Estimating 'people in need' from combined GAM in Afghanistan

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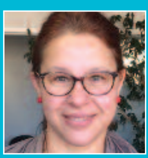

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Taking MUAC measurement of a small child, Afghanistan, 2016

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Location: *Afghanistan*

What we know: The correlation between weight-for-height z-score (WHZ) and mid-upper arm circumference (MUAC) prevalence varies by context; this has implications for programme caseload projections.

What this article adds: The proportions of global acute malnutrition (GAM) and severe acute malnutrition (SAM) cases among children aged 6-59 months in Afghanistan captured by different indicators (WHZ, MUAC and a proposed aggregate indicator (cGAM)) was determined. Anthropometric databases from 31 SMART surveys from 30 out of 34 provinces (2015-2018) were used, totalling 28,301 children. Only 25.7% of GAM cases and 14.7% of SAM cases met both WHZ and MUAC criteria. Numbers of GAM cases identified were: 2,936 (WHZ); 3,068 (MUAC); and 4,777 (cGAM). Caseloads for SAM were: 814 (WHZ); 751 (MUAC); and 1,364 (cSAM). Three caseload calculations were performed in 22 priority provinces based on WHZ, MUAC and cGAM to compare the differences. The caseload estimate was 1,021,039 by WHZ; 1,090,620 by MUAC; and 1,578,465 by cGAM. Poor correlation between WHZ and MUAC in the Afghanistan context necessitates use of cGAM to estimate caseloads. The authors recommend that cGAM is routinely reported from population-representative nutrition surveys globally, in addition to WHZ and MUAC, to enable context-specific decision-making. Globally validated cut-offs for cGAM are needed.

Background

The World Health Organization (WHO) recommends the use of weight-for-height z-score (WHZ) to estimate prevalence of global acute malnutrition (GAM), also referred to as wasting, among children aged 6-59 months (WHO and UNICEF, 2009). Population WHZ is compared against the 2006 WHO growth standards for boys and girls. Individual cases with WHZ ≥-3 and <-2 are categorised as moderate acute malnutrition (MAM), while WHZ <-3 cases are categorised as severe acute malnutrition (SAM). WHO also recommends the use of mid-upper arm circumference (MUAC) as an independent diagnostic criterion (WHO and UNICEF, 2009). MUAC relies not on sex-specific growth references, but on a global cut-off indicating severity; MUAC ≥115 mm and <125 mm is categorised as MAM, while cases with MUAC <115 mm are categorised as SAM.

WHZ and MUAC are generally presented independently in SMART[1] and UNHCR Standardised Expanded Nutrition Surveys (SENS) to estimate the prevalence of acute malnutrition, since it is well established in the literature that WHZ and MUAC correlate poorly (Roberfroid *et al*, 2015). A 2018 analysis of 744 population-representative surveys from 41 countries concluded that the prevalence of acute malnutrition by WHZ and MUAC varied considerably, even within the same region and country, while the prevalence of global acute malnutrition GAM by WHZ was higher than GAM by

[1] Standardized Monitoring and Assessment of Relief and Transitions

A girl being measured for height, Kandahar, Afghanistan, 2018

Alexandra Humphreys, Action Against Hunger

MUAC approximately 75% of the time (Bilukha and Leidman, 2018). WHZ is standardised for sex and height (and thus indirectly for age). Recommended global MUAC cut-offs are not standardised for sex, height, or age and tend to identify younger and stunted children (Grellety and Golden, 2016, Roberfroid et al, 2015). The potential for WHZ and MUAC to capture different children is why they are reported separately and used independently as enrolment criteria for the treatment of acute malnutrition among children aged 6-59 months. However, the discrepancy between WHZ and MUAC, and how this can affect overall caseloads, is rarely considered at field level for programmatic purposes.

