MEASURING NUTRITION DYNAMICS OVER TIME TO ILLUMINATE CRITICAL TRENDS AND RELATIONSHIPS

LONGITUDINAL STUDY LEARNING BRIEF

INTRODUCTION & RATIONALE

In pursuit of a sustained and transformative reduction in persistent global acute malnutrition (P-GAM), strategic direction is derived through an in-depth understanding of wasting epidemiology and how its predictors vary over time. Prior to USAID Nawiri, most nutrition studies in Kenya had focused on a cross-section of children at a single point in time. Virtually no evidence existed on how nutrition outcomes and related variables fluctuate over time and across seasons within the same households, and in relation to the synergistic effects of increasingly frequent and severe climate-associated shocks. This learning brief summarizes key results, insights, and lessons from the baseline survey round of a longitudinal mixed-methods study - the longitudinal study (LS) - designed to fill this evidence gap and to follow up on trends.

The study follows households with children aged three years and under for twenty-four months, taking repeat measures every four months of key nutrition outcomes and other indicators hypothesized to be related to child nutrition outcomes. The study focuses on immediate and underlying factors described in

the conceptual framework for undernutrition in Africa's drylands[1], including infant and young child feeding (IYCF), morbidity and maternal diet; livelihood dynamics and interactions with undernutrition; access to and availability of water, household hygiene, and food safety; caregiver and household health-seeking behavior; gender, women's time poverty, decision-making, and control over resources; household exposure and response to shocks.

Tracking acute malnutrition and associated factors longitudinally allows USAID Nawiri to empirically test which of these factors (or combinations thereof) are correlated with changes in acute malnutrition over a two-year period and the relative strength of those relationships. Weighing these factors and interpreting them through qualitative inquiry methods, combined with research from USAID Nawiri and other sources examining environmental and systemic constraints and opportunities (e.g., in relation to community health systems, food and water systems, natural resource management, livelihoods dynamics, conflict, etc.), USAID Nawiri is better able to prioritize, adjust, sequence, layer, and integrate interventions adapted to the different circumstances found across geographical and livelihood zones in Samburu and Turkana counties. In addition to informing program design, implementation, and adaptation, the longitudinal study can inform how nutrition surveillance systems might be adapted to track key variables correlated with acute malnutrition, and/or other methodological options for better tracking nutrition over time. *(See Insight n° 6 in the Conflict Learning Brief)*

LEARNING JOURNEY

The initial design of the longitudinal study brought together an international interdisciplinary team of researchers, nutritionists, public health experts, food security and resilience experts, and practitioners from the USAID Nawiri consortium partners. The initial design phase articulated a draft of the research objectives, protocol development, key variables to measure, sampling design, and frequency and duration of the survey. In addition, the program conducted stakeholder consultation sessions and workshops at the county level to finalize the design of the study and the baseline implementation process. Led by the African Population and Health Research Center (APHRC), the LS process goes through multiple phases or waves. This brief shares initial insights stemming from the first survey phase of the study which was conducted in May-June in Turkana and June-July in Samburu. Since data from just one survey round was available at the time of drafting this learning brief, it is premature to present any results that speak to trends and dynamics in acute malnutrition and associated factors. Instead, this brief summarizes the results for acute malnutrition and hypothesized immediate and underlying factors, and important variation observed by geography, livelihood, and other key demographics. In addition, this brief details lessons learned from the implementation of the longitudinal study that will inform adaptation of future survey rounds. The following waves will be integral to USAID Nawiri's ongoing learning journey and will allow the program to not only look at data snapshotting one point in time but to analyze and act upon identified trends while evaluating the program's contribution to reducing P-GAM.

[1] Helen Young, "Nutrition in Africa's Drylands: A conceptual framework for addressing acute malnutrition," Feinstein International Center, 2020.

