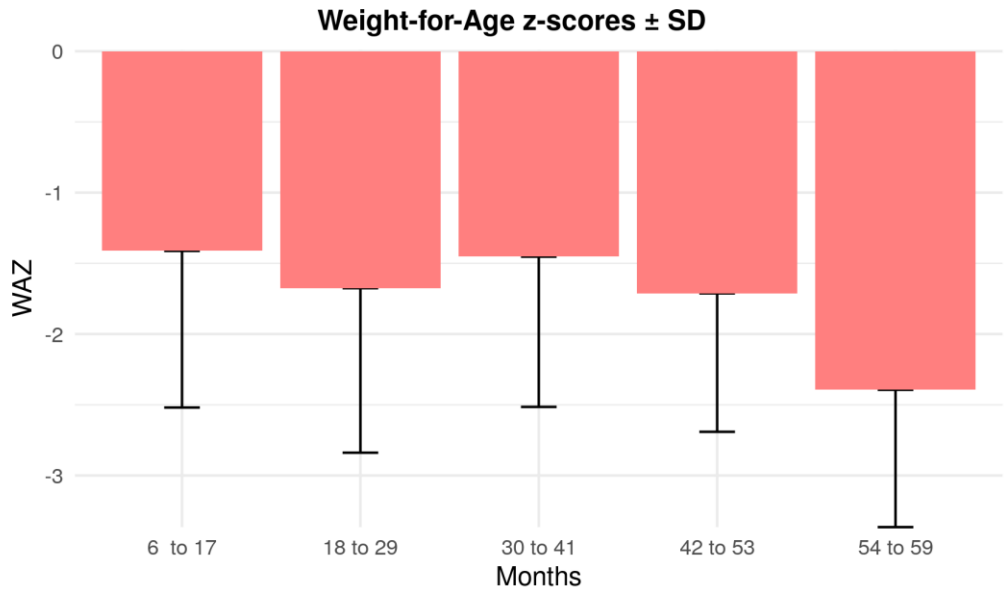



Figure 5 illustrates the mean WAZ by age group for children aged 6 to 59 months. The graph shows a declining trend in mean WAZ as children grow older, indicating a worsening of underweight status with age. The youngest age group (6 to 17 months) has the highest mean WAZ, while the oldest age group (54 to 59 months) has the lowest. This trend suggests that the prevalence of underweight increases as children age, highlighting the need for targeted nutritional interventions, particularly for older children, to address and mitigate the impact of undernutrition.

**Figure 7:** Mean WAZ by Age Group



## 10.6. Other Indicator Results

### *10.6.1. Indicators at individual level – Children 6-59 months*

*Morbidity results and health-seeking behaviour*

Table 23 presents the prevalence of common childhood illnesses among children aged 6-59 months in the two weeks preceding the survey. The results indicate that 1.1% of children experienced symptoms of acute respiratory infection (ARI) (95% CI: 0.2%–4.8%), while 23.4% had fever (95% CI: 16.4%–32.3%) and 20.5% suffered from diarrhoea (95% CI: 14.1%–28.8%). Fever was the most frequently reported illness, followed closely by diarrhoea, highlighting the ongoing burden of infections in this population.

**Table 23:** Prevalence of ARI symptoms, fever and diarrhoea in the two weeks preceding the survey for children aged 6-59 months.

| Level | Freq. | Proportion | 95% CI |
|---|---|---|---|
| ARI symptoms* | 3 | 1.1% | (0.2%, 4.8%) |
| Fever | 65 | 23.4% | (16.4%, 32.3%) |
| Diarrhoea | 57 | 20.5% | (14.1%, 28.8%) |

** Cough accompanied by short, rapid breathing which was chest related or with difficulty breathing which was chest related*

Table 24 presents the use of ORS and zinc tablets among children with diarrhea. Among children aged 6-59 months who experienced diarrhoea in the two weeks preceding the survey, 49.1% received oral rehydration salts (ORS), while 52.6% were given zinc tablets or syrup. However, only 45.6% received the recommended combination of both ORS and zinc, indicating gaps in optimal diarrhea management. These findings highlight the need for strengthened interventions to improve child health and ensure adherence to appropriate treatment guidelines.

**Table 24:** ORS and zinc use during diarrhoea episode for children aged 6-59 months

| Level | Freq. | Proportion | 95% CI |
|---|---|---|---|
| ORS use during diarrhoea episode | 28 | 49.1% | (29.4%, 69.2%) |
| Zinc tablet or syrup use during diarrhoea episode | 30 | 52.6% | (34.2%, 70.3%) |
| ORS and zinc tablet or syrup use during diarrhoea episode | 26 | 45.6% | (26.4%, 66.3%) |

Table 25 presents the treatment rates for symptoms of Acute Respiratory Infection (ARI), fever, and diarrhoea among children aged 6-59 months. The data shows that 66.7% of children with ARI symptoms received treatment. For children with fever, 63.1% received treatment. Similarly, 68.4% of children with diarrhoea were treated. These results indicate that a significant proportion of children with these common illnesses are receiving treatment.

**Table 25:** Treatment for ARI symptoms, fever and diarrhoea for children aged 6-59 months

| Level | Freq. | Proportion | 95% CI |
|---|---|---|---|
| Children with symptoms of ARI | 2 | 66.7% | - |
| Children with fever | 41 | 63.1% | (43.1%, 79.4%) |
| Children with diarrhoea | 39 | 68.4% | (48.2%, 83.4%) |

** Prevalences relate to whether advice or treatment was sought from a health facility/provider (excludes pharmacy, shop and traditional practitioners)*

# 11. Discussion

## 11.1. Nutritional Status

The prevalence of acute malnutrition among children aged 6–59 months varied depending on the assessment criteria. Using WHZ and/or edema, the GAM rate was 6.2%, comprising 5.1% MAM and 1.1% SAM. When assessed by MUAC and/or edema, GAM prevalence rose to 7.2%, with 5.1% MAM and 2.2% SAM. The prevalence of wasting identified by MUAC was higher than that identified by WHZ, consistent with findings from a study conducted in Southern Ethiopia. In that study, MUAC classified a larger proportion of children as wasted (10.5%, 95% CI: 9.6%–11.4%) compared to WHZ (5.4%, 95% CI: 4.8%–6.1%), underscoring MUAC's tendency to detect a higher rate of malnutrition among children in specific regions particularly in agrarian regions.[6]

Combining both criteria (WHZ and MUAC), the total GAM prevalence reached 9.0%, while SAM prevalence was 2.5%. According to WHO/UNICEF severity thresholds, WHZ-based wasting prevalence (6.2%) falls within the medium classification (5.0–9.9%), indicating moderate public health concern.

While the survey coincided with the lean season, a period typically associated with heightened food insecurity, it overlapped with the coffee harvesting season, which may temporarily improve household income and food access. This dual context underscores the need for sustained monitoring and context-specific interventions to address acute malnutrition, particularly given the elevated MAM rates.

## 11.2. Additional Indicators

The interplay between malnutrition and common childhood illnesses in this population reveals a critical public health dynamic. The prevalence of acute malnutrition ranged from 6.2% GAM (WHZ/edema) to 9.0% GAM (combined criteria) and 2.5% SAM indicates moderate to severe public health concerns, particularly as SAM exceeds the WHO/UNICEF critical threshold (≥2%). Concurrently, high rates of fever (23.4%) and diarrhoea (20.5%), alongside suboptimal treatment adherence (e.g., only 45.6% of diarrhoea cases received both ORS and zinc), underscore a bidirectional relationship between malnutrition and infection. Acute malnutrition, particularly SAM, weakens immune function, increasing susceptibility to infections like diarrhoea and fever. This is evident in the high prevalence of these illnesses despite moderate treatment rates (63–68%). Prolonged or recurrent infections can further impair nutrient absorption and utilization, exacerbating malnutrition and perpetuating a cycle of poor health outcomes.

Frequent infections, especially inadequately managed diarrhoea (low ORS+zinc coverage), lead to dehydration, reduced appetite, and nutrient loss, worsening existing malnutrition. This may explain the elevated SAM rates (2.5%) and combined GAM (9.0%). The medium GAM

classification (5.0–9.9%) signals a need for targeted nutrition programs, including community-based management of acute malnutrition (CMAM) to address MAM/SAM. Improved adherence to treatment protocols (e.g., scaling up ORS+zinc for diarrhoea to 80–90% coverage) could reduce infection duration and severity, mitigating their impact on nutritional status. Integrated approaches which combine nutritional support with infection prevention (e.g., vaccination, WASH initiatives) and treatment are critical to breaking the malnutrition-infection cycle.

While the survey coincided with the coffee harvest (a period of temporary food security), the lean season's residual effects likely contributed to both malnutrition and infection susceptibility. Seasonal fluctuations highlight the need for year-round interventions. Addressing malnutrition in this population requires not only therapeutic feeding for SAM but also robust infection management to prevent deterioration of nutritional status. Strengthening health systems to ensure consistent access to quality care, alongside community education on treatment adherence, could significantly reduce the dual burden of malnutrition and preventable infections.

## 12. Conclusion

The findings from Hambela Wamena reveal a moderate public health challenge, characterized by a GAM rate of 6.2%, compounded by high incidences of fever (23.4%) and diarrhoea (20.5%). These nutritional deficits, observed during the lean season, might have been even more severe if not for temporary improvements in food security resulting from the coffee harvest. The interplay between malnutrition and infection not only undermines the health and development of children but also highlights the urgent need for integrated, year-round interventions that address both nutritional deficits and infection control.

## 13. Recommendation

**Nutrition**

*Immediate*

- Strengthen Community-Based Nutrition Programs: Scale up Community-Based Management of Acute Malnutrition (CMAM) to effectively target both moderate and severe acute malnutrition, ensuring early detection and treatment.
- Implement social behavior change communication strategies (SBCC) to address underlying causes of malnutrition.

**Health**

*Immediate*

- Strengthen integrated management of childhood illness programs (IMCI).

*Intermediate*

- Improve adherence to treatment protocols by increasing the coverage of combined ORS and zinc for diarrhoea to at least 80‑90% and ensure prompt treatment of fever and ARI to prevent complications.
- Scaling-up of integrated health and nutrition outreach activities in to improve coverage of the interventions to populations that are far from the health center catchment areas.

# Annexes

## Annex 1 - Cluster Selection

| Cluster Name | Population | Selected Clusters |
|---|---|---|
| Kubii | 2053 | RC |
| Qullibbichaa | 1535 | 1 |
| Burqituu | 1905 | 2 |
| Haroo | 2424 | 3 |
| Abbal Horaa | 2086 | 4 |
| Hammajii | 1572 | 5 |
| Hamballa Hadaamaa | 4425 | 6 |
| Diimtuu Dingoo | 2049 | 7 |
| Qallee Genneti | 2134 | 8 |
| Bulee Geeshe | 1897 | 9 |
| Mudhii Horaa | 1852 | RC |
| Qutii Yaa'aa | 1735 | 10 |
| Quttoo | 1467 | 11 |
| Gootuu buusaa Aanolee | 1424 | 12 |
| Dhakbor Buka | 1087 | 13 |
| Tirtira | 2407 | 14 |
| Sorsa mazora | 2464 | 15 |
| Laayyoo Isoo | 2737 | 16 |
| Daansee Diribaa | 2455 | 17 |
| Kirite lema | 2000 | 18 |
| Keellaa Fayyaa | 1529 | 19 |
| Darii Dasee | 2010 | 20 |

| | | |
|---|---|---|
| Dibbittuu Dhooqaa | 1388 | 21 |
| Burqaa | 1892 | 22 |
| Daamee Boortichaa | 2426 | 23 |
| Beledaa | 1840 | RC |
| Baddeesaa Mandisu | 1602 | 24 |
| Tibiro Mazora | 1159 | 25 |

## Annex 2 - Standardization Test Results

**Table 26:** Bias and Technical Error of Measurement (TEM) Results for Weight

| | No. of subjects | TEM | Bias | Bias relative to | Outcome (TEM) | Outcome (Bias) |
|---|---|---|---|---|---|---|
| Individual TEM (intra) | | | | | | |
| 665.0 | | | | | | |
| Observer 1 | 10 | 0.21 | -0.03 | Median | TEM reject | Bias good |
| Observer 2 | 10 | 0.21 | -0.06 | Median | TEM reject | Bias acceptable |
| Observer 3 | 10 | 0.32 | -0.04 | Median | TEM reject | Bias good |
| Observer 4 | 10 | 0.11 | -0.04 | Median | TEM poor | Bias good |
| Observer 5 | 10 | 0.21 | -0.08 | Median | TEM poor | Bias acceptable |
| Team TEM (inter) | | | | | | |
| | | | | | | |
| enum inter 1st | 5x10 | 0.21 | | | TEM acceptable | |
| enum inter 2nd | 5x10 | 0.16 | | | TEM acceptable | |

**Table 27:** Bias and Technical Error of Measurement (TEM) Results for Height

| | No. of subjects | TEM | Bias | Bias relative to | Outcome (TEM) | Outcome (Bias) |
|---|---|---|---|---|---|---|
| Individual TEM (intra) | | | | | | |
| 665.0 | | | | | | |
| Observer 1 | 10 | 0.5 | 99.9 | Median | TEM acceptable | Bias good |
| Observer 2 | 10 | 0.12 | 100 | Median | TEM good | Bias good |
| Observer 3 | 10 | 0.16 | 100 | Median | TEM good | Bias good |
| Observer 4 | 10 | 0.18 | 100 | Median | TEM good | Bias good |
| Observer 5 | 10 | 0.25 | 100 | Median | TEM good | Bias good |
| Team TEM (inter) | | | | | | |
| | | | | | | |
| enum inter 1st | 5x10 | 0.34 | 99.9 | | TEM good | |
| enum inter 2nd | 5x10 | 0.26 | 100 | | TEM good | |

**Table 28:** Bias and Technical Error of Measurement (TEM) Results for MUAC

| | No. of subjects | TEM | Bias | Bias relative to | Outcome (TEM) | Outcome (Bias) |
|---|---|---|---|---|---|---|
| Individual TEM (intra) | | | | | | |
| 665.0 | | | | | | |
| Observer 1 | 10 | 3.83 | -2.45 | Median | TEM reject | Bias poor |
| Observer 2 | 10 | 2.85 | 1 | Median | TEM poor | Bias acceptable |
| Observer 3 | 10 | 3.17 | 0.25 | Median | TEM poor | Bias good |
| Observer 4 | 10 | 2.5 | -0.15 | Median | TEM acceptable | Bias good |
| Observer 5 | 10 | 1.63 | 0.95 | Median | TEM good | Bias good |
| Team TEM (inter) | | | | | | |
| 665.0 | | | | | | |
| enum inter 1st | 5x10 | 2.64 | | | TEM acceptable | |
| enum inter 2nd | 10x10 | 2.69 | | | TEM acceptable | |

## Annex 3 - Plausibility Check

*Attach the plausibility check here.*

**Table 29 :** Anthropometry Data Quality Snapshot

| Component | Value | Score | Outcome |
|---|---|---|---|
| Flagged data | 0.4% | 0 | Excellent |
| Overall Sex ratio | p=0.719 | 0 | Excellent |
| Age ratio(6-29 vs 30-59) | p=0.418 | 0 | Excellent |
| Dig pref score - weight | 4 | 0 | Excellent |
| Dig pref score - height | 9 | 0 | Good |
| Dig pref score - MUAC | 5 | 0 | Excellent |
| Standard Dev WHZ | 0.96 | 0 | Excellent |
| Skewness WHZ | -0.31 | 1 | Excellent |
| Kurtosis WHZ | 0.06 | 0 | Excellent |
| Poisson dist WHZ-2 | p=0.371 | 0 | Excellent |
| OVERALL SCORE WHZ = | | 3 | Excellent |

## Annex 4 - Integrated Questionnaire

| |
|---|
| Region / State |
| District |
| Team number |
| The number you have typed is outside the expected range (1-99). |
| Cluster number |
| The number you have typed is outside the expected range (1-999). |
| Household number |
| The number you have typed is outside the expected range (1-99). |

| |
|---|
| Hello my name is _____. I am with _____ [organization/governmental agency]. Please let me introduce you to the other team members: _____ and _____. We are here today to gather household information related to nutrition and _____. If there are any children under 5 in the household, we would like to take some measurements (weight, height, MUAC, oedema / explain) to help determine the overall under 5 nutrition status in ${region} region, district of ${district}. Please note that it is not currently known what actions (if any) will be taken after the results of the survey are finalized. All information will be kept completely confidential. Do you have any questions? May I begin? |
| Yes (present/agreed) |
| No (refusal) |
| Absent |
| CONSENT REFUSED: Please ensure that Team Leader has explained clearly the objectives of the survey. If the head of household / respondent still refuses, go to end of questionnaire. |
| CURRENT HOUSEHOLD MEMBERS: Please complete the following questions for each household member who lives in the household. |
| Press "Add Group" - to add another household member until all members are listed. When listing is complete, press "Do Not Add" to continue with the questionnaire. |
| **Household Members** |
| First Name |
| Gender |
| Male |
| Female |
| What is the age of the household member ${name} (in completed years)? |
| Please enter an age in complete years for every household member. You do not need to see proof of age. If age is less than 1 year, record 0. |
| Age in years must be between 0 and 120. |
| **Child Section** |
| Now entering data for child: ${child_name} (${CHSEX}) with age in years: ${child_age_years} |

| |
|---|
| Do you have an official age documentation for ${child_name}? |
| The exact date of birth (day, month, year) is recorded from either a birth registration, child health card or EPI card if available. |
| Yes |
| No |
| ${child_name}'s date of birth: |
| The exact birth date should only be taken from an age documentation showing day, month and year of birth |
| ${child_name}'s month and year of birth: |
| IT IS IMPORTANT TO ESTIMATE THE AGE VERY CAREFULLY. Since no age documentation is available, estimate month and year of birth using a local events calendar. |
| Verify that ${child_name} is ${MONTHS} months old. Remember, if they are older than 59 months; they are not eligible for inclusion, and you should stop here |
| Warning: In the listing of the current household members, you have recorded that ${child_name} is ${child_age_years} years old.<br>His/her age in months (${MONTHS}) should match with the age in completed years. |
| If the age in months is not matching the age in completed years, go back and correct the previous entries. |
| Is ${child_name} currently present in the household? |
| Yes |
| No |
| If eligible child is absent, team should revisit the household once before leaving the village to conduct the interview and/or measure the child. |
| Weight in KG of ${child_name}: |
| The child must be weighed naked. Remove diapers, necklaces and other items that could increase the weight before measuring. REMINDER: Always record weight with one digit after the decimal point. |
| Please remeasure child's weight |
| Was ${child_name} dressed with clothes for the weight measurement? |

| |
|---|
| Yes |
| No |
| Height in CM of ${child_name}: |
| Children younger than 24 months are measured lying down, while standing height is measured in children aged 24 months and older. REMINDER: Always record height with one digit after the decimal point. |
| Please remeasure child's Height |
| Record measurement taken:  Length or Height |
| Standing height |
| Length (lying horizontal on board) |
| PLEASE, MEASURE LENGTH. Children younger than 24 months are measured lying down. If possible, to abide by the protocol, please retake length measurement and correct the information on measurement taken. |
| PLEASE, MEASURE HEIGHT. Children aged 24 months and older are measured standing up. If possible, to abide by the protocol, please retake height measurement and correct the information on measurement taken. |
| MUAC in MM of ${child_name} |
| Please remeasure child’s MUAC |
| Does ${child_name} have bilateral oedema, that is swelling with pitting oedema in both feet? |
| Yes |
| No |
| Please confirm with the team leader. Does ${child_name} have bilateral oedema? |
| Yes |
| No |
| Please take a picture of the bilateral oedema |
| MAKE SURE TO ONLY PHOTOGRAPH THE FEET |
| REMEASURE: ${child_name} (${CHSEX}) aged ${child_age_years} year(s) must be remeasured |

| |
|---|
| REMEASURE: Do you have an official age documentation for ${child_name}? |
| The exact date of birth (day, month, year) is recorded from either a birth registration, child health card or EPI card if available. |
| Yes |
| No |
| REMEASURE: ${child_name}'s date of birth: |
| The exact birth date should only be taken from an age documentation showing day, month and year of birth |
| REMEASURE: ${child_name}'s month and year of birth: |
| IT IS IMPORTANT TO ESTIMATE THE AGE VERY CAREFULLY. Since no age documentation is available, estimate month and year of birth using a local events calendar. |
| REMEASURE: Verify that ${child_name} is ${MONTHS_2} months old. Remember, if they are older than 59 months; they are not eligible for inclusion, and you should stop here |
| REMEASURE: Weight in KG of ${child_name}: |
| The child must be weighed naked. Remove diapers, necklaces and other items that could increase the weight before measuring. REMINDER: Always record weight with one digit after the decimal point. |
| Please remeasure child's weight |
| REMEASURE: Was ${child_name} dressed with clothes for the weight measurement? |
| Yes |
| No |
| REMEASURE: Height in CM of ${child_name}: |
| Children younger than 24 months are measured lying down, while standing height is measured in children aged 24 months and older. REMINDER: Always record height with one digit after the decimal point. |
| Please remeasure child's Height |
| REMEASURE: Record measurement taken:  Length or Height |
| Standing height |

| |
|---|
| Length (lying horizontal on board) |
| PLEASE, MEASURE LENGTH. Children younger than 24 months are measured lying down. If possible, to abide by the protocol, please retake length measurement and correct the information on measurement taken. |
| PLEASE, MEASURE HEIGHT. Children aged 24 months and older are measured standing up. If possible, to abide by the protocol, please retake height measurement and correct the information on measurement taken. |
| REMEASURE: MUAC in MM of ${child_name} |
| Please remeasure child’s MUAC |
| REMEASURE: ${child_name} (${CHSEX}) aged ${child_age_years} year(s) must be remeasured |
| REMEASURE: Do you have an official age documentation for ${child_name}? |
| The exact date of birth (day, month, year) is recorded from either a birth registration, child health card or EPI card if available. |
| Yes |
| No |
| REMEASURE: ${child_name}'s date of birth: |
| The exact birth date should only be taken from an age documentation showing day, month and year of birth |
| REMEASURE: ${child_name}'s month and year of birth: |
| IT IS IMPORTANT TO ESTIMATE THE AGE VERY CAREFULLY. Since no age documentation is available, estimate month and year of birth using a local events calendar. |
| REMEASURE: Verify that ${child_name} is ${MONTHS_3} months old. Remember, if they are older than 59 months; they are not eligible for inclusion, and you should stop here |
| REMEASURE: Weight in KG of ${child_name}: |
| The child must be weighed naked. Remove diapers, necklaces and other items that could increase the weight before measuring. REMINDER: Always record weight with one digit after the decimal point. |
| Please remeasure child's weight |

| |
|---|
| REMEASURE: Was ${child_name} dressed with clothes for the weight measurement? |
| Yes |
| No |
| REMEASURE: Height in CM of ${child_name}: |
| Children younger than 24 months are measured lying down, while standing height is measured in children aged 24 months and older. REMINDER: Always record height with one digit after the decimal point. |
| Please remeasure child's Height |
| REMEASURE: Record measurement taken:  Length or Height |
| Standing height |
| Length (lying horizontal on board) |
| PLEASE, MEASURE LENGTH. Children younger than 24 months are measured lying down. If possible, to abide by the protocol, please retake length measurement and correct the information on measurement taken. |
| PLEASE, MEASURE HEIGHT. Children aged 24 months and older are measured standing up. If possible, to abide by the protocol, please retake height measurement and correct the information on measurement taken. |
| REMEASURE: MUAC in MM of ${child_name} |
| Please remeasure child’s MUAC |
| Has ${child_name} received a vitamin A capsule in the past 6 months? |
| Has ${child_name} had diarrhoea in the past 2 weeks? |
| CASE DEFINITION: THREE OR MORE LOOSE OR LIQUID STOOLS DURING 24 HOURS (INCLUDING BLOODY STOOLS) |
| Yes |
| No |
| Don't know |
| Did you seek any advice or treatment for the diarrhoea from any source? |
| Yes |

| |
|---|
| No |
| Don't know |
| Where did you seek advice or treatment? |
| IF SEVERAL ANSWERS ARE MENTIONED, RECORD THE FIRST PLACE WHERE THE CAREGIVER SEEK ADVICE OR TREATMENT |
| Public sector: Government hospital |
| Public sector: Government health center |
| Public sector: Government health post |
| Public sector: Mobile clinic |
| Public sector: Fieldworker |
| Other public sector |
| Private medical sector: Private hospital / clinic |
| Private medical sector: Pharmacy |
| Private medical sector: Private doctor |
| Private medical sector: Mobile clinic |
| Private medical sector: Fieldworker |
| Other private medical sector |
| Other source: Shop |
| Other source: Traditional practitioner |
| Other source: Market |
| Other source: Itinerant drug seller |
| Other |
| Did you give ORS to ${child_name} when s/he had diarrhoea? |
| SHOW ORS SACHET |
| Yes |
| No |

| |
|---|
| Don't know |
| Did you give zinc tablets or syrup to ${child_name} when s/he had diarrhoea? |
| SHOW ZINC TABLET OR SYRUP |
| Yes |
| No |
| Don't know |
| Has ${child_name} been ill with a fever in the past 2 weeks? |
| Yes |
| No |
| Don't know |
| Did you seek any advice or treatment for the fever from any source? |
| Yes |
| No |
| Don't know |
| Where did you seek advice or treatment? |
| IF SEVERAL ANSWERS ARE MENTIONED, RECORD THE FIRST PLACE WHERE THE CAREGIVER SEEK ADVICE OR TREATMENT |
| Public sector: Government hospital |
| Public sector: Government health center |
| Public sector: Government health post |
| Public sector: Mobile clinic |
| Public sector: Fieldworker |
| Other public sector |
| Private medical sector: Private hospital / clinic |
| Private medical sector: Pharmacy |
| Private medical sector: Private doctor |

| |
|---|
| Private medical sector: Mobile clinic |
| Private medical sector: Fieldworker |
| Other private medical sector |
| Other source: Shop |
| Other source: Traditional practitioner |
| Other source: Market |
| Other source: Itinerant drug seller |
| Other |
| Has ${child_name} had an illness with a cough in the past 2 weeks? |
| Yes |
| No |
| Don't know |
| Has ${child_name} had fast, short, rapid breaths or difficulty breathing in the past 2 weeks? |
| Yes |
| No |
| Don't know |
| Was the fast or difficult breathing due to a problem in the chest or a blocked or runny nose? |
| Problem in chest only |
| Blocked or runny nose only |
| Both |
| Other |
| Don't know |
| Did you seek any advice or treatment for the illness from any source? |
| Yes |

| |
|---|
| No |
| Don't know |
| Where did you seek advice or treatment? |
| IF SEVERAL ANSWERS ARE MENTIONED, RECORD THE FIRST PLACE WHERE THE CAREGIVER SEEK ADVICE OR TREATMENT |
| Public sector: Government hospital |
| Public sector: Government health center |
| Public sector: Government health post |
| Public sector: Mobile clinic |
| Public sector: Fieldworker |
| Other public sector |
| Private medical sector: Private hospital / clinic |
| Private medical sector: Pharmacy |
| Private medical sector: Private doctor |
| Private medical sector: Mobile clinic |
| Private medical sector: Fieldworker |
| Other private medical sector |
| Other source: Shop |
| Other source: Traditional practitioner |
| Other source: Market |
| Other source: Itinerant drug seller |
| Other |
| ${child_name}' has conditions indicating SEVERE ACUTE MALNUTRITION (SAM). |
| COMPLETE REFERRAL FORM to the SAM TREATMENT PROGRAM (Do not refer to BSFP) |
| Have you referred the child for management of severe acute malnutrition services? |

| |
|---|
| Yes |
| No, already enrolled in a nutrition treatment program |
| No, there is no nutrition treatment program in place |
| ${child_name}' has conditions indicating MODERATE ACUTE MALNUTRITION (MAM). |
| COMPLETE REFERRAL FORM to the MAM TREATMENT PROGRAM (Do not refer to BSFP) |
| Have you referred the child for management of moderate acute malnutrition services? |
| Yes |
| No, already enrolled in a nutrition treatment program |
| No, there is no nutrition treatment program in place |
| ${child_name}' doesn't have conditions indicating acute malnutrition |
| Please take a GPS reading |
| Push the 'Save GeoPoint' button when the accuracy of the GPS measure is less than 25 m. Avoid taking it inside house or under trees (to make it faster). |
| If household is absent, team should revisit the household once before leaving the village to conduct the interview. |
| Please add any relevant comments (OPTIONAL) |
| I confirm that questionnaire is complete |
| Yes |
| No |