Countries adopt different approaches towards individual detection and enrolment criteria for acute malnutrition management according to the context. In Afghanistan, population-representative anthropometric SMART surveys have suggested a distinct discrepancy between the prevalence of GAM by WHZ and MUAC, with the prevalence by MUAC being higher in most surveys. The Integrated Management of Acute Malnutrition National Guidelines[2] (January 2018) recommends the use of WHZ, MUAC, oedema and clinical status. In order to represent the burden of acute malnutrition among children aged 6-59 months more accurately, Action Against Hunger, with the support of local partners and the Ministry of Public Health Public Nutrition Directorate, began reporting on the prevalence of GAM combining both WHZ and MUAC in 2015. Combined GAM (cGAM) is an aggregated indicator including all cases of GAM by WHZ <-2, MUAC <125 mm, and/or bilateral pitting oedema.

This article examines the practical implications of using cGAM in the Afghan context and considers the implications of using cGAM in settings where WHZ and MUAC are poorly correlated.

The humanitarian programme cycle (HPC) is a coordinated series of actions undertaken to help prepare for, manage and deliver humanitarian response. The critical first step of the HPC is the humanitarian needs overview (HNO), which helps to inform strategic response planning. During the process of HNO development, each sector cluster calculates its estimated caseload requiring humanitarian assistance, known as the 'people in need' (PiN) estimation. In Afghanistan, the PiN is calculated in advance of each year in alignment with the Afghanistan multi-year Humanitarian Response Plan (HRP) strategy. Previously, caseload calculation in Afghanistan had relied on malnutrition estimates based on WHZ. With the frequent observations that the prevalence of acute malnutrition by MUAC was higher in most provinces than WHZ, nutrition stakeholders began advocating for both indicators to be considered in PiN estimates.

Methods

An analysis of the proportions of GAM and SAM cases among children aged 6-59 months in Afghanistan captured by different indicators (WHZ, MUAC, cGAM) was performed. Data cleaning and analysis was conducted using STATA Version 15. The anthropometric databases from 31 SMART surveys supported by Action Against Hunger between January 2015 and September 2018 were appended to create a complete database of children aged 6-59 months. During the data cleaning process, observations were systematically excluded from the dataset, as only children with both MUAC and WHZ data were retained for analysis. Eighty-one observations were removed due to missing MUAC data. Thirty observations were removed due to missing WHZ data, including cases of oedema (9)[3]. Due to the assumed heterogeneity of the sample of nationwide data, the data were assessed using WHO flags (+/- 5 standard deviations from the mean (μ=0)) in order to exclude outliers based on biological implausibility. Seventy-four observations were flagged as outliers per WHO flags and removed from the dataset. Overall, 185 (0.6%) observations were removed from the dataset. The final analysis assessed 28,301 children aged 6-59 months.

Children categorised as GAM by WHZ (<-2 z-scores) were cross-tabulated against children categorised as GAM by MUAC (<125 mm) to examine the relationship between the two indicators. The same method was conducted to compare SAM by WHZ (<-3 z-scores) and SAM by MUAC (<115 mm).

Separately, to compare the difference in caseload calculations based on the different anthropometric indicators (WHZ, MUAC and cGAM), three separate caseload calculations were performed using Excel 2016 following the method developed by the Global Nutrition Cluster (GNC):

Caseload = N x P x K
where N=population size,
P=prevalence of malnutrition,
K= correction factor

Twenty-two priority provinces were used for calculation, with the Nutrition Cluster in Afghanistan defining a province as priority if it has a GAM prevalence by WHZ ≥10.0%. The population size (N) was derived from the 2018-2019 population estimates available from the Central Statistics Organization (CSO) of Afghanistan. The estimated prevalence of acute malnutrition (P) by WHZ, MUAC and cGAM per province was sourced from the most recent SMART surveys. Lastly, a correction factor (K) of 2.6 was used per GNC recommendations for calculating nutrition caseload for a year.

Results

The anthropometric data were examined from 31 population-representative, cross-sectional SMART surveys conducted across 30 of the 34 (88.2%) provinces of Afghanistan from 2015 to 2018, suggesting a sample reflecting all regions of the country. The sample was 48.6% female and 51.4% male. The age ratio of children aged 6-29 months compared to children aged 30-59 months was 1.03 (higher than the expected proportion of 0.85[4]).