INSIGHTS AND IMPLICATIONS

INSIGHT N°1: The findings of USAID Nawiri's longitudinal study are consistent with numerous cross-sectional surveys conducted in recent years which indicate that mid-upper arm circumference (MUAC) consistently underestimates gam rates relative to weight-for-height z-scores (WHZ) in the context of the arid and semi-arid lands. While MUAC-only programming and surveillance have clear and valid operational advantages, the risks of a priori exclusion from treatment, misclassification, and underestimation of gam prevalence warrant further risk stratification analysis of different anthropometric and non-anthropometric measures, in relation to both screening and monitoring. (ToC reference: IO 2.2.2)

The global trend towards MUAC (+oedema) based programming continues to accelerate as part of concerted efforts to maximize coverage and improve early detection and treatment of wasting. As the name implies, the bucket of interventions known collectively as the Simplified Approaches, some of which USAID Nawiri has piloted and will continue to scale in collaboration with county Ministry of Health, are predicated in part on a wealth of evidence and experience showing that MUAC can serve as an important, low-skill, rapid, and cost-effective wasting detection tool.

However, global evidence suggests that sensitivity and specificity of case detection utilizing MUAC and weight for height are widely disparate.[2] In both Samburu and Turkana baseline analyses found that MUAC consistently underestimated GAM rates relative to WHZ and moreover, the difference between the results from WHZ and MUAC suggests a non-linear relationship between the two measures. Previous research in the wider region has suggested that this non-linearity is particularly acute in pastoralist livelihood zones due to MUAC and WHZ having different associations with body composition and body shape.[3]

Key questions to address when choosing criteria for both identification/treatment and surveillance purposes center on associated risk (including both short- and long-term adverse effects) and anticipated benefits from the available or proposed intervention (in terms of both immediate response to treatment(s) and sustained recovery after treatment). One widely espoused argument is that MUAC is more closely associated with mortality and serious morbidity and that therefore in low resource settings, MUAC-only criteria is a valid means of prioritizing caseload. Some in the global nutrition community are pushing back on this notion, with data from several mortality studies (i.e., based on health facility data) suggesting that use of currently recommended World Health Organization (WHO) cut-offs in conjunction with MUAC-only (+ oedema) admission criteria may put a substantial number of WHZ only children at risk.[4] Proportional analysis has also been used to estimate how many children

[2] Lamsal et al (2021) 'Accuracy of Using Mid-Upper Arm Circumference to Detect Wasting Among Children Aged 6-59 Months in Nepal' https://pubmed.ncbi.nlm.nih.gov/34933983/
[3] Myatt et al (2009) 'The effect of body shape on weight-for-height and mid-upper arm circumference-based case definitions of acute malnutrition in Ethiopian children' https://pubmed.ncbi.nlm.nih.gov/19085192/;
[4] Schwinger et al (2019) 'Severe acute malnutrition and mortality in children in the community: Comparison of indicators in a multi-country pooled analysis https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0219745; Grellty et al (2015) 'Comparison of weight-for-height and mid-upper arm circumference (MUAC) in a therapeutic feeding programme in South Sudan: is MUAC alone a sufficient criterion for admission of children at high risk of mortality?' https://pubmed.ncbi.nlm.nih.gov/25805273/

may be missed under an "expanded MUAC-only" scenario. For example, a 2020 meta-analysis conducted by ACF and CDC, based on 550 population representative cross-sectional cluster surveys from across the world (36 of which were from Kenya), found that approximately one-quarter of WHZ only SAM children would not be detected and eligible for treatment and another 20% would be classified as MAM.[5] Even the strongest proponents of MUAC are now exploring more hybrid approaches, with Myatt et al (2021) for example, recently suggesting that MUAC + weight-for-age z score (WAZ), as opposed to WHZ, is a better predictor of mortality and may indeed be especially appropriate in a pastoral setting.[6] Some have proposed using ROC Curve analysis to derive adjusted MUAC cut-offs, as was recently done during the initial response to COVID-19 in several countries, though this has significant cost implications. Such examples have not yet provided answers to the operational issues and tradeoffs that propel MUAC to the fore, but they are indicative of a recognized need to continue searching for solutions, inclusive of both anthropometric and non-anthropometric measures, that leave no one behind.

INSIGHT N°2: High baseline levels of gam in both counties, with variation by livelihood group and survey zone, has potential implications for where and who to target, nonetheless additional rounds of data are needed to understand and act on trends.

