



Family MUAC study: Training, supervision improve caregiver-led malnutrition screening

Introduction

This brief summarizes key insights from the ongoing quasi-experimental Family MUAC (Mid-Upper Arm Circumference) pilot study in the U.S. government-funded Strengthen PSNP5 Institutions and Resilience (SPIR II) implementation areas of Amhara and Oromia regions. It **presents findings on how periodic training and supervision influence caregivers' knowledge of malnutrition, their MUAC measurement skills, and their ability to detect early signs of malnutrition and edema.** These skills are critical for timely referral and preventing complications.

The brief highlights change in these outcomes at 12 weeks of implementation across two intervention arms. The study included three groups: Caregivers who received standard care but did not participate in our program (Control, T1); those who received basic training at the start of implementation (T2); and those who received the basic training, follow-up training, and supportive supervision at six weeks (T3). These findings focus on T2 and T3 caregiver-child pairs (index child) and provide provisional evidence on the role of training frequency and supervision in strengthening caregiver-led screening and reducing the risk of severe acute malnutrition in children. Full findings from the study will be available in a subsequent paper.

Context and Background

Malnutrition remains a critical public health challenge in Ethiopia, with persistently high rates of stunting, wasting, and being underweight among children under five.¹ Severe acute malnutrition (SAM) is a leading cause of under-five mortality, contributing to an estimated 8% of child deaths nationally.² These high levels of child undernutrition not only increase the risk of illness and mortality but also constrain broader health and development outcomes.

Highlights of the Findings

World Vision's intervention:

- Improved MUAC knowledge and accuracy
- Led to greater understanding of purpose and empowerment among participants
- Sparked deeper engagement of family and community members
- Enhanced edema-detection skills
- Increased early detection of child malnutrition and reliable self-referrals
- Was inexpensive, averaging \$2.67 (T2) and \$3.03 (T3) per caregiver-child pair

In response, the SPIR II project aims to improve food security, enhance resilience to shocks, and strengthen nutrition outcomes among rural households vulnerable to food insecurity in Amhara, Oromia and Tigray regions of Ethiopia. SPIR II is funded by the former USAID Bureau for Humanitarian Assistance and implemented by World Vision as lead, in partnership with CARE, ORDA Ethiopia, and IFPRI. A key innovation within SPIR II is the Family MUAC intervention, a community-based approach that equips mothers, caregivers, and family members to use color-coded MUAC tapes to screen their children for acute malnutrition.³ Originally developed to expand coverage of treatment services and enable earlier detection, Family MUAC has been scaled across several African countries with promising results.^{4,5}

Aim and Methods

This one-year pilot study under SPIR II aims to assess how periodic caregiver training and supervision, combined with increased caregiver awareness of malnutrition prevention, detection, and treatment, affect knowledge retention, MUAC measurement skills, edema detection, and timely treatment. By strengthening early identification and management of malnutrition at the household level, the study aims to reduce complications, minimize costly inpatient care for SAM, and ultimately lower child morbidity and mortality in Ethiopia.

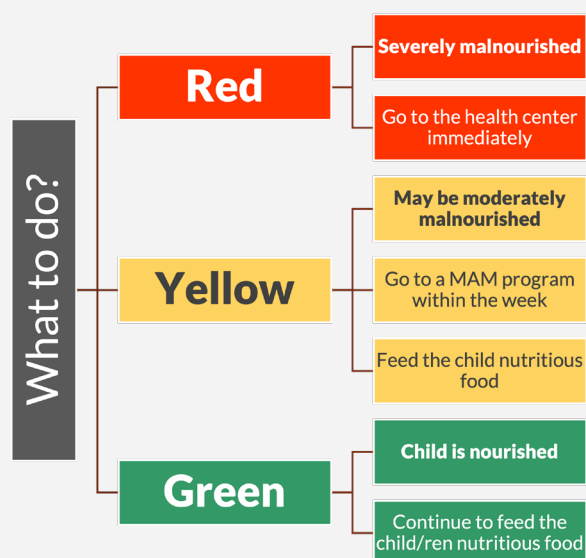
Study design and sample

The study employs a three-arm quasi-experimental design to evaluate the effect of training and supervision on caregivers' ability to use MUAC tape accurately and detect malnutrition early in rural Ethiopia. The caregivers in the control group (T1) received standard care without MUAC training. The caregivers in the second arm (T2) received basic MUAC training with minimal follow-up and supervision, while the caregivers in the third arm (T3) received basic initial MUAC training with comprehensive ongoing follow-up and supervision. Comparing these different training and supervision modalities helps determine the extent to which frequency of refresher training and follow-up is necessary to ensure caregiver's accurate MUAC use and timely detection of malnutrition in their children.