Overall, there were 2,936 cases of GAM per WHZ and 3,068 cases of GAM per MUAC, as presented in Figure 1. Despite a similar number of cases using either indicator, there remains a large discrepancy in cases captured by both, with only 25.7% of cases identified as GAM according to both indicators. More GAM cases were identified using MUAC than WHZ; however, using MUAC alone would capture only 64.2% of cases. Alternatively, using WHZ alone would capture just 61.5% of these cases. Considering cGAM (WHZ and/or MUAC), there were a total of 4,777 GAM cases.

Overall, there were 814 cases of SAM per WHZ and 751 cases of SAM per MUAC, as presented in Figure 2 below. Despite a similar number of cases using either indicator, there remains a large discrepancy in cases captured by both, with only 14.7% of cases identified as SAM according to both indicators. More SAM cases were identified using WHZ than MUAC; however, using WHZ alone would capture only 59.7% of cases. Alternatively, using MUAC alone would capture just 55.1% of these cases. Considering cSAM (WHZ and/or MUAC), there were a total of 1,364 SAM cases.

The results of the caseload calculation based on three scenarios presented in Table 1 demonstrate the difference in caseloads based on WHZ, MUAC and cGAM. All three scenarios examined the same 22 priority provinces, thereby utilising the same total population and total population under five years old data, while examining a different prevalence of malnutrition per province based on the indicator. As expected, the caseload estimate by WHZ was the lowest, with an estimated

[2] www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/afg_imam_guideline_2018_final.pdf
[3] Due to the physiological effects of oedema causing retention of fluid in the body, weight data is not considered for children with nutritional oedema.
[4] Per the SMART Methodology plausibility check

Figure 1 Venn diagram visualising discrepancies between cGAM, GAM per WHZ and GAM per MUAC

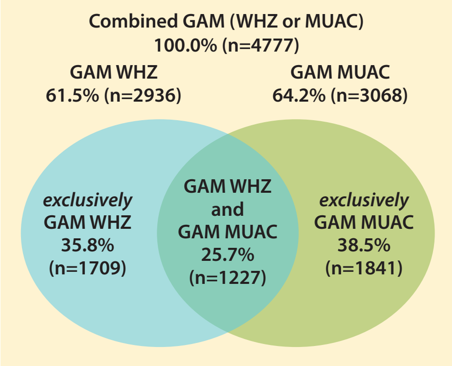
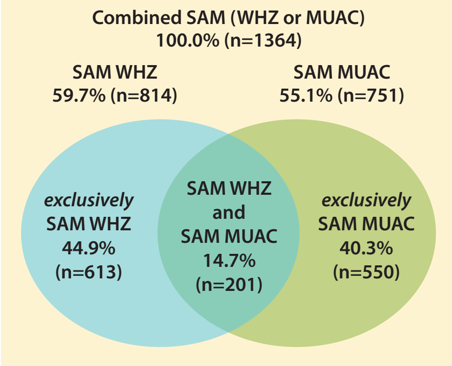


Figure 2 Venn diagram visualising discrepancies between cSAM, SAM per WHZ and SAM per MUAC



1,021,039 children under five years old acutely malnourished. The caseload estimate by MUAC was higher, with an estimated 1,090,620 children under five years old acutely malnourished. The caseload estimate by cGAM was the highest, with an estimated 1,578,465 children under five acutely malnourished (UNOCHA, 2018).

Discussion

WHZ and MUAC are currently used independently to assess acute malnutrition among individual children as well as the overall population of children aged 6-59 months. Both methods possess strengths and weaknesses, lending to their potential to capture different subsets of children. In the Afghan context, the higher proportion of children identified using MUAC prompted humanitarian practitioners to investigate how many children were being captured by both indicators. This analysis demonstrates that there is a large discrepancy between cases of acute malnutrition identified by WHZ and MUAC in Afghanistan, with only one in four children being captured by both indicators.

These findings have important implications for estimating the burden of acute malnutrition. Traditionally, most countries have relied on the prevalence of WHZ for caseload calculation as it is standardised for age and sex and tends to generate a higher prevalence than MUAC; often perpetuating the assumption that, because it is a larger prevalence, it also captures and accounts for the children who are acutely malnourished by MUAC. The poor correlation between WHZ and MUAC as demonstrated in recent literature, in addition to the results of this analysis, supports the argument that cGAM should be routinely calculated and reported by countries to recognise any discrepancy between the two indicators.

There are also programming implications for countries or regions that rely exclusively on MUAC as a criterion for enrolment into a programme for the treatment of acute malnutrition. Using only MUAC can exclude the portion of the population aged 6-59 months that would be eligible only by WHZ, who are more likely to be older children considering MUAC's known bias towards identifying smaller and younger children. Depending on the discrepancy between the two indicators for the context, a sizable portion of the eligible children could be excluded from treatment. In Afghanistan, MUAC is mainly used for community-based screenings, increasing the likelihood that a portion of acutely malnourished children is missed altogether.

The Afghanistan national Integrated Management of Acute Malnutrition (IMAM) guideline includes both WHZ and MUAC as independent admission criteria for SAM and MAM treatment centres. Practically, this means that any child under five years old with WHZ <-2 and/or MUAC <125mm should be referred to a nutrition centre for appropriate malnutrition treatment and care. WHO recommends that, to improve planning, the same criteria used for admission into programmes should be used for estimating caseload (WHO and UNICEF, 2009). Accurate caseload calculation is crucial in planning the appropriate resources to meet the needs of this vulnerable subset of the population. Ultimately, planning based on cGAM is both viable and important in the Afghan context, with the Public Nutrition Directorate, the Ministry of Public Health and the Nutrition Cluster having endorsed the practice to ensure realistic forecasting and programme implementation. Yemen has also adopted combined GAM for caseload calculation since 2017 as part of its national guideline.

Given the discrepancy between WHZ and MUAC in the Afghan context, the use of cGAM for caseload calculation is necessary to accurately estimate the burden of acute malnutrition. As contrasted in the three scenarios, using cGAM estimated 1.58 million acutely malnourished children under five, while using MUAC estimated 1.09 million (30.9% less) and WHZ estimated 1.02 million (35.3% less). In other words, relying on WHZ caseload estimations alone for 2019 could have overlooked the necessary advocacy, resources, planning and programming for half a million cases of acute malnutrition; one in every three wasted children under five in Afghanistan.

Recommendations

Given the evidence presented, it is recommended that cGAM be routinely reported from population-representative nutrition surveys globally. Reporting cGAM should not replace but complement the reported prevalence of acute malnutrition by GAM by WHZ and GAM by MUAC to enable nutrition stakeholders to utilise any of the three indicators for decision-making as is most appropriate for their context. cGAM should also be considered for use in calculating caseload, particularly in contexts where GAM by WHZ and GAM by MUAC are poorly correlated. Considering that there are globally validated cut-offs for GAM by WHZ as well as GAM by MUAC, global nutrition leaders should establish a globally validated cut-off for cGAM for better interpretation of findings by nutrition stakeholders and decision-makers.

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Table 1 Three scenarios for Afghanistan 2019 HNO caseload estimation among 22 priority provinces (2018-19 SMART survey data)

Scenario	Total Population (2018)	Total U5 population (17.3%)	GAM (range)*	SAM (range)	Total # of MAM (U5)	Total # of SAM (U5)	Total # of GAM (U5)
Scenario 1: WHZ**	17,773,741	3,074,857	(10.4% to 15.7%)	(1.4% to 4.2%)	783,201	237,838	1,021,039
Scenario 2: MUAC			(6.4% to 24.4%)	(1.3% to 7.4%)	789,370	301,250	1,090,620
Scenario 3: cGAM			(14.4% to 26.9%)	(2.7% to 8.4%)	1,122,626	455,839	1,578,465

*Range of acute malnutrition prevalence across the 22 priority provinces
**WHZ data was available for children aged 0-59 months. MUAC and cGAM data was only available for children aged 6-59 months (as MUAC is not a validated indicator for infants <6 months) and the results were generalised to the entire under-five population.

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