The baseline round of the longitudinal study found that rates of acute malnutrition, according to WHZ classification <2, exceeded WHO emergency levels at 21.4% in Turkana and 19.3% in Samburu. This is generally consistent with recent SMART surveys, although comparisons must be approached with care given that the LS sampling frame focuses on children ages 0-35 months as opposed to 6-59 months. In both counties, bivariate analyses showed that prevalence of GAM varied by livelihood group, with pastoralists in Samburu and fisherfolk in Turkana having significantly higher GAM rates relative to other livelihood groups. Multivariate analyses found that these results were only robust for fisherfolk in Turkana, and other factors might be influencing differences in GAM rates observed between livelihood zones. Rates of GAM also varied by geography, with higher GAM rates in Samburu North and lower GAM rates in Samburu West relative to other survey zones. Understanding these variations is important for targeting and design of nutrition (and other) interventions for unique livelihood and geographic profiles, however subsequent survey rounds will be critical in elucidating whether these variations in GAM rates are consistent over time. For example, key dimensions (e.g., productivity, income generation, input availability, etc.) of livelihood strategies may vary significantly over time, which could influence GAM rates - monitoring whether and how this fluctuates over time will be a key dynamic for the longitudinal study to focus on.

[5] Guesdon et al (2020) 'Potential consequences of expanded MUAC-only programs on targeting of acutely malnourished children and ready-to-use-therapeutic-food allocation: lessons from cross-sectional surveys https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7050718/
[6] Myatt et al (2019) 'Improving screening for malnourished children at high risk of death: a study of children aged 6-59 months in rural Senegal' https://pubmed.ncbi.nlm.nih.gov/30501655/

INSIGHT N°3: The first round of the ls was unable to immediately draw correlations between baseline gam rates and explanatory variables, possibly due to limited variability among covariates.

Regressions and bivariate analyses were conducted to determine whether any associations could be detected between key explanatory variables and baseline GAM rates. While analysis of baseline data did uncover some relationships between key explanatory variables and GAM rates, few robust relationships were found. However, as discussed below, this could be due to limited variability in explanatory variables, and further quantitative and qualitative inquiry in subsequent survey rounds should explore these factors.

Consistent with other studies from the region, the baseline analysis suggested that early initiation of breastfeeding, including feeding of colostrum, are widespread. Rates of exclusive breastfeeding up to the recommended 6 months of age were much more mixed, with some significant differences across geographical and livelihood zones, and significant variation in line with the age and educational attainment of primary caregivers. Measures of complementary feeding were so universally poor that it proved too difficult to observe the nature of the relationship to nutrition outcomes. Clearly income and issues around food access are omnipresent factors, however there's also some indication that caregivers do have access to some nutritious foods given that their own consumption patterns include foods such as pulses which are generally more absent in the diets of young children. USAID Nawiri is in the process of consolidating similar findings with a wealth of qualitative data, all of which will serve as a cornerstone for heavily contextualized behavior change interventions.

Unsurprisingly the baseline study found very high rates of water insecurity, with roughly three out of four households in both Samburu and Turkana water insecure, with the exception of fisherfolk households in Turkana, where approximately half of households were water insecure. No statistically significant associations between water insecurity and acute malnutrition were however observed in the baseline data. The implications of this and other baseline results suggests that it may be too soon to conclude definitively what factors are (consistently) associated with child acute malnutrition. Baseline analysis has identified a few factors to explore further quantitatively and qualitatively (e.g., barriers to child dietary diversity and meal frequency). Other indicators with limited variation should continue to be monitored since these could, in theory, have increased variability at other times of the year.

INSIGHT N°4: The current ls study requires additional rounds of data and adapted methods to augment USAID Nawiri's understanding of how drivers and rates of p-gam may vary among children of adolescent mothers in Samburu and Turkana. Similarly, limited data on various dimensions of adolescent health and nutrition more broadly has also hindered the generation of evidence-based strategies and interventions aimed at disrupting the intergenerational cycle of malnutrition.

Learning in Phase 1 supports the need to adopt a broader "1,000 to 10,000 day" approach to the sustainable reduction of P-GAM in Samburu and Turkana (see ASRH Learning Brief). One subset of adolescents that calls for specific attention are those who are pregnant or parenting, particularly as global evidence suggests that pregnancy during adolescence, especially among girls who are or have in the past experienced severe malnutrition, is associated with poorer birth outcomes and increased risk of childhood acute malnutrition.