The study is being conducted in SPIR II implementation areas in Daro Lebu and Doba woredas in Oromia region, and Wadla woreda in Amhara region in Ethiopia, which are identified as priority one for their high malnutrition burden (National Hotspot Woreda Classification, 2023). Three Kebeles (smallest administrative unit) per Woreda were purposively selected based on high malnutrition caseloads, with each Kebele randomly assigned to a study arm. An original total sample of 1,350 households (450 per arm) with caregiver-child pairs were randomly selected from these kebeles. The index children were aged 6–47 months at enrollment to allow follow-up until age five for the oldest children in the sample. Power calculations were performed using Stata 17, assuming a significance level of $\alpha=0.05$, 80% power, while accounting for 10% attrition.

What Is MUAC Tape?

The MUAC (Mid-Upper Arm Circumference) tape is a simple, color-coded tool used to detect wasting in children. Measurements between 11.5 and 12.5 cm (yellow band) indicate moderate acute malnutrition (MAM), while measurements below 11.5 cm (red band) indicate severe acute malnutrition (SAM). During caregiver training, the tape and an accompanying color-coded graphic were used to support ease of interpretation. At monitoring visits, enumerators captured both the numerical measurements and the corresponding color codes.



This analysis presented in this brief is based on a sample of 384 for T2 and 410 for T3, representing caregiver-child pairs available when data was collected. T1 arm (control group) is not included in this analysis, as the caregivers in that arm did not receive monitoring visits. However, the final endline report will incorporate findings from all study arms. This analysis was conducted by an independent contractor using data collected by the project team during monitoring visits. Additional details can be found in the main report linked within the brief.

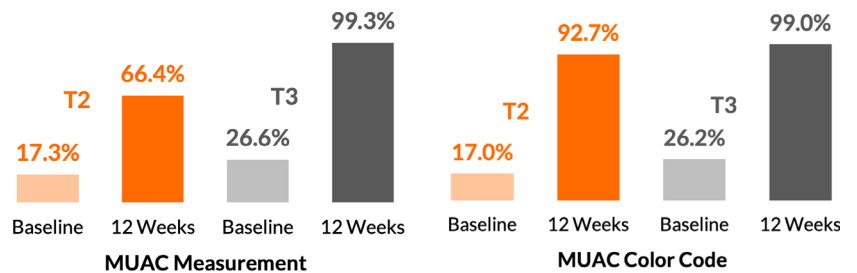
Key Findings

This section presents key descriptive findings at 12 weeks of implementation, thus providing early insights on the effectiveness of caregiver-led screening in improving malnutrition detection and reducing the risk of severe acute malnutrition in children.

IMPROVED MUAC KNOWLEDGE AND ACCURACY

Caregivers in both intervention groups (T2 and T3) showed substantial gains in MUAC knowledge and measurement skills compared to baseline when verified by health project staff. By 12 weeks, nearly all caregivers could measure MUAC with accuracy, showing an improvement of more than threefold since baseline. Measurement agreement between the enumerator and the caregiver rose sharply in both arms, increasing from 17% to 66% in T2 and from 27% to 99% in T3 from baseline to 12 weeks (see Figure 1). Similarly, caregiver/enumerator agreement in the color code read increased from 17% to 93% in T2 and from 26% to 99% in T3 by week 12. Accuracy improved in both study arms, with caregivers in T2 showing higher accuracy in MUAC color code than measurement, which caregivers in T3 were equally accurate in both at 12 weeks.

Fig. 1. Accuracy improved in both study arms, with caregivers in arm T2 showing higher accuracy in MUAC color code than measurement

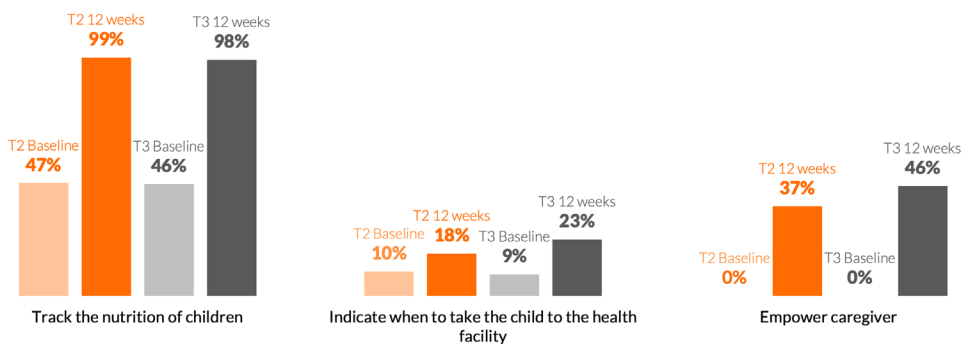


Caregivers in T3 demonstrated significantly higher accuracy in both measurement and color code compared to the T2 caregivers at 12 weeks, potentially indicated added value of intensive training and monitoring in improving their ability to detect malnutrition accurately.

GREATER UNDERSTANDING OF PURPOSE AND EMPOWERMENT

Caregiver’s awareness that MUAC tracks levels of child malnutrition rose to nearly universal levels at 12 weeks (98% or higher in both groups), up from 47% for T2, and 46% for T3 at baseline (see Figure 2). Notably, at 12 weeks over one-third of caregivers reported that the purpose of the MUAC tape was to empower the caregiver to know the nutritional status of their children and take action, as needed—a perspective absent at baseline.

Fig. 2. Caregivers report feeling more empowered through the program as they measure MUAC in addition to being able to track nutrition.

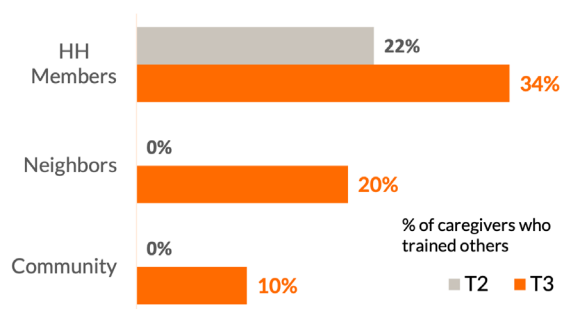


HIGHER ENGAGEMENT OF FAMILY AND COMMUNITY MEMBERS AMONG T3

At 12 weeks, caregivers in the T3 arm reported sharing their MUAC measurement skills more frequently with household members, neighbors, and the broader community compared to those in T2 (see Figure 3, next page). This suggests that caregivers who received more

frequent training were not only more engaged but also played a role in spreading knowledge within their communities, contributing to broader awareness of child health. Additionally, caregivers in T3 measured their children more frequently than those in T2, reinforcing the impact of consistent engagement and support.

Fig. 3: Caregivers in the T3 arm trained their neighbors and community, compared to T2 which only trained family members



ENHANCED EDEMA-DETECTION SKILLS

Caregivers' ability to correctly perform edema checks improved dramatically between baseline and 12 weeks. Most (80.5%) in T2 and nearly all (99.5%) in T3 achieved "good" scores by 12 weeks, up from 32.5% for T2 and 38.9% for T3 at baseline (see Figure 4).

When it came to detecting edema (swelling caused by fluid retention), caregivers in the second group (basic training only) misclassified ten cases, while those in the third group (who received additional training and supervision) misclassified seven. In both cases, caregivers thought

children had edema, but checks by health and nutrition program staff confirmed the children were healthy. Although caregivers slightly over-diagnosed, none of the true edema cases were missed, and most caregivers matched the specialists' assessment, an encouraging sign (see Table 1). The results also show that strong measurement skills alone don't guarantee accuracy in recognizing edema, as seen in the third group, which had excellent skills scores but still made seven classification errors.

Fig. 4: Caregivers in T3 (intensive training) significantly improved their ability to check for edema compared to T2

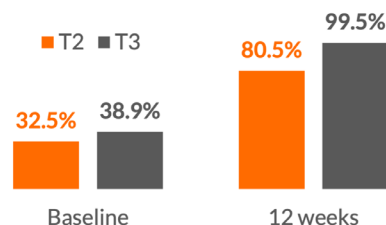


Table 1: Alignment in outcomes of edema checks between caregivers and health and nutrition program staff at 12 weeks by study arm (misclassified cases in light gray).

Caregivers Edema check n (%)	Health-Nutrition Program Staff Edema check n (%)						
	T2 at 12 weeks (n=384)			T3 at 12 weeks (n=410)			
	Yes	No	Total	Yes	No	Total	
Yes	7 (1.8%)	10 (2.6%)	17 (4.4%)	3 (0.7%)	7 (1.7%)	10 (2.4%)	
No	0 (0.0%)	367 (95.6%)	367 (95.6%)	0 (0.0%)	400 (97.6%)	400 (97.6%)	
Total	7 (1.8%)	377 (98.2%)	384 (100%)	3 (0.7%)	407 (99.3%)	410 (100%)	

EARLY DETECTION AND RELIABLE SELF-REFERRALS

Based on MUAC measurement, at 12 weeks, 13.2% of all caregivers suspected malnutrition—66/496 in T2 and 69/530 in T3 arms, respectively. All of those referred

their children to health posts and over 90% of their MUAC classifications matched health workers' classifications. In terms of color code, the referral rates were at 13.4% (137/1,026). Most referrals (approx. 90%) were for moderate acute malnutrition (MAM) cases, with very few cases of severe acute malnutrition (SAM), one case in each arm. Of the confirmed SAM cases, both were correctly identified by the caregivers, though there were also 2 MAM cases that were incorrectly measured as SAM by caregivers – both from T2 (see Table 2).

In T3, the 1 SAM case was accurately recognized by the caregivers, though five children with normal MUAC were misclassified by caregivers as MAM. T2 had four misclassifications (two MAM as SAM, two normal as MAM). The table highlights the misclassifications across the arms. Importantly, there was high accuracy of the caregiver screenings for all self-referred cases, and where there was misalignment, the caregivers had erred on the side of caution in seeking care, including for a few children (7 total) who were not malnourished. Lastly, when asked what they would do in case of "yellow" or "red" results, nearly all caregivers reported they would seek facility care treatment, with T3 caregivers more likely to involve family members in decisions to seek treatment.

Table 2: MUAC readings from caregivers and enumerators of children who were self-referred by caregivers to a health facility for suspected malnutrition

		Health Extension Workers MUAC measurement n (%)			
		>12.5 cm	11.5 to 12.5 cm	<11.5 cm	Total
T2 Caregivers MUAC measurement n (%) Total n=66	>12.5 cm	1 (1.5%)	0 (0.0)	0 (0.0%)	1 (1.5%)
	11.5 to 12.5 cm	2 (3.0%)	60 (90.9%)	0 (0.0%)	62 (93.9%)
	<11.5 cm	0 (0.0%)	2 (3.0%)	1 (1.5%)	3 (4.5%)
	Total	3 (4.5%)	62 (93.9%)	1 (1.5%)	66 (100)
T3 Caregivers MUAC measurement n (%) Total n=69	>12.5 cm	1 (1.4%)	0 (0.0)	0 (0.0%)	1 (1.4%)
	11.5 to 12.5 cm	5 (7.2%)	62 (89.9%)	0 (0.0%)	67 (97.1%)
	<11.5 cm	0 (0.0%)	0 (0.0%)	1 (1.4%)	1 (1.4%)
	Total	6 (8.7%)	62 (89.9%)	1 (1.4%)	69 (100)

Family MUAC Cost-efficiency

This cost analysis is provisional, based on data collected from the setup up to 12 weeks of implementation of the Family MUAC intervention. Costs were grouped into five categories: program administration and staff, implementation and materials, transportation and per diems, targeting and visibility, and training and office expenses. Consortium-level costs were distributed evenly across implementing partners and study arms.

The Family MUAC intervention proved highly cost-efficient, averaging **USD \$2.67 per caregiver–child pair in T2 and USD \$3.03 in T3**. Training was the most significant cost driver across both groups, reflecting the program’s focus on building caregiver skills and providing supervision. Next came program administration and staffing, followed by implementation and materials, which included MUAC tape procurement. Office-related costs were minimal, as the intervention was integrated into the broader SPIR II platform that already covered rent, utilities, and equipment.

Although T3 was slightly more expensive, it consistently produced stronger results in MUAC measurement accuracy, edema detection, caregiver empowerment, and family engagement. These preliminary findings suggest that the additional investment in training and supervision may offer better value for improving early detection and treatment of child malnutrition. A final cost-efficiency and cost-effectiveness analysis will be completed after endline data collection to capture any remaining expenditures.

Conclusion

The Family MUAC intervention strengthened caregivers’ knowledge and skills in MUAC measurement, edema detection, and overall measurement accuracy, with the strongest gains observed in the intensive arm (T3) after 12 weeks of implementation. Providing MUAC tapes, training, and supportive supervision empowered caregivers to play a more active role in child nutrition and engage other family members—a shift not reported at baseline.

Importantly, these improvements were achieved at a modest cost—an average of **USD \$2.67 per caregiver–child pair in T2 and \$3.03 in T3**—demonstrating that even the enhanced, more intensive approach remained highly cost-efficient. While both arms showed progress, the added investment in refresher training and follow-up under T3 delivered consistently stronger results, suggesting a favorable balance between cost and impact.

Full attribution and deeper insights into caregivers’ experiences will be presented in the upcoming endline report, along with final cost-effectiveness results and recommendations for future programming.

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- [3] UNICEF (2024). [Family led measurement of Mid-Upper Arm Circumference](#).
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