

IPC guidance on assessing the quality of MUAC data

1. Background

Global Acute Malnutrition based on Mid-Upper Arm Circumference (GAM based on MUAC¹) is one of the indicators used to classify the severity of acute malnutrition in IPC. IPC allows MUAC data coming from surveys, sentinel site surveillance, and rapid assessments in its classifications provided that the quality² of the MUAC data is acceptable. Although Global Acute Malnutrition based on Weight for Height Z-score (GAM based on WHZ³) is the preferred indicator, MUAC has increasingly been collected and used in IPC classifications, especially in humanitarian contexts where it is difficult to collect GAM based on WHZ.

Concerns have been raised about the quality of MUAC data collected through these methods in several countries and humanitarian contexts. This note describes the different tests and techniques that can be used to assess quality of the MUAC data. IPC analysts should use these tests and techniques to verify the quality of the MUAC data before using it in IPC analyses and classifications.

2. MUAC assessments

In order to ensure adequate precision and accuracy of the MUAC data are available for IPC analyses, it is important to consider various issues before, during, and after the assessments in which MUAC is collected. Although IPC does not involve in primary data collection and the primary focus of this guidance note is on checking the quality of MUAC data already collected, it is important to ensure that these are taken into account during the assessment.

2.1. Before the assessments

2.1.1. Sample size

Depending on the type of assessment, the sampling and sample requirements for MUAC varies. Table 1 below provides the minimum sample size requirement for each of the different type of assessment from which MUAC data are accepted for IPC analysis.

Table 1: Minimum sample size requirement for MUAC based on the type of assessment

No	Type of assessment*	Sample size
1	Representative surveys	- Cluster surveys with ≥ 25 clusters** - Simple or systematic surveys with ≥ 150 observations
2	Sentinel sites	≥ 5 sites per unit of analysis with ≥ 200 total observations (if the area is pastoral, ≥ 5 sites with 100 observations is acceptable)
3	Screening	- Exhaustive screening (door-to-door) carried out at the unit of analysis ($>80\%$ coverage) or - Screening from ≥ 3 sites (selected either randomly or purposively, for variability reasons) from the unit of analysis and ≥ 200 observations selected randomly or exhaustively ($>80\%$ coverage) totalling ≥ 600 observations

*all MUAC assessments should be carried out during the same season of current analysis if there's seasonality; if not any MUAC assessment conducted in the same year can be used.

**if the cluster survey has between 20-25 clusters, the estimates may still be used but if <20 clusters, the estimate cannot be used

¹MUAC $< 125\text{mm}$ and/or presence of bilateral pitting oedema

² Measured in terms of both precision and accuracy

³WHZ < -2 and/or presence of bilateral pitting oedema

Note that although the sample size reequipments mentioned above address the precision of the MUAC prevalence estimates, it doesn't ensure the accuracy of the MUAC data.

2.1.2. Dedicated measurers and standardisation test

Each assessment team should have dedicated member(s) for measuring MUAC. **Each** measurer **must** go through a **standardisation exercise**⁴ and **pass the test** it before being allowed to take measurements during the survey.

2.1.3. Data to collect

MUAC must be collected in absolute numbers (e.g. 113mm, 127mm, etc.) rather than in colour categories (such as green, yellow, and red). This is of particular importance in contexts where MUAC screening is collected for programming purposes but also used to generate prevalence estimates – although different colour categories may be sufficient for programming purposes, it is not useful to check the quality of the data.

As MUAC has inherent bias towards age, it is essential to collect age⁵ of the child as well. Knowing the age ratio allow one to correct for age as needed. Additionally, it is recommended to collect the sex data as well as oedema.

2.1.4. Assessment forms

Standard MUAC assessment forms are available. Two of these forms are included in annex 1 (MUAC Assessment Form A) and annex 2 (MUAC Assessment Form B). The MUAC Assessment Form B in annex 2 should only be used in situations where there is insufficient time to collect age data accurately– e.g. MUAC screening in contexts where majority of the children don't have accurate date of birth records and therefore enumerators need to rely on local events calendars to estimate the age. In all other circumstances (e.g. surveys, sentinel site data collection, etc.) the MUAC Assessment Form A in annex 1 should be used. Sufficient time should be allocated for enumerators to accurately estimate the age of the child and collect age data.

2.2. During the assessment

MUAC data collected during the assessment should be checked on a daily basis against the criteria outlined below and feedback should be given to the measurers. It is strongly recommended that the MUAC data be entered in ENA software and quality is checked.

2.3. After the assessment

A final quality check using the criteria outlined below should done before the results of the assessment are used in an IPC analysis.

3. MUAC quality checks

Before conducting MUAC quality checks, the following face validity check could be carried out:

- a) **Number of clusters (if it is a cluster survey) and number of sites and number of children in other assessments.** Check the numbers and make sure that they meet the criteria specified in Table 1 above.
- b) **Percentage of children with MUAC 115mm and <125mm and MUAC<125.** Percentage of children with MUAC<115mm can not be more than the percentage of children with MUAC 115mm and <125mm

⁴For details, visit www.smartmethodology.org

⁵MUAC measurements are carried out on children 6-59 months of age. Ideally, age should be collected in months. If this is not possible, age data should at least be collected and recorded as <2 years and >2 years. In areas with limited access or there is limited time to collect age data, height sticks may be considered to estimate the age.

- c) **Percentage of children with Oedema.** Oedema is usually rare. The overall percentage of children with oedema in most areas will not exceed 3%.

Table 2 provides the details of quality check that must be performed. All these tests can be carried out in the ENA for SMART software.

Table 2: MUAC quality check criteria and ranges

No	Criteria	Expected	Excellent	Acceptable	Poor	Problematic
1	Age ratio between 6-29 months and 30-69 months*	Around 0.85 (p>0.05)	p>0.1	p>0.05	p>0.001	p<=0.001
2	Sex ratio between boys and girls	Around 1 (p>0.05)	p>0.1	p>0.05	p>0.001	p<=0.001
3**	MUAC-for-Age Zscore Standard Deviation	Between 0.8 and 1.2	<1.1 and >0.9	<1.15 and >0.85	<1.20 and >0.80	>=1,2 or <=0,8
4a**	MUAC Digit preference	Digit Preference Score <12	0-7	8-12	13-20	>20
4b**	MUAC Standard deviation	Standard deviation<14.0	<13.0	13.0-<14.0	14.0-<15.0	>15.0
*if age ratio is significantly different (i.e. p<0.05), age-adjusted estimates should be calculated using the Excel worksheet developed by CDC – see diagram in annex 3 (an electronic version is provided with this guidance note) **MUAC-for-Age Zscore Standard Deviation(MUACZ-SD) should be prioritize when available. MUAC Digit preference together with MUAC Standard deviation should be consider only in absence of MUACZ-SD						

All the above-mentioned tests can be performed using the ENA for SMART software. The age ratio, sex ratio, and the digit preference can be obtained by generating the ENA Plausibility Check. The standard deviation of MUAC can be obtained from the Results Anthropometry screen of the ENA for SMART software (by selecting the 'All' and 'MUAC' options under the 'Graphs' section in the Results Anthropometry screen).

Once the quality check is completed, it is useful to summarise the results by area and share it with the IPC lead facilitator for the analysis for review. The following summary table is recommended for use.

Table 3: Summary MUAC results by area

No	Area Name	Total no. of clusters	Total no. of children	Sex ratio boys/girls [p-value]	Age ratio, 6-29 months to 30-59 months [p-value]	Digit preference score MUAC	% MUAC <125mm [95% CI]	% MUAC <115mm [95% CI]	% Oedema	Mean $\pm$ SD of MUAC	Design effect of MUAC < 125 mm (if cluster survey)
1											
2											
3											
4											
5											
...											

Annex 1: MUAC Assessment Form A

Cluster/Village/Camp/Location: Team number: Date:

INSTRUCTIONS

- Identify if the child is male (M) or female (F); use the left side for male children and the right side for female children.
- Record the sex of the child in the first column (Male or Female). Record the MUAC measurement, to the nearest mm, in the 'MUAC measurement' column. Mark an 'X' in the normal **or** moderate **or** severe column as per the MUAC measurement. Check for Oedema and record in the last column.
- Add the totals in the last row.

Male						
Child No	DoB or Age in months	MUAC (mm)	Normal ≥ 125 mm (Green)	Moderate 115-124mm (Yellow)	Severe < 115 mm (Red)	Oedema (Y/N)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
Total						

Female						
Child No	DoB or Age in months	MUAC (mm)	Normal ≥ 125 mm (Green)	Moderate 115-124mm (Yellow)	Severe < 115 mm (Red)	Oedema (Y / N)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
Total						

DoB=Date of Birth

Annex 1: MUAC Assessment Form B

Village/Camp/Location: Team number: Date:

INSTRUCTIONS

- Determine if the child is 2 years or older or below 2 years of age and use the left side for children less than 2 years old and the right side for children 2 years or older.
- Record the sex of the child in the first column (Male or Female). Record the MUAC measurement, to the nearest mm, in the 'MUAC measurement' column. Mark an 'X' in **EITHER** the normal **or** moderate **or** severe column as per the MUAC measurement. Check for Oedema and record in the last column.
- Add the totals in the last row.

6 Months - <2 Years Old						
Child No	Sex (M / F)	MUAC (mm)	Normal ≥125mm (Green)	Moderate 115-124mm (Yellow)	Severe <115mm (Red)	Oedema (Y/N)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
Total						

≥ 2-5 Years Old						
Child No	Sex (M / F)	MUAC (mm)	Normal ≥125mm (Green)	Moderate 115-124mm (Yellow)	Severe <115mm (Red)	Oedema (Y / N)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
Total						

Annex 3: Diagram of CDC Excel worksheet to generate age-adjusted MUAC estimates (an electronic version is provided with this guidance note)

Nutrition Assessment Results

Age categories	Indicator	Males		Females		Total		Weighted Total**
		N	%	N	%	N	%	%
6mo - <2 Years Old	Oedema	0	0.0%	0	0.0%	0	0.0%	
	<115 mm	1	0.5%	12	0.2%	13	0.3%	
	115-124 mm	159	80.7%	194	4.0%	353	7.0%	
	≥125 mm	37	18.8%	4648	95.8%	4685	92.8%	
	Total	197	100.0%	4854	100.0%	5051	100.0%	
≥ 2-5 Years Old	Oedema	0	0.0%	0	0.0%	0	0.0%	
	<115 mm	0	0.0%	5	0.1%	5	0.1%	
	115-124 mm	5	0.1%	489	11.6%	494	5.1%	
	≥125 mm	5521	99.9%	3739	88.3%	9260	94.9%	
	Total	5526	100.0%	4233	100.0%	9759	100.0%	
Total	Oedema	0	0.0%	0	0.0%	0	0.0%	0.0%
	<115 mm	1	0.0%	17	0.2%	18	0.1%	0.1%
	115-124 mm	164	2.9%	683	7.5%	847	5.7%	5.7%
	≥125 mm	5558	97.1%	8387	92.3%	13945	94.2%	94.2%
	Total	5723	100.0%	9087	100.0%	14810	100.0%	100.0%

Instructions: Fill in the cells that have a white background (C5-C7, C9-11, E5-7, E9-11). The rest of the cells will be filled in automatically.

** MUAC shows a known bias towards younger children. In a balanced sample we expect approximately two thirds of the sample to be over 2 years old. If too few older children are included in the sample use the weighted total.