One of the objectives of the LS is to inform the program on variations across livelihood zones as they pertain to IYCF-related immediate causes of acute malnutrition, including how these variations

potentially differ between children of adolescent mothers versus older mothers (20 years and older). Besides the global evidence, findings from USAID Nawiri's gender analysis and research into the context-specific drivers of adolescent pregnancy gives cause to suspect that these differences may indeed exist in the local context, due in part to the existence of several additional risk factors. For example, it indicates that adolescent girls, and especially pregnant and early married girls are often virtually invisible within their communities and have extremely limited engagement outside of the household. This has critical implications, as their invisibility within the community limits their ability to shape decisions and outcomes that impact their access to opportunities and services and which will most probably be carried over into their adult life. (See ASRH Learning Brief, Insight 2)

Regrettably however, it is currently impossible to explore any hypothesis related to adolescent mothers through our quantitative data due to the age classifications selected for the survey instrument, whereby adolescents 15-19 years are grouped together with young women aged 20-24 years. Having more granular information about adolescents' roles and the challenges they face at specific ages will be critical for the program strategies design, hence the need to make sure future rounds of LS differentiate age categories more precisely. Further consideration also needs to be given to quantitative data needs pertaining to the 10–14-year-old age group, who although less likely to be mothers, are a group that USAID Nawiri needs to engage with in a preventative capacity.

Another important aspect that is currently difficult to scrutinize quantitatively relates to the phenomena of older women stepping in as caregivers for their grandchildren. Qualitative data suggests that this is especially common among mothers of adolescents who have given birth and either return to school or migrate to towns to seek employment. More insight into the impact of this on IYCF and care practices would allow USAID Nawiri to propose measures to better support what may be a hidden "at risk" group. Particularly relevant elements to understand are effects on the prevalence of exclusive breastfeeding, bottle feeding, breastmilk substitutes (BMS) usage (including what types of BMS), wet feeding (and by whom), and the age at which complementary foods are introduced. (See ASRH Learning Brief, Insight 2).

USAID Nawiri is currently considering how to adapt future rounds of the longitudinal study based on the needs and limitations identified. This may include the incorporation of adolescent anthropometric measurements (10-19yrs) and age category adjustments (disaggregation of 15-19yrs and 20-24yrs) to enable stronger bi-variate and multivariate analysis of the associations between caregiver age and other study variables. Access to iron folic acid supplements, adolescent consumption patterns, time use, and school attendance are also thought to be important factors and the team continues to deliberate on the practicality of their inclusion considering the limitations of the existing sampling framework. Where the latter is too much of a constraint for a viable statistical analysis, USAID Nawiri will look at designing small-scale independent studies to fill the knowledge gaps, including where relevant, deepening our qualitative inquiry work. Furthermore, USAID Nawiri will advocate at national and county level for the inclusion of standardized indicators and determinants of adolescent nutritional status in national data collection systems.

CONCLUSION & PRIORITY AREAS FOR CONTINUED LEARNING

The full utility of the longitudinal study will emerge as additional rounds uncover variations over time and across seasons within the same households, and in relation to the synergistic effects of what are

expected to be increasingly frequent and severe climate-associated shocks. Our experience implementing the baseline study has highlighted critical areas of improvement for future study phases and subsequent discussions on the results with county stakeholders also surfaced a number of opportunities to adapt subsequent survey rounds. These will more narrowly focus on context specific and emergent issues and are expected to help reduce the risk of attrition. Additionally, as key drivers of malnutrition are influenced by seasonality, the timing of the rounds will need to be reconsidered. Specifically, Turkana County stakeholders suggested slight modifications to the timing of survey rounds in their county to better capture temporal dynamics they have observed. Finally, the program is also considering reducing the questionnaire length to mitigate attrition in subsequent rounds and further explore issues specific to adolescent mothers and caregivers.

Phase 1 helped to identify priority areas for continued learning that include:

1. MUAC-WHZ and implications for programming (including simplified approaches), costing and surveillan3.
2. The impact of adolescent caregiver status on nutrition outcomes. This will allow the program to gather the granularity of information required to adapt interventions to specific needs and vulnerabilities.

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This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents of this report are the responsibility of Mercy Corps recipient of cooperative agreement no. 72DFFP19CA00003 and do not necessarily reflect the views of USAID or the United States Government.

Nawiri is a consortium of: